3232 Jockvale Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

Prepared for:

Minto Communities
200-180 Kent Street
Ottawa, ON K1P 0B6

Prepared by:

CGH TRANSPORTATION

13 Markham Avenue
Ottawa, ON K2G 3Z1

February 2020

PN: 2019-22

Table of Contents

List of Figures

Table of Tables

List of Appendices

1 Screening

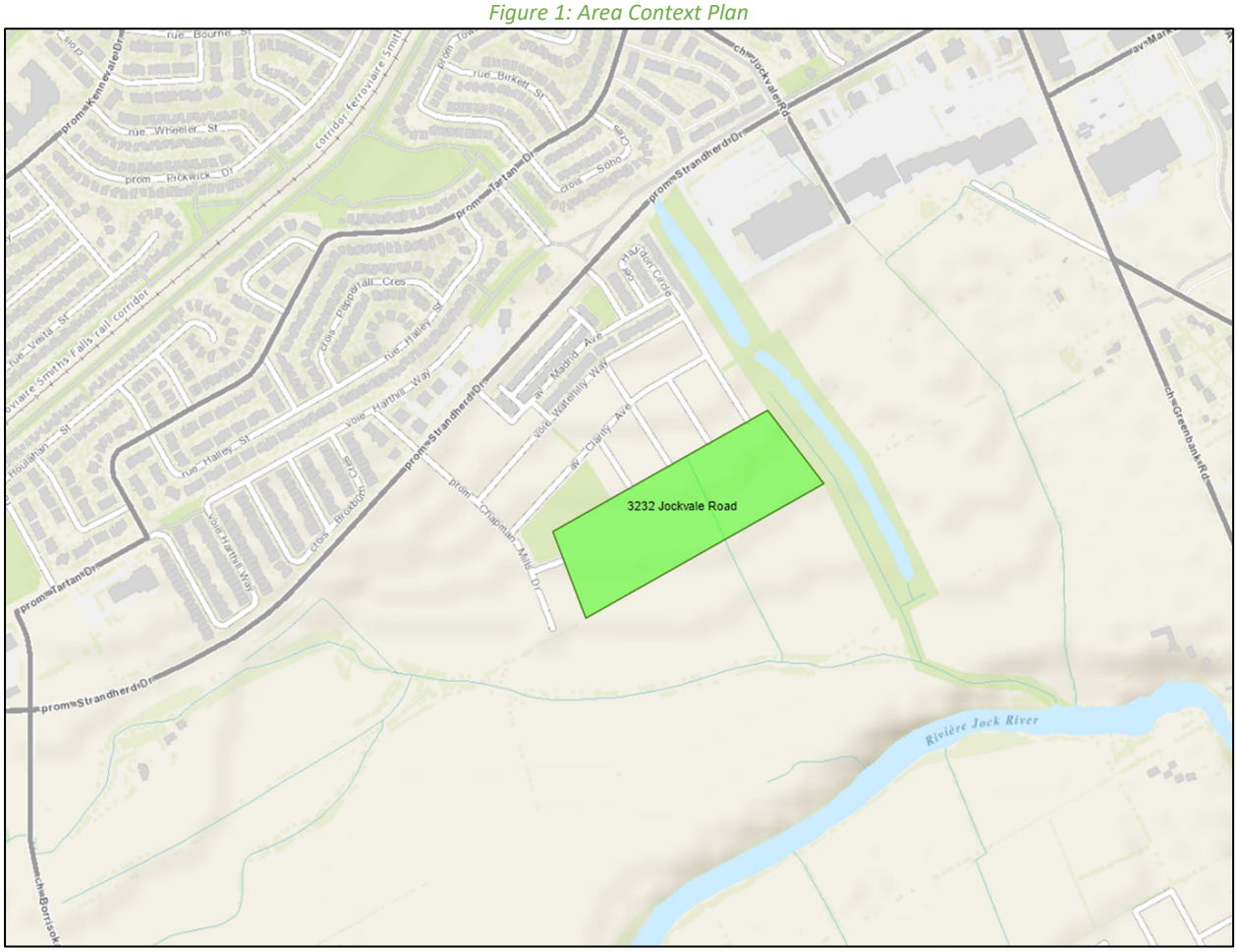
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required including the Design Review component and the Network Impact Component.

2 Existing and Planned Conditions

2.1 Proposed Development

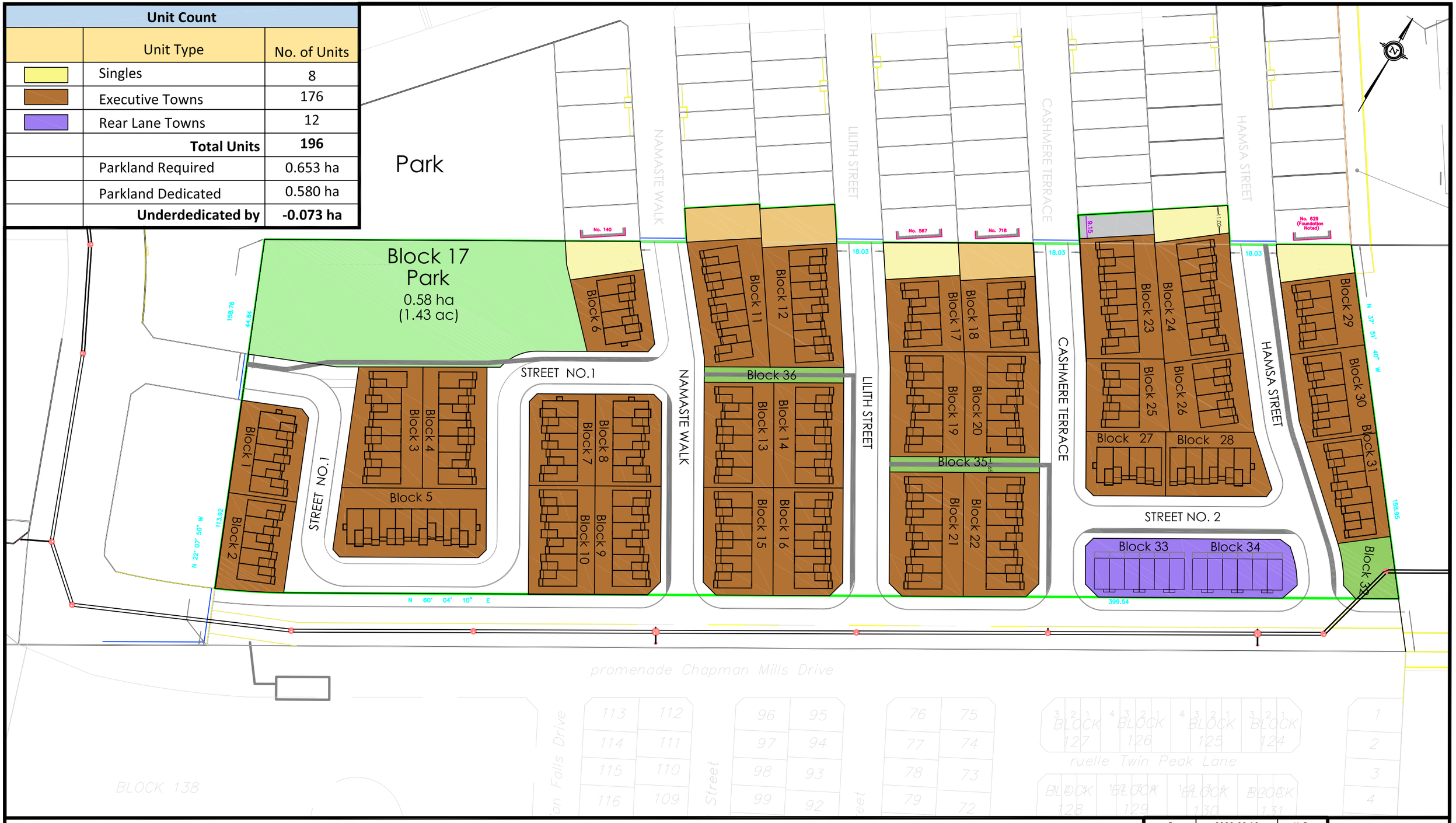
3232 Jockvale Road, currently zoned as Development Reserve (DR), is being planned to include a total of 8 single family homes and 188 townhome units built in a single phase. The anticipated full build-out and occupancy horizon is 2022. A signalized full movement intersection and three right-in/right-out intersections will connect to Chapman Mills Drive. The site is within the Nepean South Area 8 Secondary Plan area and will be used as the reference planning documents. This study supports both zoning bylaw amendment and plan of subdivision applications. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: May 23, 2019

Unit Count		
	Unit Type	No. of Units
	Singles	8
	Executive Towns	176
	Rear Lane Towns	12
	Total Units	**196**
	Parkland Required	0.653 ha
	Parkland Dedicated	0.580 ha
	Underdedicated by	**-0.073 ha**



minto Communities

HARMONY - STAGE 4
Concept Plan 9.6

- Sidewalks
- 30' Single Lot
- 36' Single Lot
- 43' Single Lot

Rev.	Date	By
5	2020-02-18	K.G.
4	2020-02-12	E.P.
3	2020-01-27	M.G.
2	2020-01-23	M.G.
1	2019-11-27	M.G.
0	2019-11-08	M.G.

Scale:

NTS

2.2 Existing Conditions

2.2.1 Area Road Network

Strandherd Drive: Strandherd Drive is a City of Ottawa arterial road with a 2-lane rural cross-section, including sidewalks. The posted speed limit is 80 km/h and the Ottawa Official Plan reserves a 44.5 metre right of way.

Chapman Mills Drive: Chapman Mills Drive is a City of Ottawa major collector road with a divided two-lane urban cross-section and centre median reserved for bus rapid transit. Sidewalks and on-street parking are provided on both sides of the roadway, and buffered bike lanes are provided on blocks east of Beatrice Drive. The posted speed limit is 40 km/h during school days/hours, and the right-of-way is 41.0 metres.

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.

Jockvale Road (rural): Jockvale Road, adjacent to Greenbank Road, is a City of Ottawa local road with a two-lane cross-section that transitions between an urban cross section and a rural cross section, with gravel shoulders. The posted speed is 60 km/h and the right-of-way is 26.0 metres west of Greenbank Road and 20.0 metres to the east.

Jockvale Road (urban): Jockvale Road, north of Strandherd Drive, is a City of Ottawa major collector road with a two-lane rural cross-section including gravel shoulders. The posted speed limit is 60 km/h and the right-of-way is 26.0 metres. South of Strandherd Drive, Jockvale Road is a City of Ottawa collector road with an unposted 50 km/h speed limit. The road is an urban cross-section, with a 24.0 metre dedicated right-of-way, narrowing to 20.0 metres between the existing commercial/retail (currently a Best Buy and Home Depot).

Andora Avenue: Andora Avenue is a City of Ottawa local road with a two-lane urban cross-section. The unposted speed limit is 50 km/h, a sidewalk is provided on one side, and the existing right-of-way is 16.0 metres.

Madrid Avenue: Madrid Avenue is a City of Ottawa local road with a two-lane urban cross-section. The unposted speed limit is 50 km/h, a sidewalk is provided on one side, and the existing right-of-way is 16.0 metres.

2.2.2 Existing Intersections

The existing area intersections adjacent to the proposed site and additional signalized intersections within 1 km have been summarized below:

Strandherd Drive & Chapman Mills Drive	The intersection of Strandherd Drive and Chapman Mills Drive is an unsignalized intersection with minor street stop-control. The northbound approach currently consists of a northbound right-turn only, and the southbound approach consists of a shared left-turn/right-turn lane. The eastbound approach consists of a left-turn lane and shared through/right-turn, and the westbound approach consist of a shared through/right-turn. The south leg is planned to become a right-in/right-out access. The splitter island on the south side of the intersection currently restricts northbound through and left-turn, southbound through, and westbound left-turning movements
Strandherd Drive & Andora Avenue	The intersection of Strandherd Drive and Andora Avenue is a signalized intersection. The northbound approach consists of a shared all movement lane, the east bound approach consists of a shared though

	lane/right-turn lane, and the westbound approach consists of a left-turn lane and shared through lane. No turn restrictions are noted.
Strandherd Drive & Jockvale Road	The intersection of Strandherd Drive and Greenbank Road is a signalized intersection. The east and west bound approaches consist of an auxiliary left-turn lane, a through lane, and a shared through/right-turn lane. The northbound approach consists of an auxiliary left-turn lane, through lane, and an auxiliary right-turn lane. The southbound approach consists of an auxiliary left-turn lane, and a shared through/right-turn lane. No turn restrictions were noted.
Greenbank Road & Marketplace Avenue	The intersection of Greenbank Road and Marketplace Avenue is a signalized intersection. The east and west bound approaches consist of an auxiliary left-turn lane and a shared through/right-turn lane. The southbound approach consists of dual auxiliary left-turn lanes, a through lane, a shared through/right-turn lane, and a bike lane. The northbound approach consists of an auxiliary left-turn lane, a through lane, and a shared through/right-turn lane. No turn restrictions were noted.
Greenbank Road & Jockvale Road	The intersection of Greenbank Road and Jockvale Road is a signalized intersection with shared all movement lanes on the north and east bound approaches. The southbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane, and the westbound approach consists of a shared left-turn/through lane and an auxiliary right-turn lane. No turn restrictions were noted.

2.2.3 Existing Driveways

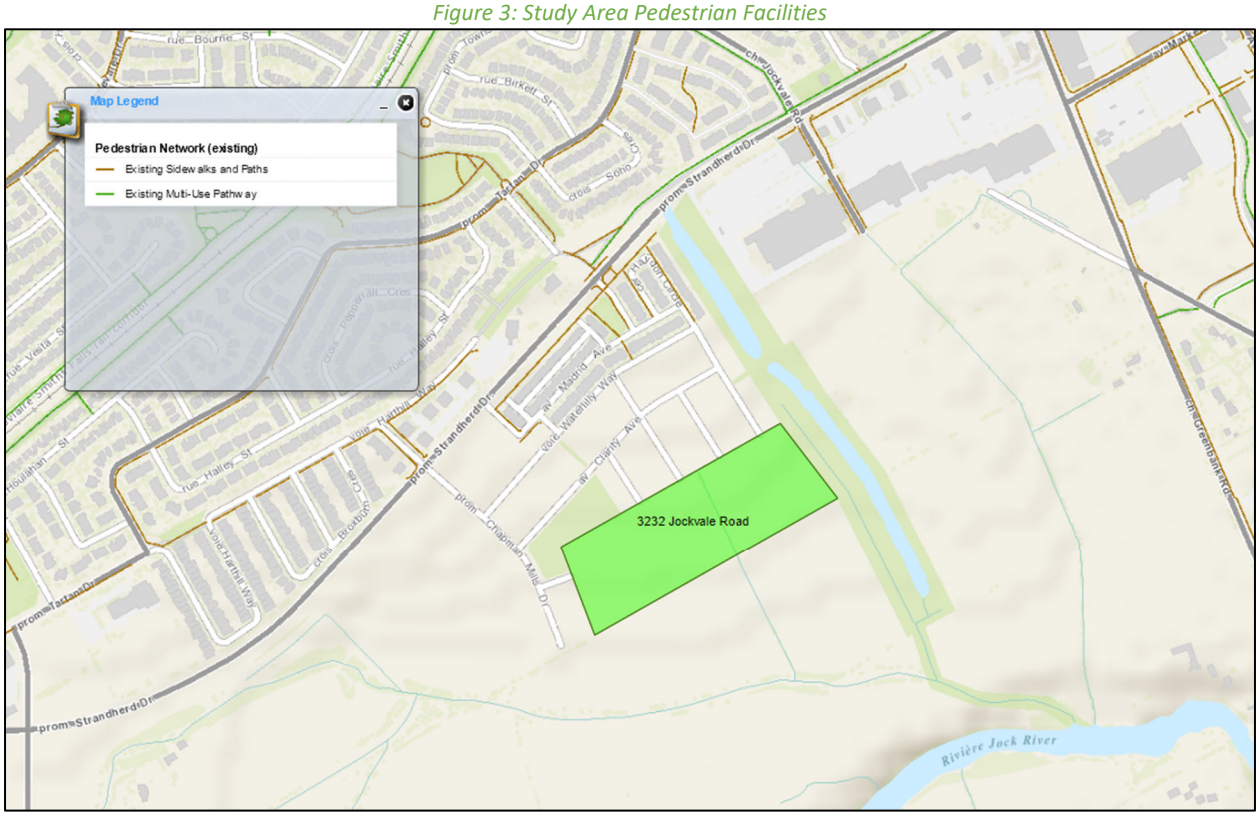
Within 200 metres of the future development, local streets from Minto Harmony access the north-south section of Chapman Mills Drive, and future local streets will access the future east-west section of Chapman Mills Drive on the south side of the corridor. The local streets within Minto Harmony will have residential driveways.

2.2.4 Cycling and Pedestrian Facilities

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

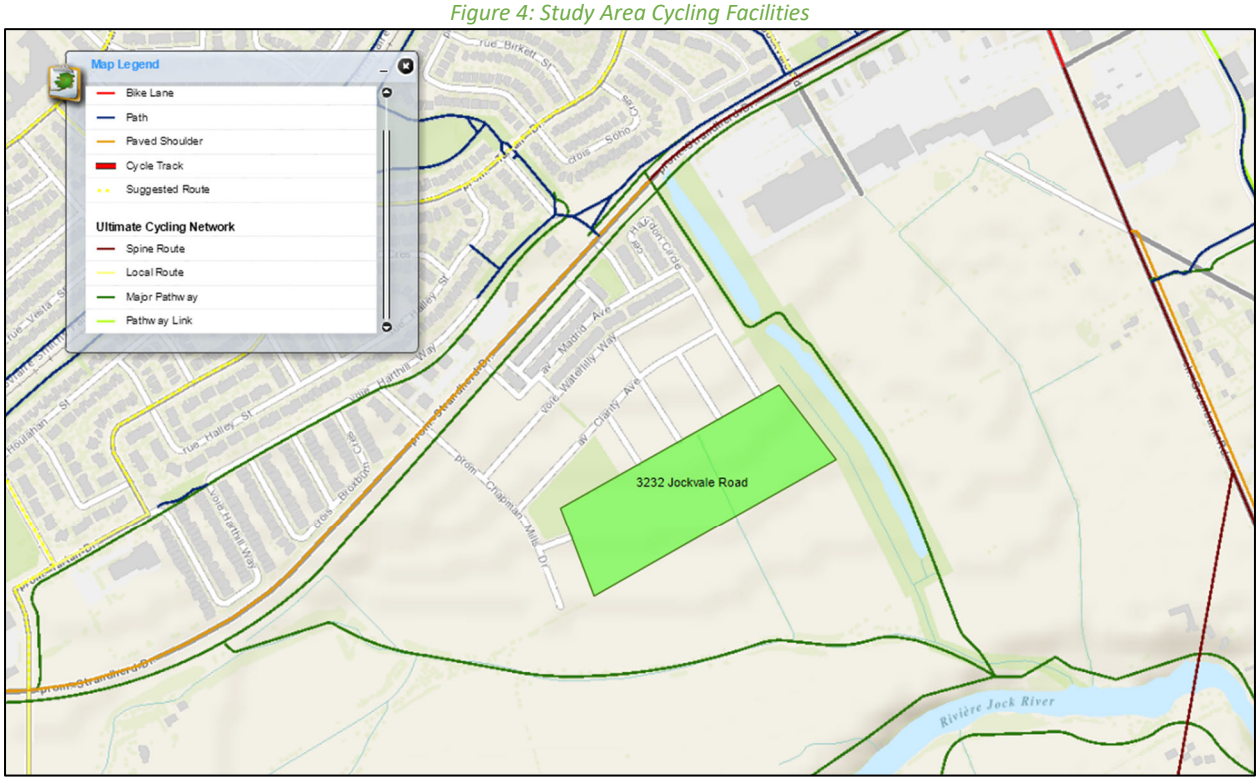
Sidewalks are provided along Strandherd Drive between Madrid Avenue and Andora Avenue, and east of the Kennedy-Burnett SWM Pond. A multi-use pathway is also provided along the north side of Strandherd Drive east of Andora Avenue. No dedicated cycling facilities are located near to proposed site, although future pathways are planned in the area.

Figure 3: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: May 23, 2019

Figure 4: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: May 23, 2019

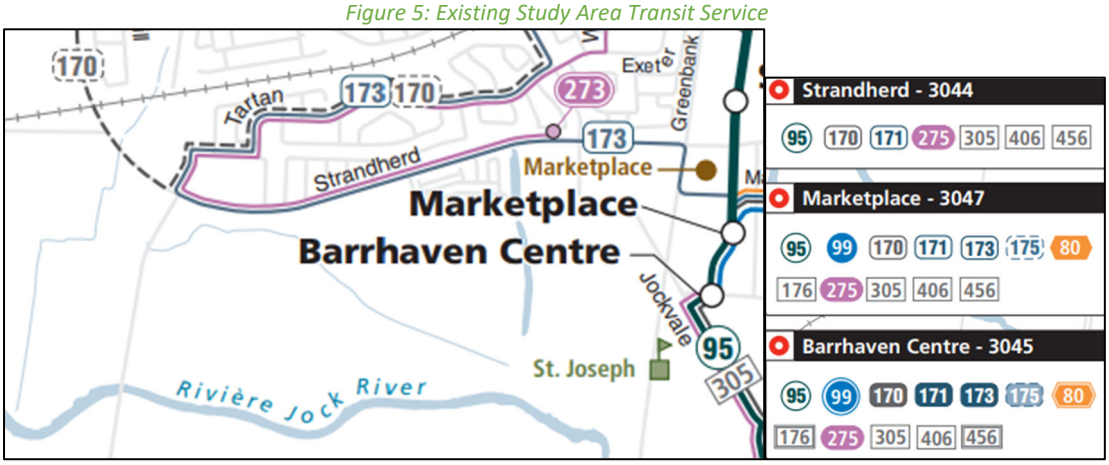
2.2.5 Existing Transit

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. The frequency of these routes within proximity of the proposed site currently are:

- Route #170 – 30-minute service all day
- Route #173 – 30-minute service during the peak hours and 1-hour service during the off-peak and midday
- Route #273 – Peak hour service only, with trips starting at 6:05 to 8:30 AM every 15-20 minutes to downtown, returned 3:15 to 6:10 PM to Strandherd Drive and Jockvale Road

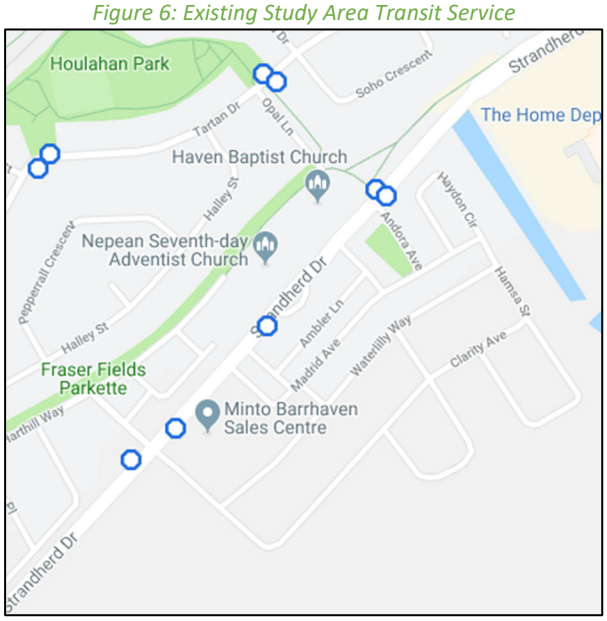
Figure 5 illustrates the transit system map in the study area and Figure 6 illustrates nearby transit stops.

Figure 5: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: May 23, 2019

Figure 6: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: May 23, 2019

2.2.6 Existing Area Traffic Management Measures

No traffic calming measures were documented in the area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from City counts for the existing Study Area intersection. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date
Strandherd Drive & Chapman Mills Drive	Thursday, January 18, 2018
Strandherd Drive & Andora Avenue	Wednesday, December 09, 2015
Strandherd Drive & Jockvale Road	Thursday, January 18, 2018
Greenbank Road & Marketplace Avenue	Wednesday, February 10, 2016
Greenbank Road & Jockvale Road	Tuesday, August 16, 2016

Figure 7 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The traffic counts have been balanced, similar to recent TIA studies on adjacent lands along Greenbank Road. 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

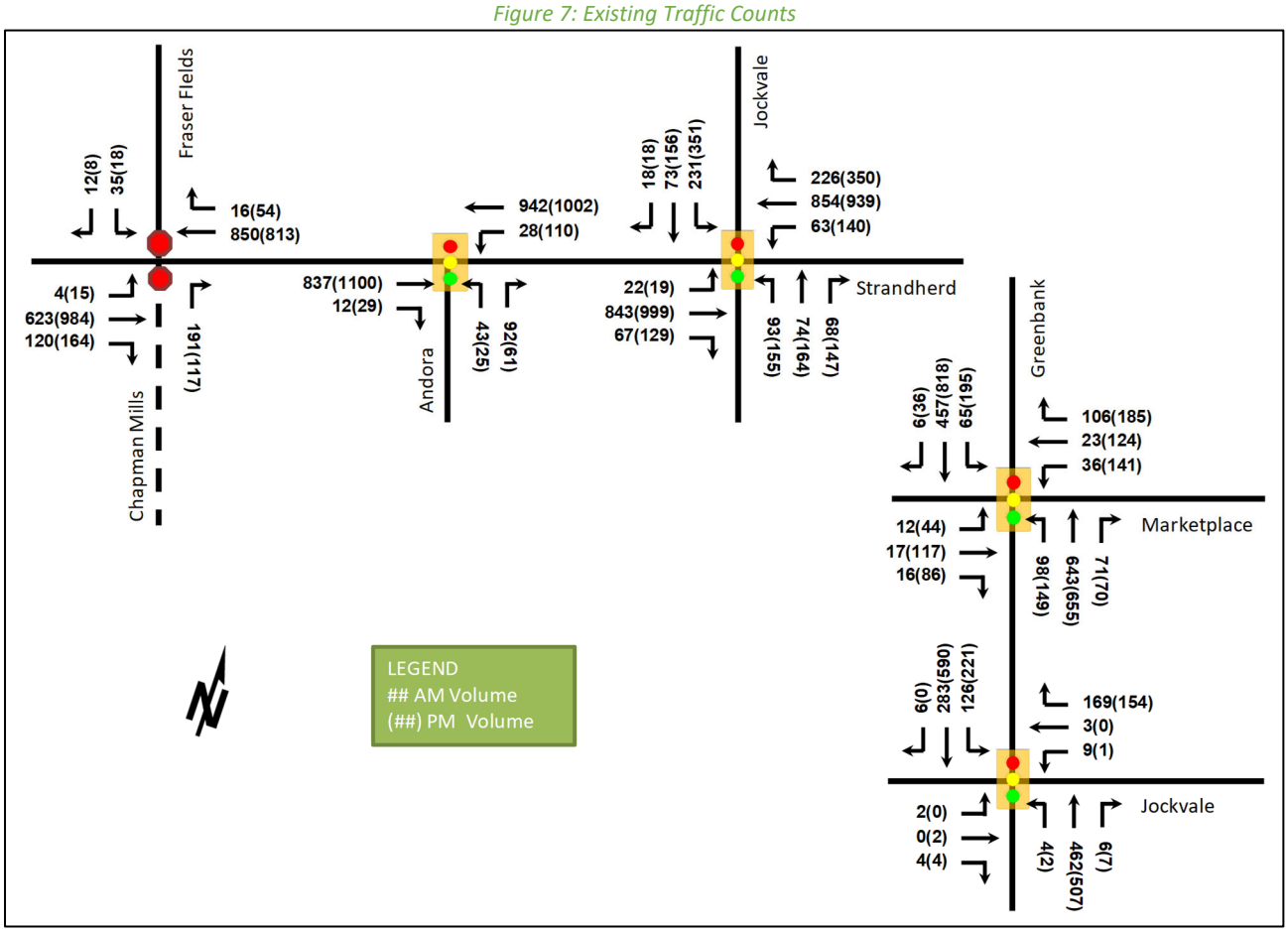


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95th)	LOS	Delay	V/C	Q (95th)
Strandherd Drive & Fraser Fields Way/Chapman Mills Drive ***Unsignalized***	EBL	A	9.1	0.01	0.0	A	9.1	0.02	0.1
	EBT/R	-	-	-	-	-	-	-	-
	WBR	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	-	-	-	-
	SB	D	32.8	0.29	1.1	**F**	**55.0**	**0.43**	**1.9**
	Overall	**A**	**1.4**	**-**	**-**	**A**	**1.9**	**-**	**-**
Strandherd Drive & Andora Avenue ***Signalized***	EB	A	4.4	0.38	66.1	A	6.8	0.57	135.3
	WBL	A	3.8	0.01	1.7	A	4.1	0.09	6.4
	WBT	A	5.4	0.48	96.0	A	5.4	0.48	95.7
	NB	C	23.8	0.23	13.5	C	22.5	0.13	8.8
	Overall	**A**	**5.7**	**-**	**-**	**A**	**6.4**	**-**	**-**
Strandherd Drive & Jockvale Road ***Signalized***	EBL	B	11.9	0.07	7.3	B	12.7	0.08	6.4
	EBT/R	B	16.7	0.30	65.2	C	24.0	0.52	108.6
	WBL	B	11.7	0.08	10.5	B	13.7	0.25	17.8
	WBT/R	B	18.4	0.49	110.6	B	19.4	0.58	123.1
	NBL	D	53.2	0.28	18.0	D	66.8	0.59	35.3
	NBT	D	50.4	0.24	20.1	D	59.7	0.56	45.5
	NBR	A	0.8	0.12	0.0	A	4.4	0.32	4.2
	SBL	D	53.4	0.77	65.6	**F**	**104.9**	**1.07**	**#146.3**
	SBT/R	C	23.7	0.16	19.0	C	29.4	0.24	34.8
	Overall	**C**	**23.3**	**-**	**-**	**D**	**35.2**	**-**	**-**
Greenbank Road & Marketplace Avenue ***Signalized***	EBL	D	35.1	0.07	6.9	C	31.1	0.27	17.3
	EBT/R	C	29.2	0.19	13.0	D	46.4	0.65	69.8
	WBL	D	38.7	0.19	14.7	D	44.3	0.62	44.5
	WBT/R	B	17.2	0.45	21.9	E	56.2	0.84	#109.1
	NBL	E	67.0	0.61	#63.9	**F**	**88.6**	**0.84**	**#84.4**
	NBT/R	B	10.9	0.23	39.0	C	20.3	0.33	36.4
	SBL	E	56.4	0.25	12.3	E	59.1	0.58	34.0
	SBT/R	B	15.2	0.19	39.0	C	26.6	0.41	68.6
	Overall	**C**	**21.5**	**-**	**-**	**D**	**40.9**	**-**	**-**
Greenbank Road & Jockvale Road ***Signalized***	EB	A	0.2	0.03	0.0	D	37.0	0.04	4.9
	WBL/T	D	52.9	0.10	9.7	D	51.0	0.01	2.1
	WBR	B	15.0	0.62	19.5	B	14.6	0.58	18.0
	NB	A	6.2	0.30	57.0	A	5.7	0.34	73.6
	SBL	A	2.6	0.17	7.8	A	3.1	0.31	14.2
	SBT/R	A	1.7	0.16	9.6	A	2.0	0.31	36.1
	Overall	**A**	**6.8**	**-**	**-**	**A**	**5.1**	**-**	**-**

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

The existing intersections operate well during the peak hours. Some queuing along Strandherd Drive is noted within the study area, generally in the peak direction of travel.

At the Strandherd Drive and Fraser Fields Way/Chapman Mills Drive intersection, the southbound approach experiences high delays during the PM peak and will require signalization to improve the conditions (anticipated by 2022 with the Strandherd Drive widening project).

At the Strandherd Drive and Jockvale Road intersection, the southbound left-turn experiences high delays during the PM peak and would require an additional 3 seconds of green time to be under 80 seconds of delay and a 1.0 v/c ratio.

At the Greenbank Road and Marketplace Avenue intersection, the northbound left-turn experiences high delays during the PM peak and, while the v/c ratio is under 0.90, would require an additional 4 seconds of green time to reduce the delay below 80 seconds.

Due to the coordination of the Strandherd Drive and Greenbank Road corridors, any additional green time to be assigned to the two signalized intersections above will need to be completed as a corridor wide optimization and is beyond the scope of this TIA. Additionally, the Strandherd Widening project will begin shortly and the conditions analyzed here will not be comparable to the field conditions, providing little value to actual operations if the corridor were assessed.

2.2.8 Collision Analysis

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

Table 3: Study Area Collision Summary, 2013-2017

		Number	%
Total Collisions		**150**	**100%**
Classification	**Fatality**	1	1%
	Non-Fatal Injury	34	23%
	Property Damage Only	115	77%
Initial Impact Type	**Approaching**	1	1%
	Angled	15	10%
	Rear end	72	48%
	Sideswipe	13	9%
	Turning Movement	32	21%
	SMV Unattended	5	3%
	SMV Other	12	8%
Road Surface Condition	**Dry**	99	66%
	Wet	28	19%
	Loose Snow	11	7%
	Slush	2	1%
	Packed Snow	3	2%
	Ice	7	5%
Pedestrian Involved		2	1%
Cyclists Involved		2	1%

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

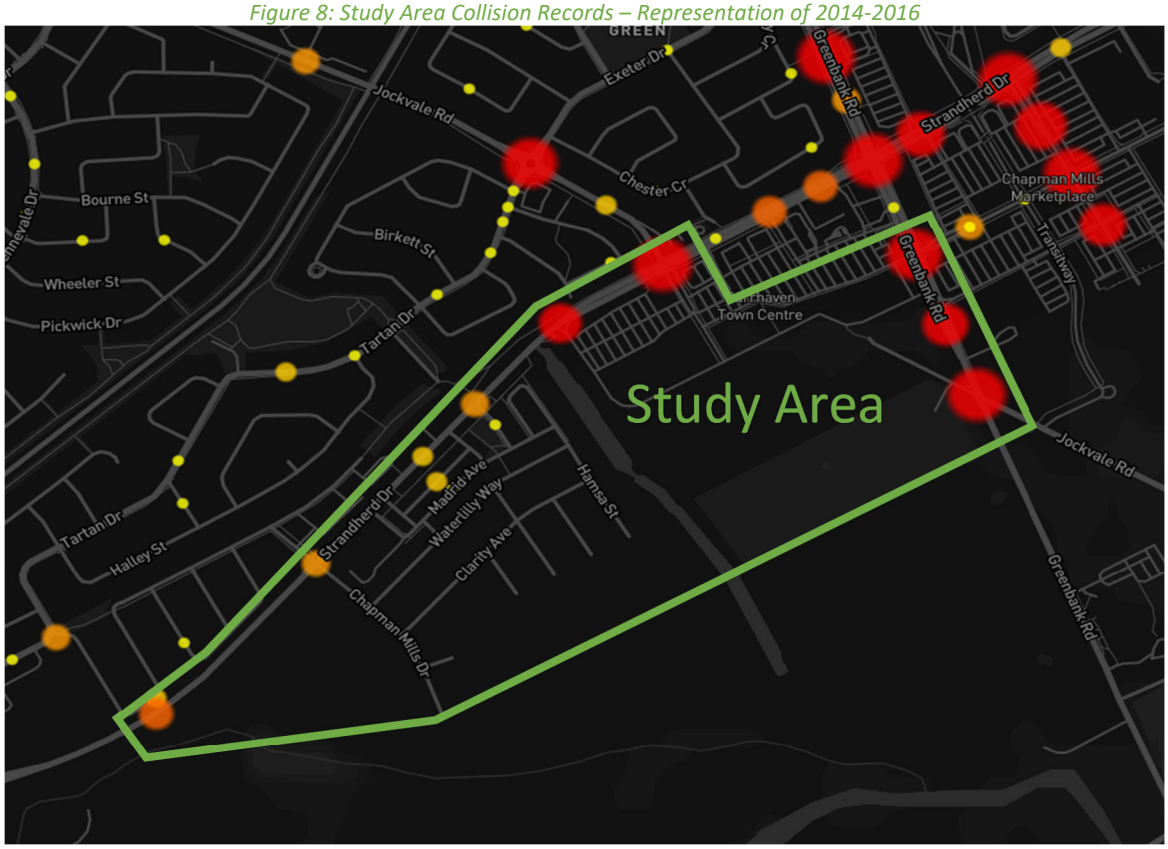


Table 4: Summary of Collision Locations, 2013-2017

	Number	%
Intersections / Segments	**150**	**100%**
Fraser Fields Way @ Strandherd Dr	5	3%
Strandherd Dr @ Madrid Ave	1	1%
Strandherd Dr @ Andora Ave	3	2%
Jockvale Rd @ Strandherd Dr	50	33%
Greenbank Rd @ Jockvale Rd	33	22%
Greenbank Rd @ Marketplace Ave	23	15%
Strandherd Dr btwn Cedarview Rd & Madrid Ave	9	6%
Strandherd Dr btwn Madrid Ave & Andora Ave	2	1%
Strandherd Dr btwn Andora Ave & Jockvale Rd	12	8%
Ambler Lane btwn Kingsview Lane & Tallgrass Lane	2	1%
Andora Ave btwn Strandherd Dr & Madrid Ave	1	1%
Madrid Ave btwn Kenton Ave & Tallgrass Lane	2	1%
Greenbank Rd btwn Marketplace Ave & Jockvale Rd	7	5%

The study area does not have a significant number of collisions within close proximity of the proposed site, with higher collisions noted on the transition of Strandherd Drive from a 2-lane road to 4-lane road, and adjacent to the retail/commercial areas on Strandherd Drive and Greenbank Road. The collisions along Strandherd Drive between Cedarview Road (now Borrisokane Road) and Andora Avenue should see a reduction of any turning movement related collisions once Strandherd Drive is urbanized and widened to a divided cross-section, and a signal provided at Fraser Fields Way and Chapman Mills Drive.

The single fatality noted was located at the Strandherd Drive and Jockvale Road intersection.

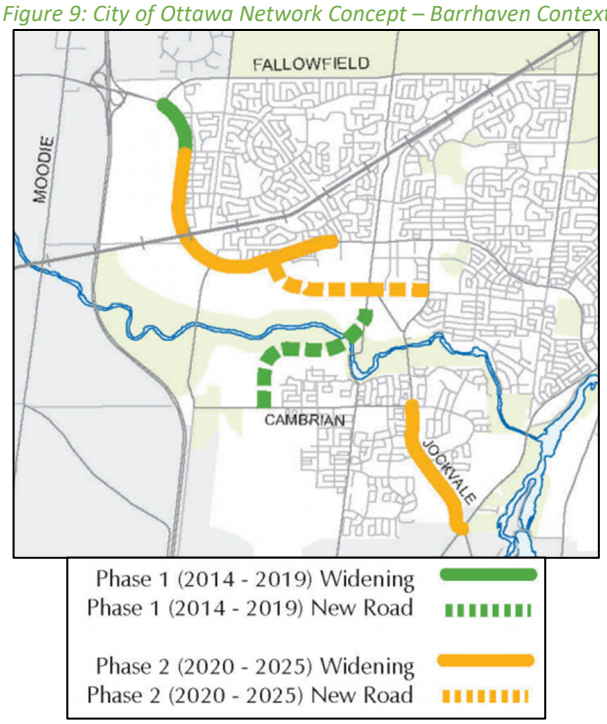
2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

The subject development is within the Nepean South Area 8 Secondary Plan. Improvements included within the 2031 Affordable Network of the Ottawa TMP are illustrated in Figure 9:

- Strandherd Drive Widening: Widen to four lanes between Fallowfield Road and Jockvale, currently being designed and anticipated to be complete by 2022
- Greenbank Road Re-Alignment: New four-lane road south of Cambrian Road, curving across the Jock River and connecting to Cambrian Road, and is unknown when this project will be designed or constructed
- Chapman Mills Drive Extension: New two-lane road extension from Longfields Drive to Strandherd Drive, with the BRT component to be constructed as funding is available for the City

Figure 9: City of Ottawa Network Concept – Barrhaven Context



2.3.2 Other Study Area Developments

Caivan Conservancy – 3285 Borrisokane Road

To the south of the proposed development, Conservancy Phase 1 is currently under construction. Phase 1 includes 132 single family homes and 73 townhome units. The development will have four right-in/right-out accesses on the south side of future Chapman Mills Drive and a full movement signalized intersection with the proposed Mion lands. Beyond Phase 1, the high-level concepts are proposed for the remaining lands that extend from Phase 1 to Highway 416, but no confirmed plans are available.

Minto Harmony – 4005, 4025 Strandherd Drive

To the north and west of the proposed development is the Harmony Development. Construction has commenced on this development between Chapman Mills Drive and the Kennedy-Burnett SWM Pond. This development includes Harmony Phases 1 through 3 residential lands and the school site.

Richcraft South Nepean Towncentre – 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.

Caivan South Nepean Towncentre – 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.

Claridge Burnett Lands – 3370 Greenbank Road
The Burnett Lands are located at 3370 Greenbank Road and 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.

Barrhaven Town Centre Retail – 3777 Strandherd Drive
A new retail pad is proposed for the Barrhaven Towncentre with a total of 5,025 ft^2. This new pad is located south of the existing BMO building.

Choice Properties Retail – 3201 Greenbank Road
Recently constructed, approximately 11,000 ft^2 of retail and an 8,000 ft^2 restaurant space will be incorporated into the existing retail development of the Loblaws and Home Sense.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of Strandherd Drive and Chapman Mills Drive/Fraser Fields Way, Strandherd Drive and Andora Avenue, Strandherd Drive and Jockvale Road, Greenbank Road and Marketplace Avenue, and Greenbank Road and Jockvale Road. Chapman Mills Drive is noted as the boundary road for the proposed development.

The intersections of Strandherd Drive and Barrhaven Town Centre (210m west of Greenbank Road) and the roundabout at Jockvale Road and Exeter Drive/Tartan Drive have been excluded from the analysis prescribed within the TIA Guidelines. While they are within 1,000 metres of the site, they are not anticipated to be impacted by the development traffic as no trips are anticipated along Jockvale Road and less than 25 peak direction trips are anticipated to travel east/west along Strandherd Drive.

The TRANS screenline SL-9 is located to the north at Fallowfield Road and SL-49 is located to the south along the Jock River and will not be reviewed as part of this study.

3.2 Time Periods

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

3.3 Horizon Years

The anticipated build-out year is 2022. As a result, the full build-out plus five years horizon year is 2027.

4 Exemption Review

Table 5 summarizes the exemptions for this TIA.

Table 5: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Exempt
	4.2.3 New Street Networks	Only required for plans of subdivision	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	Exempt

5 Development Generated Travel Demand

5.1 Trip Generation and Travel Modes

This TIA has been prepared using the vehicle and person trip rates for the residential development using the TRANS Trip Generation Study Report (2009). Table 6 summarizes the person trip rates for the proposed land uses.

Table 6: Trip Generation Person Trip Rates

Dwelling Type	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
Single Family Homes	210 (TRANS)	AM	0.70	1.27
		PM	0.90	1.41
Townhomes	224 (TRANS)	AM	0.54	0.98
		PM	0.71	1.16

Using the above Person Trip rates, the total person trip generation has been estimated. Table 7 below illustrates the total person trip generation by dwelling type.

Table 7: Total Person Trip Generation

Land Use	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Homes	8	3	7	10	7	4	11
Townhomes	188	68	116	184	116	102	218
Total Person Trips		**71**	**123**	**194**	**123**	**106**	**229**

Using the most recent National Capital Region Origin-Destination survey (OD Survey), the existing mode shares for South Nepean and target BRT area mode shares have been summarized in Table 8.

Table 8: Mode Share

Travel Mode	South Nepean	BRT Area
Auto Driver	60%	40%
Auto Passenger	15%	15%
Transit	15%	35%
Cycling	3%	3%
Pedestrian	7%	7%
Total	**100%**	**100%**

Using the above mode shares for a BRT area and person trip rates the person trips by mode have been projected. Table 9 summarizes the trip generation by mode.

Table 9: Trip Generation by Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Auto Driver	40%	28	49	78	49	43	91
Auto Passenger	15%	10	18	30	18	16	35
Transit	35%	25	43	68	43	37	80
Cycling	3%	2	4	6	4	3	7
Pedestrian	7%	5	9	13	9	7	16
Total	**100%**	**71**	**123**	**194**	**123**	**106**	**229**

As shown above, 78 AM and 91 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.2 Trip Distribution

To understand the travel patterns of the subject development the OD Survey has been reviewed to determine the travel for the residential development patterns were applied based on the build-out of Barrhaven. Table 10 below summarizes the distributions.

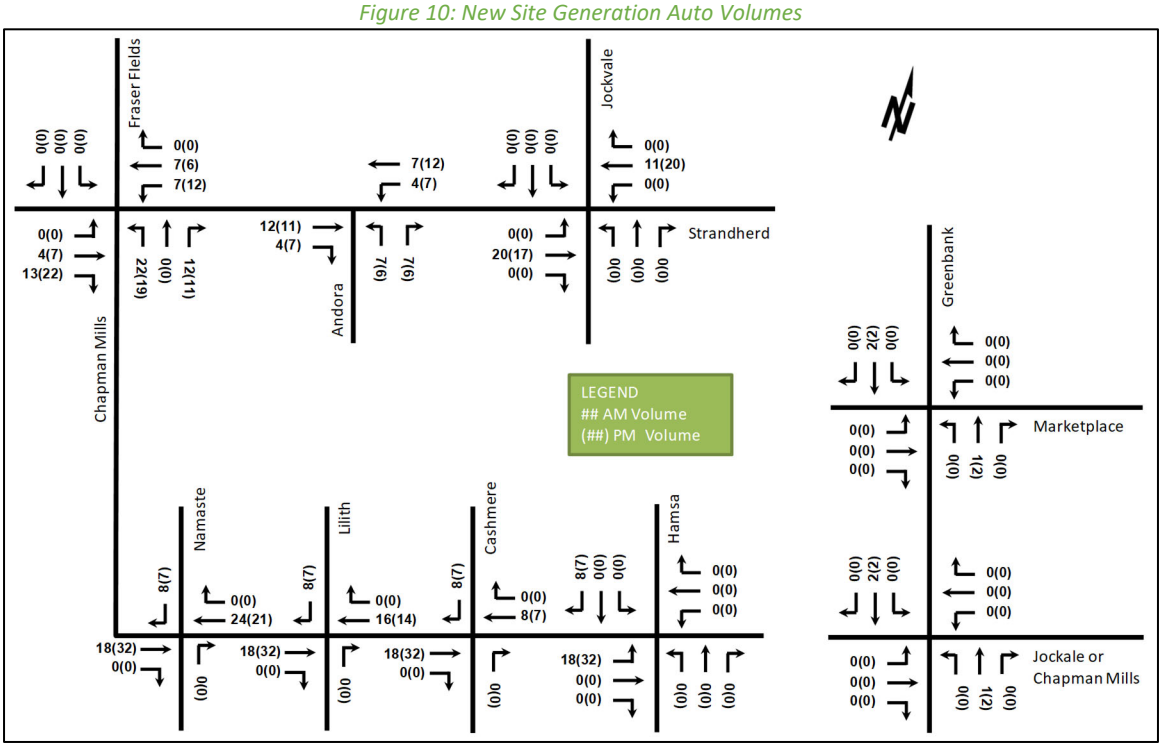
Table 10: OD Survey Existing Mode Share – South Nepean

To/From	Residential % 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 10 illustrates the new site generated volumes.

Figure 10: New Site Generation Auto Volumes



6 Background Network Travel Demand

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. The widening of Strandherd Drive has been included within the background network conditions after 2022. The re-alignment of Greenbank Road (south of the study area) is not considered to have any notable impact on the study area traffic volumes and travel patterns. The extension of Chapman Mills Drive to Strandherd Drive is not anticipated to be completed over the Kennedy-Burnett SWM Pond during the forecast horizons.

6.2 Background Growth

The adjacent area transportation studies have used a 2-3% traffic growth in the area. This background growth would be conservative for the short-term horizons, but by the 2031 horizon, would overburden the existing road network. Given the known roadway capacity issues in Barrhaven, a 10% growth total is proposed for the area, between 2018 and 2031. This results in an approximate 0.76% growth annually along the mainline volumes. Supporting this assumption is the explicit consideration of the individual developments in the surrounding area.

6.3 Other Developments

The background developments explicitly considered in the background conditions (Section 2.3) include:

- 3195 Greenbank Road
- 3201 Greenbank Road
- 3228 Greenbank Road
- 3311 Greenbank Road
- 3370 Greenbank Road
- 4005/4025 Strandherd Drive

- 3285 Borrisokane Road

The development within the Barrhaven Towncentre (3777 Strandherd Drive) is for a 5,000 sq. ft. pad and is anticipated to be negligible within the existing trips within the Towncentre.

The background development volumes within the study area have been provided in Appendix E.

7 Demand Rationalization

Given the minimal impact of the development related traffic, the Greenbank Road and Marketplace Avenue, and Greenbank Road and Jockvale Road or the future Chapman Mills Drive intersections have been excluded from the background and future traffic analysis.

7.1 2022 Future Background Intersection Operations

Figure 11 illustrates the 2022 background volumes and Table 11 summarizes the background 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 synchro worksheets for the 2022 are provided in Appendix F.

Figure 11: 2022 Future Background Volumes

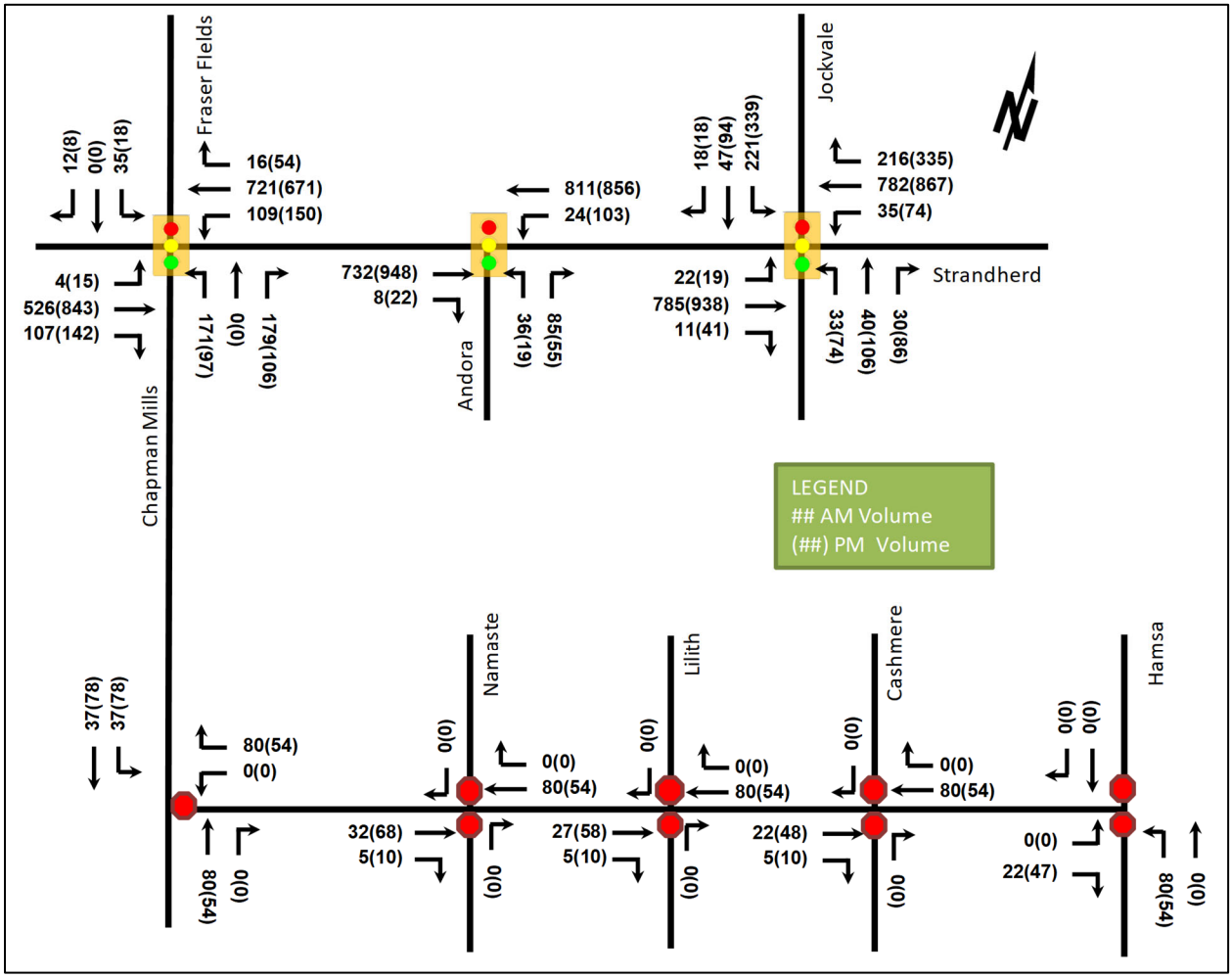


Table 11: 2022 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95th)	LOS	Delay	V/C	Q (95th)
Strandherd Drive & Chapman Mills Drive ***Signalized***	EBL	D	46.8	0.05	4.4	D	50.9	0.18	9.8
	EBT	D	46.4	0.78	70.6	D	45.2	0.88	#109.1
	EBR	A	0.7	0.18	0.0	A	0.8	0.23	0.0
	WBL	E	55.7	0.64	39.5	E	63.0	0.76	#59.8
	WBT/R	D	42.8	0.64	105.3	C	23.8	0.52	89.2
	NBL	E	56.7	0.71	55.0	E	71.3	0.70	#45.4
	NBT/R	A	0.7	0.23	0.0	A	0.5	0.16	0.0
	SBL	D	52.3	0.32	17.1	D	50.0	0.19	11.0
	SBT/R	A	0.1	0.02	0.0	A	0.0	0.01	0.0
	Overall	**D**	**39.3**	**-**	**-**	**C**	**35.0**	**-**	**-**
Strandherd Drive & Andora Avenue ***Signalized***	EB	B	11.1	0.63	108.2	A	5.5	0.36	126.5
	WBL	A	4.2	0.06	4.1	A	6.0	0.26	16.0
	WBT	A	4.7	0.32	48.6	A	4.0	0.32	43.3
	NB	C	20.8	0.47	22.2	B	19.0	0.32	15.6
	Overall	**A**	**8.5**	**-**	**-**	**A**	**5.4**	**-**	**-**
Strandherd Drive & Jockvale Road ***Signalized***	EBL	B	12.0	0.08	7.0	B	13.3	0.09	6.2
	EBT/R	B	18.3	0.42	99.1	C	25.5	0.60	135.5
	WBL	B	11.9	0.10	9.6	B	14.6	0.27	17.3
	WBT/R	B	19.7	0.54	131.2	C	23.7	0.69	#188.2
	NBL	D	52.2	0.25	16.6	E	61.8	0.53	31.4
	NBT	D	50.0	0.22	18.5	E	57.0	0.51	40.3
	NBR	A	0.7	0.11	0.0	A	2.8	0.28	1.4
	SBL	D	49.8	0.72	60.8	E	78.7	0.97	#111.6
	SBT/R	C	23.1	0.15	17.4	C	28.5	0.22	30.4
	Overall	**C**	**22.9**	**-**	**-**	**C**	**32.0**	**-**	**-**
Chapman Mills Drive & Chapman Mills Drive ***Unsignalized***	WBL/R	A	9.0	0.08	0.3	A	8.8	0.06	0.2
	NBT/R	-	-	-	-	-	-	-	-
	SBL	A	7.4	0.02	0.1	A	7.5	0.06	0.2
	SBT	-	-	-	-	-	-	-	-
	Overall	**A**	**4.2**	**-**	**-**	**A**	**4.0**	**-**	**-**

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

The intersection operations for the 2022 future background horizon generally operate satisfactorily during the peak hours. The southbound left-turn at the Strandherd Drive and Jockvale Road intersection is noted to have a volume-to-capacity ratio of 0.97 during the PM peak hour, similar to the background conditions. No other volume to capacity issues are noted

The peak hour factor adjustments for future horizons account for the increase in intersection operations (e.g. lower delays and volume-to-capacity ratios).

7.2 2027 Future Background Intersection Operations

Figure 12 illustrates the 2027 background volumes and Table 12 summarizes the background 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 synchro worksheets for the 2027 horizons are provided in Appendix G.

Figure 12: 2027 Future Background Volumes

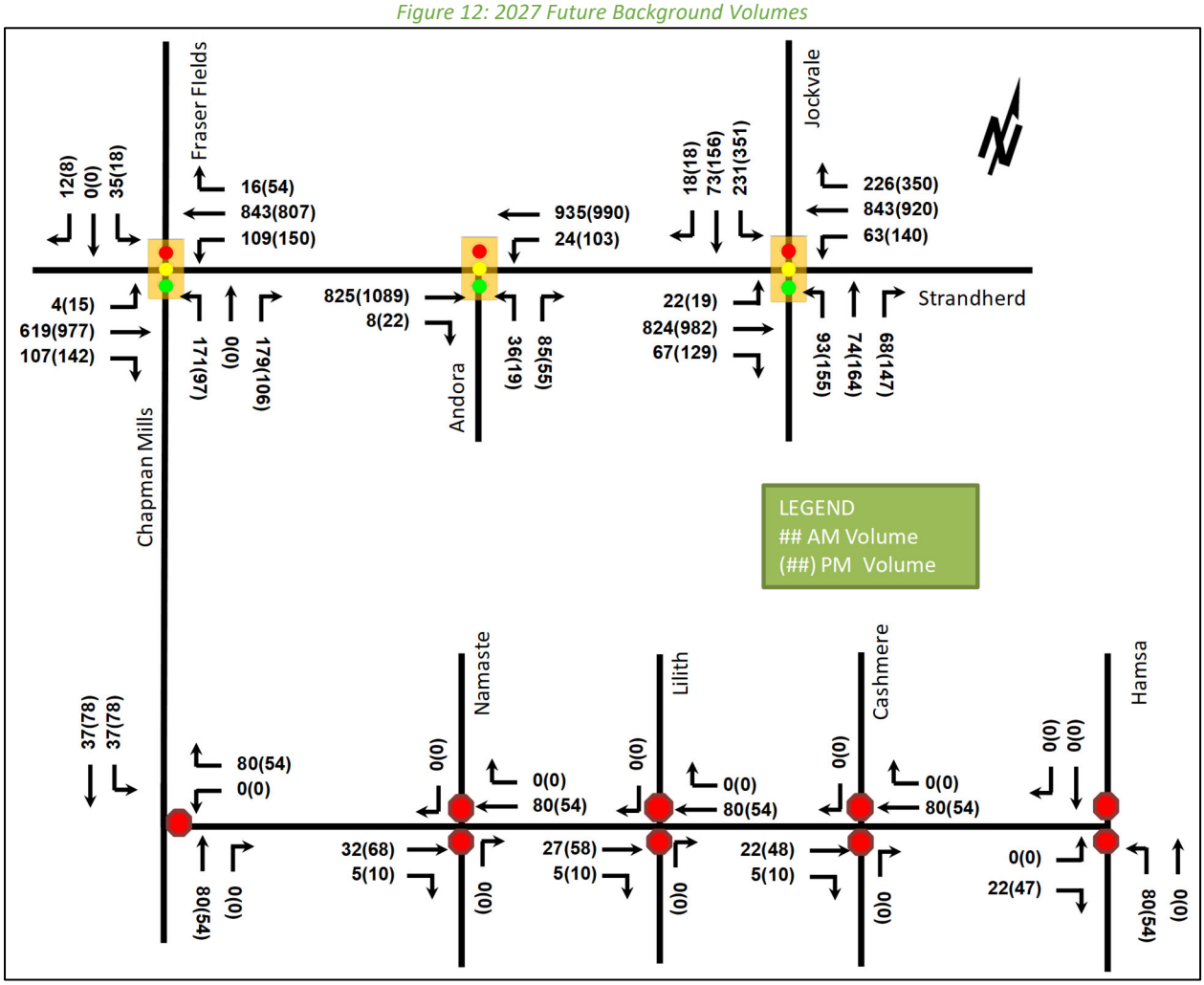


Table 12: 2027 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95th)	LOS	Delay	V/C	Q (95th)
Strandherd Drive & Chapman Mills Drive ***Signalized***	EBL	D	46.8	0.05	4.4	D	50.9	0.18	9.8
	EBT	D	50.2	0.86	#89.3	D	54.8	0.96	#145.9
	EBR	A	0.6	0.18	0.0	A	0.8	0.22	0.0
	WBL	D	55.0	0.64	39.6	E	62.4	0.76	#59.9
	WBT/R	D	43.6	0.72	#126.7	C	24.8	0.59	110.3
	NBL	E	56.7	0.71	55.0	E	75.2	0.73	#45.4
	NBT/R	A	0.7	0.24	0.0	A	0.5	0.16	0.0
	SBL	D	52.8	0.32	17.1	D	50.0	0.19	11.0
	SBT/R	A	0.1	0.02	0.0	A	0.0	0.02	0.0
	Overall	**D**	**41.3**	-	-	**D**	**39.4**	-	-
Strandherd Drive & Andora Avenue ***Signalized***	EB	B	11.1	0.63	108.2	A	6.4	0.42	m131.0
	WBL	A	4.2	0.06	4.1	A	7.1	0.30	17.8
	WBT	A	4.7	0.37	48.6	A	4.3	0.37	52.5
	NB	C	20.8	0.47	22.2	B	18.9	0.32	15.6
	Overall	**A**	**8.5**	-	-	**A**	**5.9**	-	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95th)	LOS	Delay	V/C	Q (95th)
Strandherd Drive & Jockvale Road *Signalized*	EBL	B	13.1	0.09	6.7	B	16.0	0.12	6.2
	EBT/R	C	24.0	0.55	113.8	D	37.6	0.82	161.6
	WBL	B	13.8	0.21	14.7	D	36.4	0.69	#44.9
	WBT/R	C	24.0	0.64	144.3	C	30.6	0.80	#207.2
	NBL	E	66.7	0.62	38.6	**F**	**81.2**	**0.83**	**#68.7**
	NBT	D	51.0	0.34	30.7	D	53.0	0.56	59.3
	NBR	A	1.6	0.22	0.0	A	10.0	0.40	17.8
	SBL	D	42.2	0.65	65.1	E	70.4	0.95	#127.9
	SBT/R	C	26.0	0.17	25.4	C	27.8	0.29	46.7
	Overall	**C**	**27.1**	**-**	**-**	**D**	**39.2**	**-**	**-**
Chapman Mills Drive & Chapman Mills Drive *Unsignalized*	WBL/R	A	9.0	0.08	0.3	A	8.8	0.06	0.2
	NBT/R	-	-	-	-	-	-	-	-
	SBL	A	7.4	0.02	0.1	A	7.5	0.06	0.2
	SBT	-	-	-	-	-	-	-	-
	Overall	**A**	**4.2**	**-**	**-**	**A**	**4.0**	**-**	**-**

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

The intersection operations for the 2027 future background horizon generally operate satisfactorily during the peak hours. Queues are noted along Strandherd Drive during the peak hours.

The northbound left-turn at the Strandherd Drive and Jockvale Road intersection will experience high delays during the PM peak, although the volume-to-capacity ratio is only 0.83. The northbound timing would require an additional second of green time to reduce the delay to below 80 seconds. The southbound left-turn is noted to have a volume-to-capacity ratio of 0.97 during the PM peak hour, similar to the background conditions. The southbound left-turn would require an additional 3 seconds of green time to be below 0.90 volume-to-capacity ratio. The additional timing can be gained through a reduction of the protected eastbound and westbound left-turn phases.

The eastbound through volume at the Strandherd Drive and Chapman Mills Drive/Fraser Fields Way intersection will have a volume-to-capacity ratio of 0.96 during the PM peak hour. The eastbound through would require an additional 4 seconds of green time to reduce the volume-to-capacity to below 0.90. This would require the turning movements to be reduced and increase the delays or volume-to-capacity ratios significantly.

No other volume to capacity issues are noted

7.3 BRT Modal Share Sensitivity

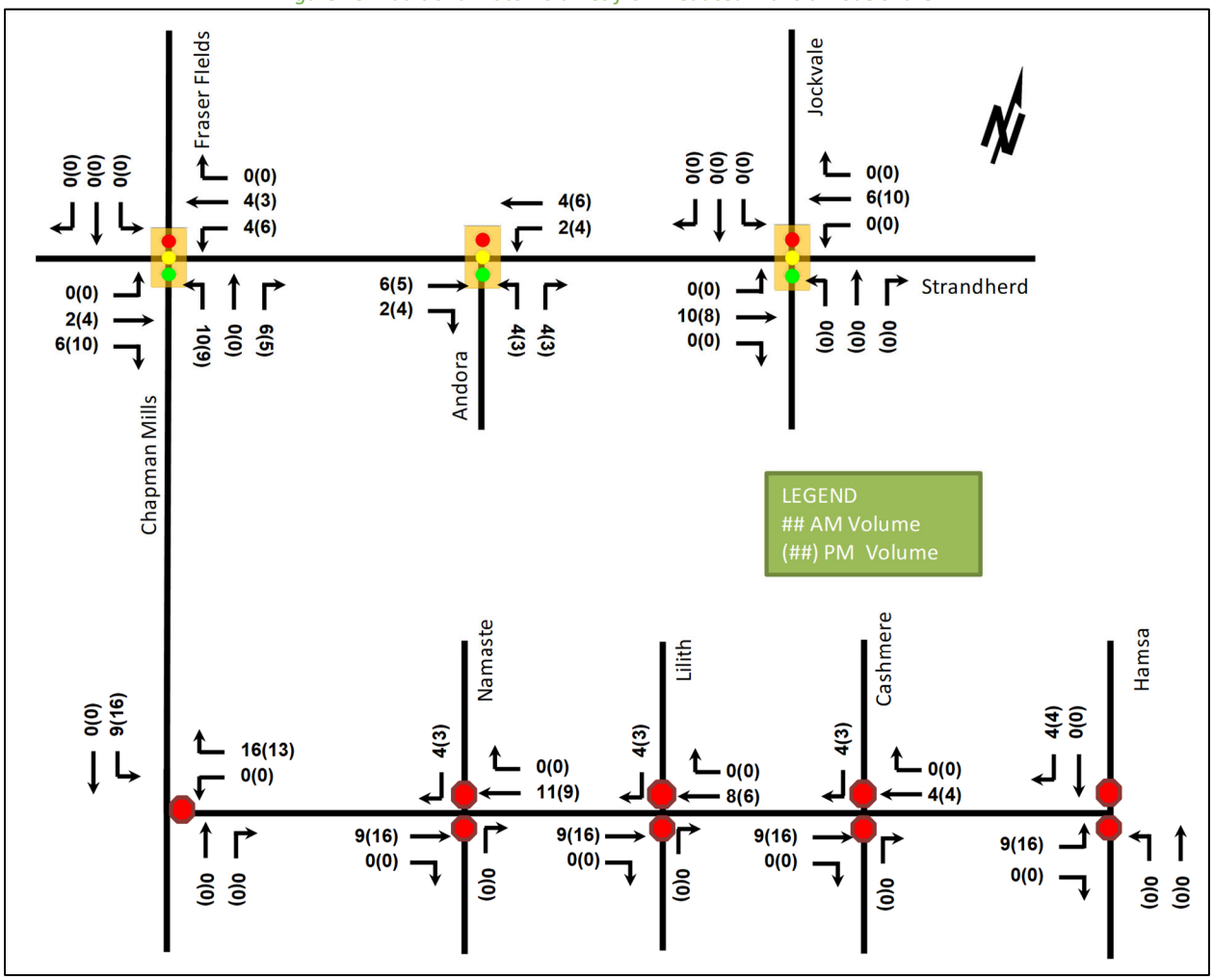
As a sensitivity test for the possibility that the BRT corridor is not extended along Chapman Mills Drive by 2022, the study area intersections have been analyzed using the South Nepean modals share distributions. Table 13 summarizes the trip generation if the South Nepean area modal shares are applied.

Table 13: Sensitivity – Trip Generation by Mode per South Nepean Area

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Auto Driver	60%	43	74	116	74	63	138
Auto Passenger	15%	10	18	30	18	16	35
Transit	15%	10	18	30	18	16	35
Cycling	3%	2	4	6	4	3	7
Pedestrian	7%	5	9	13	9	7	16
Total	**100%**	**71**	**123**	**194**	**123**	**106**	**229**

The change in auto trips would be an increase of 38 two-way trips during the AM peak and 47 two-way trips during the PM peak. If applied to the study area intersections, Figure 13 illustrates the additional trips that would be added to the road network if the transit mode was reduced. Overall, these volumes are minimal and within the range of a typical daily fluctuation of traffic due to varying schedules, weather, etc. No additional analysis is required to determine the impacts of the slight increase in auto travel until BRT service is provided to the area.

Figure 13: Additional Auto Volumes from Reduced Transit Mode Share



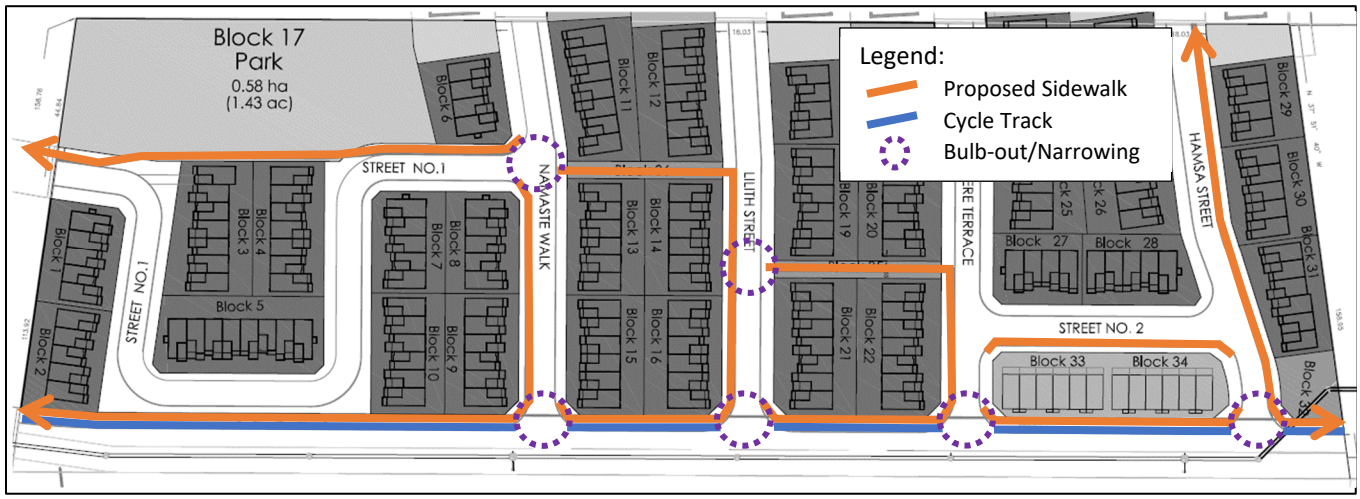
8 Development Design

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 14 illustrates the pedestrian and cycling network. The plan incorporates the adjacent developments, planned routes on geoOttawa, and the Chapman Mills Drive EA Study.

Figure 14: Concept Pedestrian and Cycling Network



Beyond the active mode network, the existing transit system stops are provided at along Strandherd Drive at Chapman Mills Drive, Kingsview Lane and Andora Avenue, and are approximately a 400-550 metre walking distance away. Once the City completes the BRT component along Chapman Mills Drive, transit stops will be located within 200-300 metres walking distances.

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 and 18.0 metre right of ways. Chapman Mills Drive is collector through the associated EA study. Traffic calming elements have limited scope within the proposed subdivision, where alternating parking on the east and west sides of the local roads. Bulb-outs are provided at pedestrian crossing locations and along Chapman Mills Drive in the EA cross-section.

Overall, the road network extends the existing local roads to Chapman Mills Drive and is consistent with the adjacent community urban design principles and policy direction from the City for developing communities.

9 Boundary Streets

Table 14 summarizes the MMLOS analysis for the boundary road of Chapman Mills. The interim and future conditions have been summarized in separate rows, which include with and without the bus rapid transit corridor. The MMLOS analysis is based on the EA Study cross-section for Chapman Mills Drive, and 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 14: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Chapman Mills Drive (developing community)	B	C	A	C	A	B	C	N/A
Chapman Mills Drive (600m of rapid transit)	**B**	A	A	B	A	A	C	N/A

The interim Chapman Mills Drive will meet the MMLOS targets and the ultimate cross-section will not meet the pedestrian MMLOS target. The daily traffic along Chapman Mills Drive will limit the pedestrian level of service to a B in both scenarios, and cannot meet a level of service target of A. As Chapman Mills Drive will serve as an important link within Barrhaven and reducing traffic to below a daily volume of 3000 cars is not feasible, no mitigation is proposed for the Chapman Mills Drive cross-section.

10 Access Intersections

10.1 Location and Design of Access

The residential accesses will connect via local roads to the adjacent collector and arterial roads of Chapman Mills Drive and Strandherd Drive. Within the subdivision, no turn lanes are proposed for the intersections and will be controlled by minor stop control. The connections to Chapman Mills Drive remain consistent with the proposed EA study intersections, with the only new full movement intersection located adjacent to the Kennedy-Burnett SWM pond.

10.2 Access Intersection Control

Namaste Street, Lilith Street and Cashmere Terrace will be right-in/right-out intersections with minor stop-control, and Hamsa Street will be a signalized intersection, as per the EA Study. The signalization of the Hamsa Street and Chapman Mills Drive intersection will not be required until Chapman Mills Drive is extended across the Kennedy-Burnett SWM pond.

10.3 Access Intersection Design

10.3.1 2022 Future Total Access Intersection Operations

Figure 15 illustrates the 2022 future total intersection volumes and Table 15 summarizes the 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, and HCM average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix I.

Figure 15: 2022 Future Total Volumes

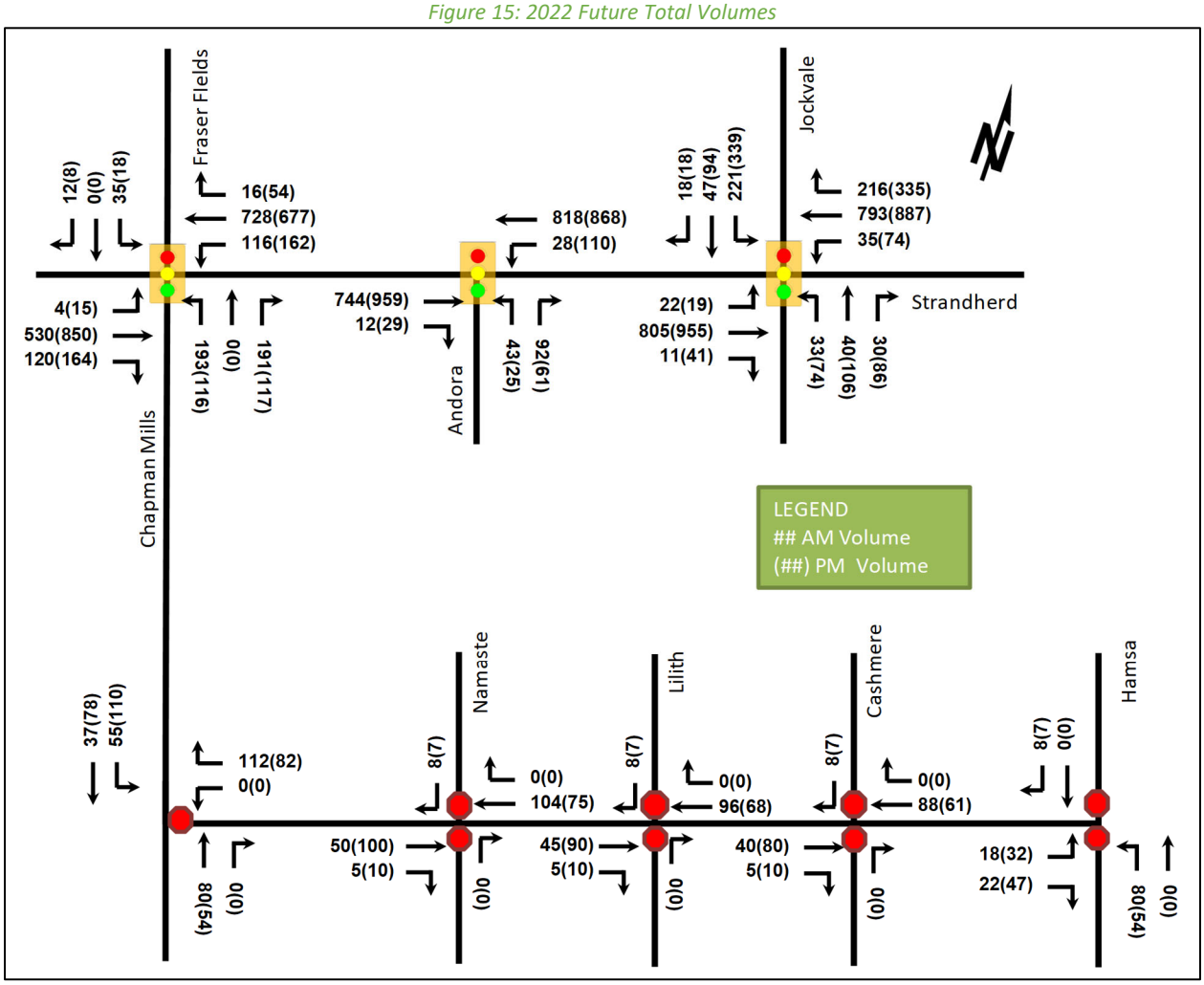


Table 15: 2022 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Andora Avenue *Signalized*	EB	A	0.57	9.4	93.3	A	0.37	6.6	m127.5
	WBL	A	0.07	4.2	4.6	A	0.28	6.3	17.6
	WBT	A	0.32	4.5	41.0	A	0.32	4.0	44.2
	NB	A	0.51	21.9	24.5	A	0.36	19.8	17.6
	Overall	**A**	**-**	**8.0**	**-**	**A**	**-**	**6.1**	**-**
Chapman Mills Drive & Namaste Street *Unsignalized*	EBT/R	-	-	-	-	-	-	-	-
	WBT/R	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBR	A	0.01	8.8	0.0	A	0.01	8.7	0.0
	Overall	**A**	**-**	**0.4**	**-**	**A**	**-**	**0.3**	**-**
Chapman Mills Drive & Lilith Street *Unsignalized*	EBT/R	-	-	-	-	-	-	-	-
	WBT/R	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBR	A	0.01	8.8	0.0	A	0.01	8.6	0.0
	Overall	**A**	**-**	**0.5**	**-**	**A**	**-**	**0.3**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Chapman Mills Drive & Cashmere Terrace ***Unsignalized***	EBT/R	-	-	-	-	-	-	-	-
	WBT/R	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBR	A	0.01	8.7	0.0	A	0.01	8.6	0.0
	Overall	**A**	**-**	**0.5**	**-**		**-**	**0.4**	**-**

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

The access intersection operations for the 2022 future total horizon generally operate satisfactorily during the peak hours. No volume to capacity issues are noted.

10.3.2 2027 Future Total Access Intersection Operations

Figure 16 illustrates the 2027 future total intersection volumes and Table 16 summarizes the 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, and HCM average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix J.

Figure 16: 2027 Future Total Volumes

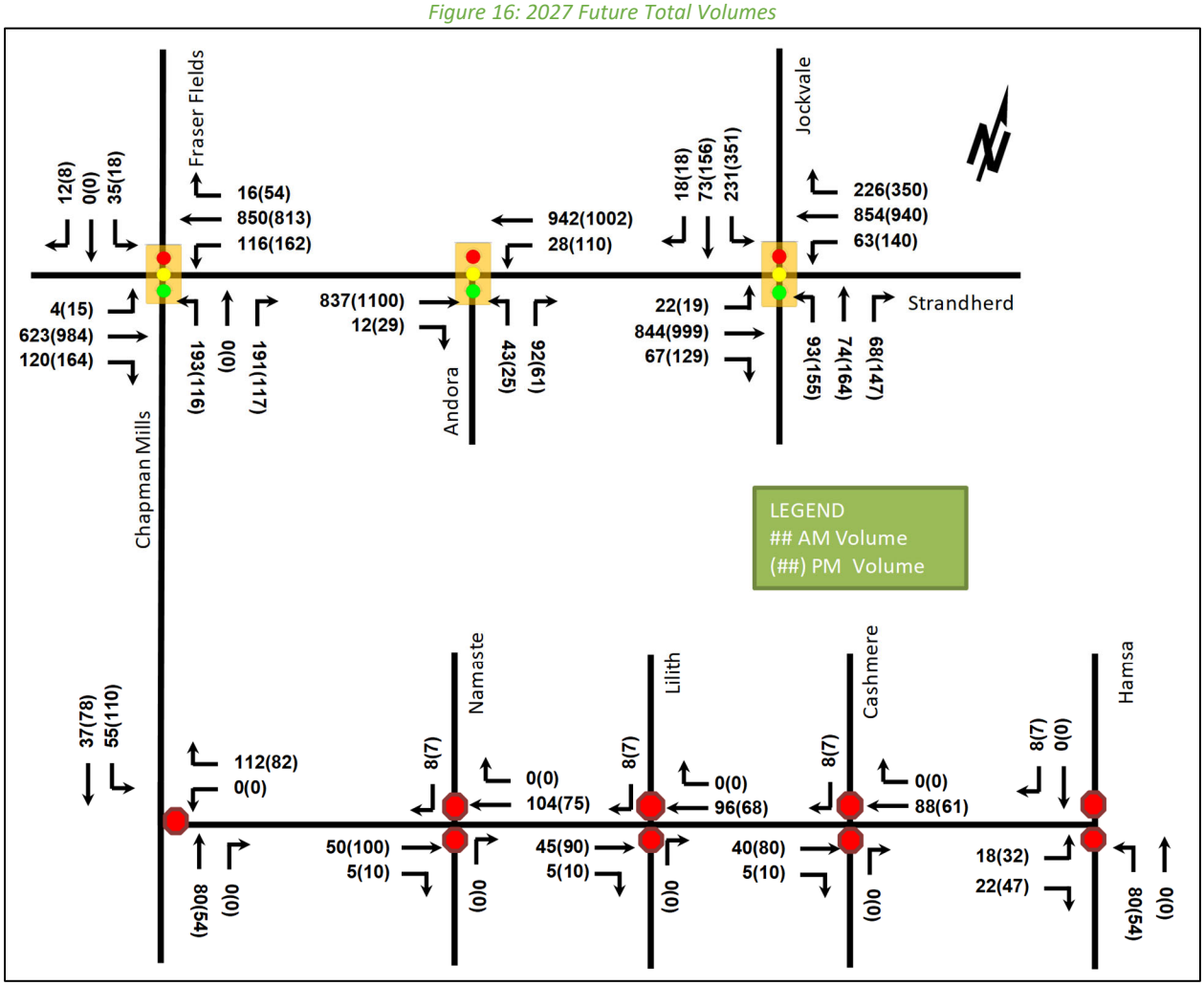


Table 16: 2027 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Andora Avenue *Signalized*	EB	A	0.34	1.6	7.0	A	0.42	7.6	m132.4
	WBL	A	0.06	4.2	4.5	A	0.33	7.7	19.9
	WBT	A	0.37	4.8	49.2	A	0.37	4.3	53.3
	NB	A	0.51	21.9	24.5	A	0.36	19.8	17.6
	Overall	**A**	**-**	**4.6**	**-**	**A**	**-**	**6.6**	**-**
Chapman Mills Drive & Namaste Street *Unsignalized*	EBT/R	-	-	-	-	-	-	-	-
	WBT/R	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBR	A	0.01	8.8	0.0	A	0.01	8.7	0.0
	Overall	**A**	**-**	**0.4**	**-**	**A**	**-**	**0.3**	**-**
Chapman Mills Drive & Lilith Street *Unsignalized*	EBT/R	-	-	-	-	-	-	-	-
	WBT/R	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBR	A	0.01	8.8	0.0	A	0.01	8.6	0.0
	Overall	**A**	**-**	**0.5**	**-**	**A**	**-**	**0.3**	**-**
Chapman Mills Drive & Cashmere Terrace *Unsignalized*	EBT/R	-	-	-	-	-	-	-	-
	WBT/R	-	-	-	-	-	-	-	-
	NBR	-	-	-	-	-	-	-	-
	SBR	A	0.01	8.7	0.0	A	0.01	8.6	0.0
	Overall	**A**	**-**	**0.5**	**-**	**A**	**-**	**0.4**	**-**

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

The access intersection operations for the 2027 future total horizon generally operate satisfactorily during the peak hours. No volume to capacity issues are noted.

10.3.3 Access Intersection MMLOS

Table 17 summarizes the MMMLOS analysis for the site access intersections of Strandherd Drive and Andora Avenue. The existing and future conditions are assumed to be the same post 2022 and are considered in one row. The analysis is based on general urban area. The MMLOS worksheets has been provided in Appendix H.

Table 17: 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
Strandherd Drive & Andora Avenue	**D**	C	**D**	C	D	D	**E**	D	A	D

The MMLOS targets for the pedestrian, bicycle and transit LOS will not be met at the Strandherd Drive and Andora Avenue intersection. The pedestrian level of service would require a maximum of four lanes at a crossing to meet a LOS C. The mixed traffic approach from the south limits the overall intersection bicycle level of service, although the east and west approaches achieve a level of service A due to the cycle tracks. The truck LOS does not meet the targets due to the single receiving lanes on the south sides of the intersection.

Considering the limitations of the MMLOS analysis and future geometry of the intersection to be completed as part of the Strandherd Drive widening, no mitigation measures are proposed.

10.3.4 Recommended Design Elements

No access intersection design elements are proposed as part of this study beyond the approved intersection configurations within the Chapman Mills Drive EA Study and Strandherd Drive widening design.

11 Transportation Demand Management

11.1 Context for TDM

The mode shares used within the TIA represent a shift from auto modes to transit modes. Overall, the modal shares are likely to be achieved and supporting TDM measures should be provided.

Total bedrooms within the development is subject to the final unit count. No age restrictions are noted.

11.2 Need and Opportunity

The subject site has been assumed to rely predominantly on auto travel and an increase on transit ridership with the proximity to the future Chapman Mills Drive BRT corridor, and those assumptions have been carried through the analysis. The study area intersections are generally anticipated to have residual capacity and the increase in transit ridership is achievable. Should the transit ridership lag due to the BRT corridor construction being built beyond the study horizons, the increase in auto traffic will be minimal.

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 and transit

12 Neighbourhood Traffic Management

12.1 Adjacent Neighbourhoods

Overall the site is anticipated to generate approximately 22-26 vehicle trips during the peak hours and will access local roads through adjacent lands to Andora Avenue. The 120-vehicle threshold for local roads will not be exceeded during the AM peak (2027 total future horizon) but is already exceeded during the existing PM peak hour. The additional 26 two-way trips anticipated on Andora Avenue is not considered a significant impact and can be accommodated by the roadway as its designed function as a signalized all movement intersection with Strandherd Drive.

The adjacent local roads are designed with an 18.0 metre right-of-way, 8.5 metre pavement width, and on-street parking. Due to the residential driveways and on-street parking, no traffic management features are recommended along Hamsa Street, Cashmere Terrace, Lilith Street or Namaste Street.

During the horizons of this study, Chapman Mills Drive at Strandherd Drive exceeds the threshold for collector roads (300 vehicles during peak hour) in the peak directions. This traffic level is consistent with the planned development area and will be a fraction of the traffic anticipated for this corridor once Chapman Mills Drive is constructed across the Kennedy-Burnett SWM pond. Traffic calming elements are already incorporated into the proposed cross-section, with bulb-outs and on-street parking.

13 Transit

13.1 Route Capacity

Overall, the forecasted new transit trips would result in the need for approximately an additional single bus (55-person capacity) during the AM and PM peak hours for local service.

13.2 Transit Priority

No transit priority is required explicitly for this study. The planned BRT corridors along Chapman Mills Drive and the associated signal coordination is beyond the horizon of this study.

14 Network Intersection Design

14.1 Network Intersection Control

No changes are recommended for the network intersections and are consistent with the Strandherd Drive widening design.

14.2 Network Intersection Design

14.2.1 2022 Future Total Network Intersection Operations

Table 18 summarizes the 2022 future total network 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 signal timing has been optimized at the Strandherd Drive and Chapman Mills Drive intersection for the horizon. The synchro worksheets have been provided in Appendix I.

Table 18: 2022 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Chapman Mills Drive ***Signalized***	EBL	A	0.05	46.8	4.4	A	0.18	50.9	9.8
	EBT	C	0.79	46.5	71.2	D	0.90	47.3	#119.0
	EBR	A	0.20	0.8	0.0	A	0.26	1.0	0.0
	WBL	B	0.67	57.6	#44.4	C	0.76	61.3	#62.4
	WBT/R	B	0.64	43.0	106.1	A	0.51	22.5	87.3
	NBL	C	0.76	59.8	#65.6	C	0.71	68.0	#49.3
	NBT/R	A	0.25	0.8	0.0	A	0.17	0.5	0.0
	SBL	A	0.32	52.3	17.1	A	0.20	50.2	11.0
	SBT/R	A	0.02	0.1	0.0	A	0.02	0.0	0.0
	Overall	**D**	-	**39.7**	-	**C**	-	**35.0**	-
Strandherd Drive & Jockvale Road ***Signalized***	EBL	A	0.08	12.0	7.0	A	0.09	13.4	6.2
	EBT/R	A	0.43	18.5	102.2	B	0.61	25.8	138.5
	WBL	A	0.10	11.9	9.6	A	0.28	14.7	17.3
	WBT/R	A	0.55	19.9	133.4	B	0.70	24.1	#193.4
	NBL	A	0.25	52.2	16.6	A	0.53	61.8	31.4
	NBT	A	0.22	50.0	18.5	A	0.51	57.0	40.3
	NBR	A	0.11	0.7	0.0	A	0.28	2.8	1.4
	SBL	C	0.72	49.8	60.8	E	0.97	78.7	#111.6
	SBT/R	A	0.15	23.1	17.4	A	0.22	28.5	30.4
	Overall	**B**	-	**22.9**	-	**C**	-	**32.1**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Chapman Mills Drive & Chapman Mills Drive ***Unsignalized***	WBL/R	A	0.11	9.1	3.0	A	0.09	8.9	2.3
	NBT/R	-	-	-	-	-	-	-	-
	SBL	A	0.04	7.5	0.8	A	0.08	7.5	2.3
	SBT	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**5.0**	**-**	**A**	**-**	**4.8**	**-**

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

The intersection operations for the 2022 future total horizon generally operate satisfactorily during the peak hours. Queues are noted along Strandherd Drive during the peak hours.

The volume-to-capacity concerns noted in the 2022 future background conditions remain and are not impacted by the development traffic.

No other volume to capacity issues are noted.

14.2.2 2027 Future Total Network Intersection Operations

Table 19 summarizes the 2027 future total network 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 signal timing has been optimized for the horizon. The synchro worksheets have been provided in Appendix J.

Table 19: 2027 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Chapman Mills Drive ***Signalized***	EBL	A	0.05	46.8	4.4	A	0.18	50.9	9.8
	EBT	D	0.86	50.5	#90.0	E	0.97	56.5	#150.7
	EBR	A	0.20	0.7	0.0	A	0.25	0.9	0.0
	WBL	B	0.67	57.1	#44.7	C	0.76	60.7	#61.6
	WBT/R	C	0.72	43.6	#128.5	A	0.58	23.2	108.0
	NBL	C	0.76	59.8	#65.6	C	0.72	68.9	#49.3
	NBT/R	A	0.26	1.0	0.4	A	0.18	0.6	0.0
	SBL	A	0.32	52.8	17.1	A	0.20	50.3	11.0
	SBT/R	A	0.02	0.1	0.0	A	0.02	0.0	0.0
	Overall	**D**	**-**	**41.5**	**-**	**D**	**-**	**38.9**	**-**
Strandherd Drive & Jockvale Road ***Signalized***	EBL	A	0.10	13.5	7.0	A	0.12	16.1	6.2
	EBT/R	A	0.56	24.3	117.3	D	0.83	38.3	#167.6
	WBL	A	0.22	14.4	15.2	B	0.70	39.1	#47.2
	WBT/R	B	0.64	24.3	147.3	D	0.81	31.2	#213.3
	NBL	A	0.60	64.7	37.8	D	0.83	**81.2**	#68.7
	NBT	A	0.33	50.1	30.1	A	0.56	53.0	59.3
	NBR	A	0.22	1.6	0.0	A	0.40	10.0	17.8
	SBL	B	0.64	41.4	63.5	E	0.95	70.4	#127.9
	SBT/R	A	0.17	25.5	24.7	A	0.29	27.8	46.7
	Overall	**C**	**-**	**27.1**	**-**	**D**	**-**	**39.7**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Chapman Mills Drive & Chapman Mills Drive *Unsignalized*	WBL/R	A	0.11	9.1	3.0	A	0.09	8.9	2.3
	NBT/R	-	-	-	-	-	-	-	-
	SBL	A	0.04	7.5	0.75	A	0.08	7.5	2.3
	SBT	-	-	-	-	-	-	-	-
	Overall	**A**	**-**	**5.0**	**-**	**A**	**-**	**4.8**	**-**

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

The intersection operations for the 2027 future total horizon generally operate satisfactorily during the peak hours. Queues are noted along Strandherd Drive during the peak hours.

The delay and volume-to-capacity concerns noted in the 2027 future background conditions remain and are not impacted by the development traffic.

No other volume to capacity issues are noted.

14.2.3 Network Intersection MMLOS

Table 20 summarizes the MMMLOS analysis for the network intersections of Strandherd Drive and Chapman Mills Drive/Fraser Fields Way, and Strandherd Drive and Jockvale Road. The existing and future conditions for both intersections will be the same and are considered in one row. The analysis is based on general urban area. The MMLOS worksheets has been provided in Appendix H.

Table 20: Study Area Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Strandherd Drive & Chapman Mills Drive	**F**	C	**D**	C	**F**	D	**E**	D	D	D
Strandherd Drive & Jockvale Road	**E**	C	**F**	C	**F**	D	**E**	D	D	D

The MMLOS targets for the pedestrian, bicycle, transit, and truck LOS will not be met at all of the signalized network intersections.

The pedestrian level of service would require a maximum of four lanes at a crossing to meet a LOS C.

The mixed traffic approaches for cyclists on some approaches, and speeds along the arterial roads drive the bicycle LOS D and F for the intersections. This is limited to the Fraser Fields Way leg at the Strandherd Drive and Chapman Mills Drive/Fraser Fields Way intersection, with the remaining approaches with a level of service A, and a multi-use pathway is provided on the north side of Strandherd Drive at the Jockvale Road intersection which allows two-way bicycle operations off the road.

The transit LOS will not be met due to the intersection delays. The truck LOS is does not meet the targets at the intersections due to the single receiving lanes on Fraser Fields Way, Chapman Mills Drive, and Jockvale Road.

Considering the limitations of the MMLOS analysis and future geometry of the intersection to be completed as part of the Strandherd Drive widening, no mitigation measures are proposed.

14.2.4 Recommended Design Elements

No network intersection design elements are proposed as part of this study beyond the approved intersection configurations within the Strandherd Drive widening design.

15 Summary of Improvements Indicated and Modifications Options

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

Proposed Site and Screening

- The proposed site includes 196 residential units
- Accesses (4) are proposed along Chapman Mills Drive and potential for access to Strandherd Drive through Andora Avenue
- The development is proposed to be completed as a single phase by 2022
- The Trip Generation and Location triggers were met for the TIA Screening

Existing Conditions

- Greenbank Road and Strandherd Drive are arterial roads, and Jockvale Road, Marketplace Avenue and Chapman Mills Drive are collector roads in the study area
- It is noted that the intersections of Greenbank Road and Marketplace Avenue, and Greenbank Road and Jockvale Road are only included as the are within a 1 km radius of the site
- Future roadways include an extension of Chapman Mills Drive to the west side of the Kennedy-Burnett SWM Pond
- Sidewalks/MUPS are generally provided to the north and east of the site, with Strandherd Drive as a rural cross-section without active mode facilities
- No collision issues were noted in the vicinity of the site, although a high number of collisions are noted along Greenbank Road, and at the Strandherd Drive and Jockvale Road intersection
- The intersections of Jockvale Road and Exeter Drive/Tartan Drive, and Strandherd Drive and Barrhaven Town Centre (210m west of Greenbank Road) have been excluded from the analysis due to minimal site traffic anticipated at these intersections

Development Generated Travel Demand

- The proposed development as forecasted produces 190 two-way people trips during the AM peak hour and 224 two-way people trips during the PM peak hour
- Of the forecasted people trips, 76 two-way trips will be vehicle trips during the AM peak hour and 89 two-way trips will be vehicle trips during the PM peak hour
- 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 limited traffic anticipated to travel along Greenbank Road, the intersections at Marketplace Avenue, Jockvale Road, and the future Chapman Mills Drive were excluded from analysis

Background Conditions

- The background developments of 3195 Greenbank, 3201 Greenbank Road, 3228 Greenbank Road, 3311 Greenbank Road, 3370 Greenbank Road, 4005/4025 Strandherd Drive, and 3285 Borrisokane Road were included in the background conditions
- A background growth rate of 0.79% annually was considered along the mainline volumes, as adjacent developments were explicitly considered within the study area
- Generally, the study area intersections will operate acceptably during the background horizons

- Minor delay and volume-to-capacity issues were noted at the Strandherd Drive and Jockvale Road, and Strandherd Drive and Chapman Mills Drive/Fraser Fields Way due to background conditions, requiring additional green time for side street movements
- Coordination along the corridor, which extends beyond the study area, is required to determine if the additional green time can be provided, or if there is a need to provide the additional capacity for the side street movements

Development Design

- The bike and auto parking will be provided at each unit
- Pedestrian connections will be made along Hamsa Street and Chapman Mills Drive
- The new streets proposed as part of the plan of subdivision include local roads only, including 14.0 (single loaded), 16.5 and 18.0 metre right-of-ways as per City standard
- No physical traffic calming elements are proposed along the internal local roads, with alternative on-street parking recommended to shift the driver line on Hamsa Street, Cashmere Terrace, Lilith Street and Namaste Street
- The proposed Chapman Mills Drive cross-section from the EA study has narrowings at each of the local road intersections and on-street parking

Boundary Street Design

- The boundary street of Chapman Mills Drive will meet MMLOS targets until such time that the BRT corridor is constructed, and the pedestrian level of service B will be below the transit station target of A
- Due to the future traffic demands of Chapman Mills Drive, the ability to meet the pedestrian level of service target is limited and no mitigation is proposed for the corridor

Access Intersections Design

- The new intersections along Chapman Mills Drive are consistent with the EA study recommendations, with Hamsa Street being a signalized full movement intersection, and Cashmere Terrace, Lilith Street and Namaste Street operating as right-in/right-out intersections
- Generally, the access intersections will operate acceptably during the total future horizons
- The MMLOS targets for the pedestrian, bicycle and transit LOS cannot be met at the Strandherd Drive and Andora intersection due to the nature of arterial roadways, mixed traffic conditions for cyclists on some approaches and intersection delays for transit
- No mitigation or intersection design elements are proposed beyond the Chapman Mills Drive EA Study and Strandherd Drive widening design

Transportation Demand Management

- The key TDM measures recommended include:
    - Enhanced connectivity of pedestrians and cyclists to the adjacent network and transit
    - Inclusion of a 1-month Presto card for first time new townhome purchase, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site

Neighbourhood Traffic Management

- While no traffic management features are required along Hamsa Street, Cashmere Terrace, Lilith Street or Namaste Street, bulb-outs at pedestrian crossing locations and alternating on-street parking will be incorporated along the local roads.

- Additional measures are already incorporated for the planned cross-section of Chapman Mills Drive

Transit

- To meet forecasted transit use, an additional single bus, or equivalent capacity, would be required for peak hour service on local routes
- No specific transit priority measures were considered as part of this development, and the BRT related measures along Chapman Mills Drive are beyond the horizons of this study

Network Intersection Design

- Generally, the network intersections will operate acceptably during the total future horizons
- Minor delay and volume-to-capacity concerns are noted in the background conditions and are not impacts by the site traffic
- The MMLOS targets for pedestrian, bicycle, transit, and truck cannot be met due to nature of arterial road intersections, mixed traffic conditions for cyclists on some approaches, intersection delays, and single receiving lanes on minor approaches for trucks
- No mitigation or intersection design elements are proposed beyond the Strandherd Drive widening design

16 Conclusion

The proposed development at 3232 Jockvale Road is recommended to proceed from a transportation perspective.

Prepared By:

Andrew Harte, P.Eng.
Senior Transportation Engineer

Reviewed By:

Christopher Gordon, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

13 Markham Avenue
Ottawa ON K2G 3Z1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

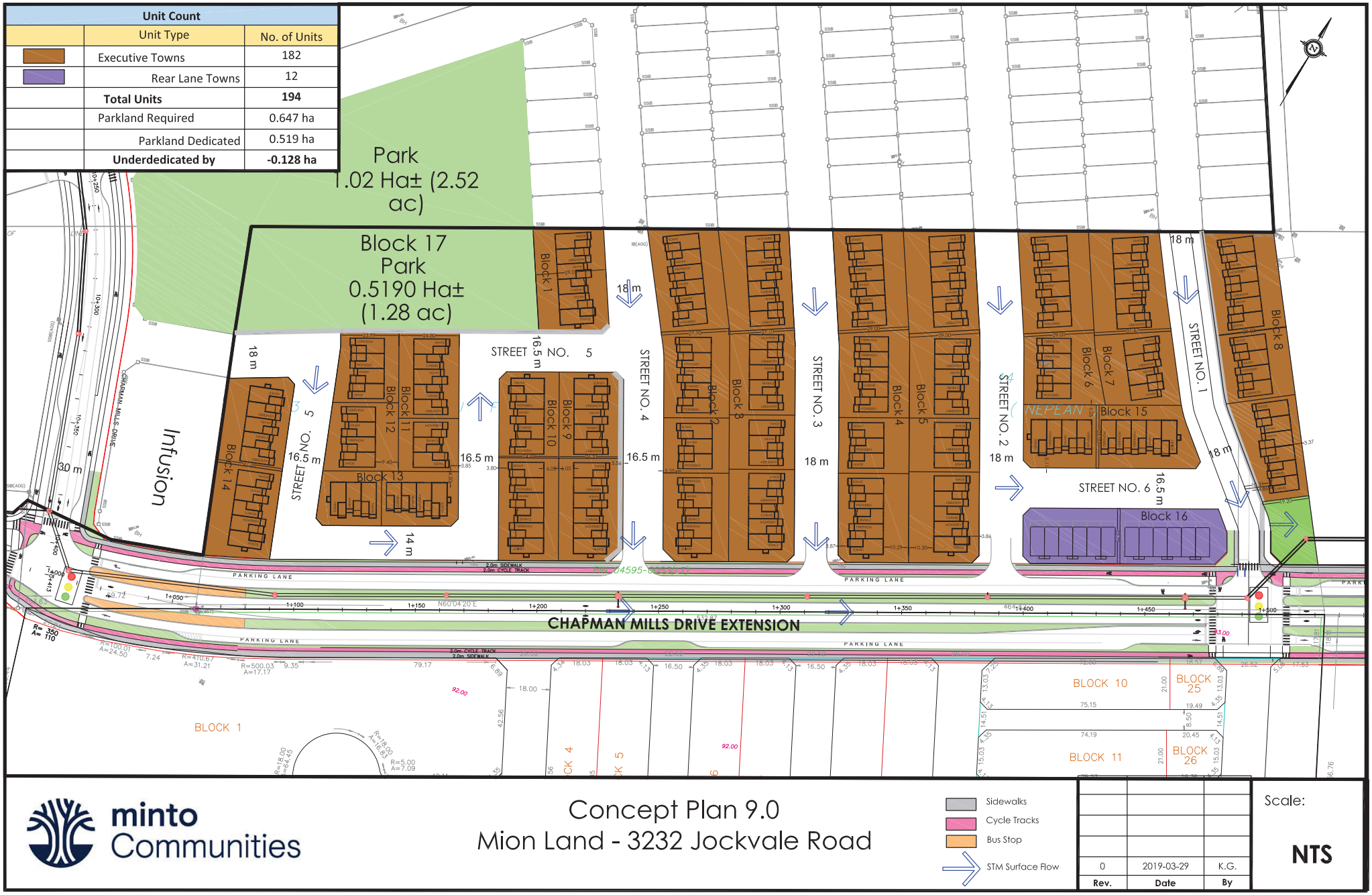
Date: 18-Apr-19
Project Number: 2019-22
Project Reference: Minto - 3232 Jockvale Road

1.1 Description of Proposed Development	
Municipal Address	3232 Jockvale Road
Description of Location	CON 3RF PT LOT 14
Land Use Classification	Zoned as "Development Reserve", Secondary Plan identified as medium to high density residential (single detached, semi-detached, row house, stacked townhouses and low rise apartment units)
Development Size	194 Townhome Units
Accesses	Chapman Mills: 4 RIRO, 1 Signal, additional non-primary access through adjacent lands
Phase of Development	Single Phase
Buildout Year	2022
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	194	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 are 80 km/hr or greater?	No
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	No


Unit Count
Unit Type
No. of Units
Executive Towns
182
Rear Lane Towns
12
Total Units
194
Parkland Required
0.647 ha
Parkland Dedicated
0.519 ha
Underdedicated by
-0.128 ha
Park
1.02 Ha± (2.52 ac)
Block 17
Park
0.5190 Ha±
(1.28 ac)
Infusion
CHAPMAN MILLS DRIVE EXTENSION
STREET NO. 1
STREET NO. 2
STREET NO. 3
STREET NO. 4
STREET NO. 5
STREET NO. 6
NEPEAN
Block 1
Block 2
Block 3
Block 4
Block 5
Block 6
Block 7
Block 8
Block 9
Block 10
Block 11
Block 12
Block 13
Block 14
Block 15
Block 16
BLOCK 1
BLOCK 10
BLOCK 11
BLOCK 25
BLOCK 26
PARKING LANE
2.0m SIDEWALK
2.0m CYCLE TRACK
18 m
16.5 m
14 m
30 m
Sidewalks
Cycle Tracks
Bus Stop
STM Surface Flow
minto Communities
Concept Plan 9.0
Mion Land - 3232 Jockvale Road
Rev.
Date
By
0
2019-03-29
K.G.
Scale:
NTS

TIA Plan Reports

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

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

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

CERTIFICATION

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

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

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

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

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

Name: _____Andrew Harte_____
(Please Print)

Professional Title: _____Professional Engineer_____

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

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

Appendix B

Turning Movement Counts

Transportation Services - Traffic Services

W.O. 37498

Turning Movement Count - 15 Minute Summary Report

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									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	**0**	8	0	7	**15**	**15**	1	95	0	**97**	0	119	1	**121**	**218**	**233**
07:15	07:30	0	0	0	**0**	7	0	6	**13**	**13**	1	136	0	**137**	0	157	1	**158**	**295**	**308**
07:30	07:45	0	0	0	**0**	9	0	9	**18**	**18**	2	116	0	**118**	0	190	0	**190**	**308**	**326**
07:45	08:00	0	0	0	**0**	11	0	4	**15**	**15**	0	159	0	**159**	0	173	2	**175**	**334**	**349**
08:00	08:15	0	0	0	**0**	8	0	4	**12**	**12**	1	131	0	**132**	0	194	4	**198**	**330**	**342**
08:15	08:30	0	0	0	**0**	8	0	1	**9**	**9**	1	147	0	**148**	0	188	3	**191**	**339**	**348**
08:30	08:45	0	0	0	**0**	8	0	3	**11**	**11**	2	109	0	**111**	0	209	7	**216**	**327**	**338**
08:45	09:00	0	0	0	**0**	11	0	3	**14**	**14**	3	114	0	**117**	0	163	5	**168**	**285**	**299**
09:00	09:15	0	0	0	**0**	5	0	7	**12**	**12**	2	102	0	**104**	0	174	2	**176**	**280**	**292**
09:15	09:30	0	0	0	**0**	5	0	0	**5**	**5**	1	114	0	**116**	0	160	1	**161**	**277**	**282**
09:30	09:45	0	0	0	**0**	3	0	1	**4**	**4**	0	123	0	**123**	0	160	1	**161**	**284**	**288**
09:45	10:00	0	0	0	**0**	2	0	0	**2**	**2**	0	114	0	**114**	0	134	3	**138**	**252**	**254**
11:30	11:45	0	0	0	**0**	4	0	0	**4**	**4**	1	122	0	**123**	0	147	3	**150**	**273**	**277**
11:45	12:00	0	0	0	**0**	1	0	1	**2**	**2**	0	122	0	**122**	0	119	8	**127**	**249**	**251**
12:00	12:15	0	0	0	**0**	2	0	1	**3**	**3**	0	134	0	**135**	0	138	4	**142**	**277**	**280**
12:15	12:30	0	0	0	**0**	3	0	4	**7**	**7**	1	144	0	**145**	0	132	4	**136**	**281**	**288**
12:30	12:45	0	0	0	**0**	3	0	0	**3**	**3**	0	154	0	**154**	0	142	1	**143**	**297**	**300**
12:45	13:00	0	0	0	**0**	1	0	0	**1**	**1**	1	182	0	**183**	0	141	8	**149**	**332**	**333**
13:00	13:15	0	0	0	**0**	3	0	0	**3**	**3**	0	151	0	**151**	0	135	2	**137**	**288**	**291**
13:15	13:30	0	0	0	**0**	2	0	0	**2**	**2**	2	133	0	**135**	0	126	9	**136**	**271**	**273**
15:00	15:15	0	0	0	**0**	6	0	3	**9**	**9**	3	154	0	**157**	0	168	6	**174**	**331**	**340**
15:15	15:30	0	0	0	**0**	5	0	2	**7**	**7**	1	197	0	**198**	0	195	10	**205**	**403**	**410**
15:30	15:45	0	0	0	**0**	5	0	3	**8**	**8**	2	197	0	**199**	0	150	7	**157**	**356**	**364**
15:45	16:00	0	0	0	**0**	7	0	1	**8**	**8**	2	178	0	**180**	0	182	10	**192**	**372**	**380**
16:00	16:15	0	0	0	**0**	4	0	5	**9**	**9**	3	197	0	**200**	0	163	10	**173**	**373**	**382**
16:15	16:30	0	0	0	**0**	8	0	1	**9**	**9**	2	211	0	**213**	0	193	13	**206**	**419**	**428**
16:30	16:45	0	0	0	**0**	6	0	1	**7**	**7**	5	184	0	**189**	0	174	7	**181**	**370**	**377**
16:45	17:00	0	0	0	**0**	1	0	3	**4**	**4**	3	190	0	**193**	0	180	17	**197**	**390**	**394**
17:00	17:15	0	0	0	**0**	3	0	3	**6**	**6**	5	190	0	**195**	0	169	17	**186**	**381**	**387**
17:15	17:30	0	0	0	**0**	5	0	1	**6**	**6**	2	195	0	**197**	0	168	15	**183**	**380**	**386**
17:30	17:45	0	0	0	**0**	4	0	4	**8**	**8**	3	198	0	**201**	0	158	10	**168**	**369**	**377**
17:45	18:00	0	0	0	**0**	2	0	3	**5**	**5**	4	177	0	**181**	0	182	12	**194**	**375**	**380**
TOTAL:		0	0	0	**0**	160	0	81	**241**	**241**	54	4870	0	**4927**	0	5183	203	**5389**	**10316**	**10557**

Note: U-Turns are included in Totals.

Comment:

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 37498

FRASER FIELDS WAY @ STRANDHERD DR

Count Date: Thursday, January 18, 2018 **Start Time:** 07:00

		FRASER FIELDS WAY			STRANDHERD DR			
Time Period		Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand 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	1	**1**	**1**
Total	.....	0	0	**0**	0	1	**1**	**1**

Comment:

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

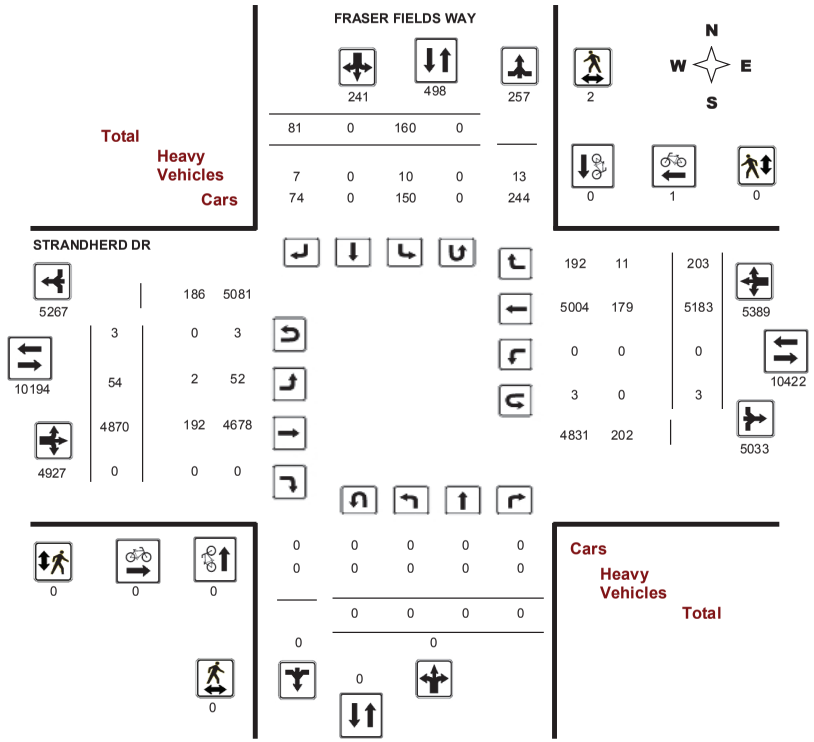
Turning Movement Count - Full Study Diagram

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

WO#: 37498

Device: Miovision



Comments

Transportation Services - Traffic Services

W.O. 37498

Turning Movement Count - Heavy Vehicle Report

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

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

Work Order 37498

Turning Movement Count - Pedestrian Volume Report

FRASER FIELDS WAY @ STRANDHERD 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)	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
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	1	1	0	0	0	1
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	1	1	0	0	0	1
09:00 09:15	0	0	0	0	0	0	0
09:15 09:30	0	1	1	0	0	0	1
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	1	1	0	0	0	1
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
11:30 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	2	2	0	0	0	2

Comment:

Transportation Services - Traffic Services

Work Order 37498

Turning Movement Count - Full Study Summary Report

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 3 Westbound: 3

AADT Factor 1.00

Full Study

	FRASER FIELDS WAY									STRANDHERD DR									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	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**	35	0	11	**46**	**46**	7	501	0	**508**	0	754	19	**773**	**1281**	**1327**
09:00 10:00	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**	10	0	6	**16**	**16**	2	522	0	**524**	0	536	19	**555**	**1079**	**1095**
12:30 13:30	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**	23	0	9	**32**	**32**	8	726	0	**734**	0	695	33	**728**	**1462**	**1494**
16:00 17:00	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**	14	0	11	**25**	**25**	14	760	0	**774**	0	677	54	**731**	**1505**	**1530**
Sub Total	0	0	0	**0**	160	0	81	**241**	**241**	54	4870	0	**4924**	0	5183	203	**5386**	**10310**	**10551**
U Turns				**0**				**0**	**0**				**3**				**3**	**6**	**6**
Total	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**	222	0	113	**335**	**335**	75	6769	0	**6849**	0	7204	282	**7491**	**14340**	**14675**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	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 Equivalent 12 hr. totals by the AADT factor.													**1.00**						
AVG 24Hr	0	0	0	**0**	291	0	147	**439**	**439**	98	8868	0	**8972**	0	9438	370	**9813**	**18785**	**19224**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													**1.31**						

Comments:

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

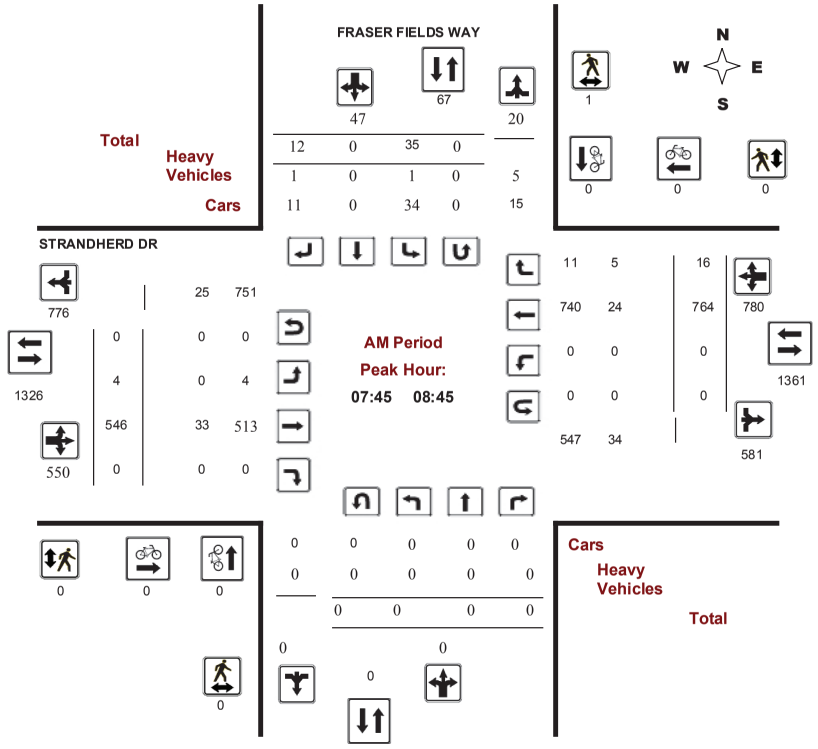
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37498

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



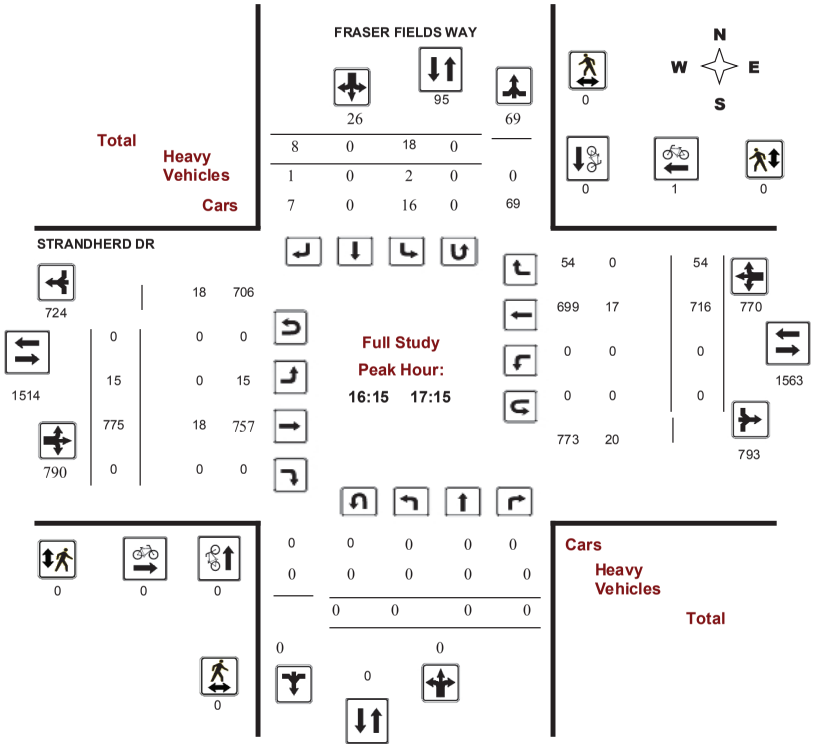
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37498

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



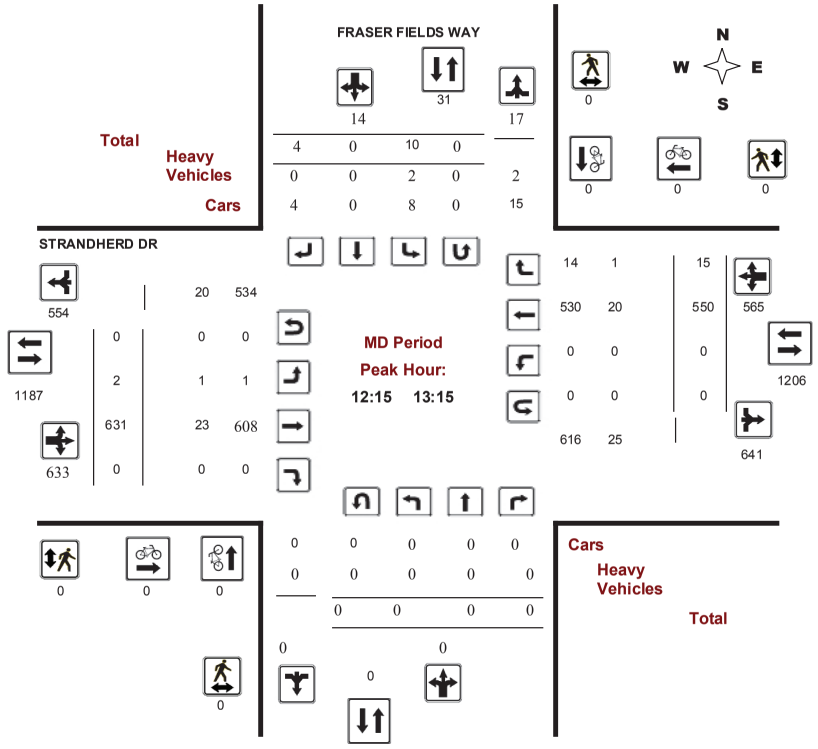
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37498

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



Comments

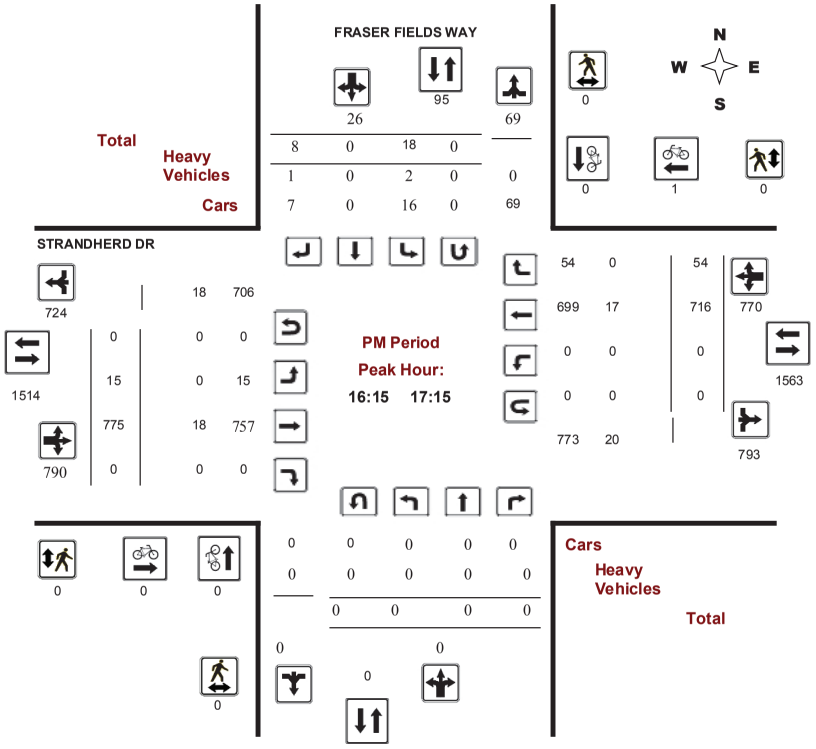
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

FRASER FIELDS WAY @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37498

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



Comments

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	07:15	0	0	1	1	2
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	1	0	1
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	1	1
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	1	0	1
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	1	1
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	3	3	6

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Signal Operations Unit

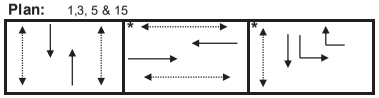
Intersection: *Main:* Greenbank *Side:* Jockvale
Controller: ATC 3 **TSD:** 6737
Author: Yassine Bennani **Date:** 26-Nov-18

Existing Timing Plans†

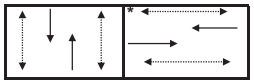
	Plan						Ped Minimum Time		
	AM Peak 1	Off Peak 2	PM Peak 3	Night 4	Weekend 5	Weekend 15	*Walk*	*DW*	*A+R*
Cycle	120	110	120	80	110	120			
Offset	100	0	10	X	0	0			
NB Thru	73	70	63	40	65	70	7	20	3.7+3.4
SB Thru	93	70	93	40	84	94	7	20	3.7+3.4
EB Thru	27	40	27	40	26	26	7	13	3.7+2.7
WB Thru	27	40	27	40	26	26	7	13	3.7+2.7
SBLT	20	_	30	_	19	24	-	-	3.7+3.4
WBRT	20	_	30	_	19	24	-	-	3.7+3.4

Phasing Sequence‡

Plan: 1,3, 5 & 15



Plan: 2 & 4



Schedule

Weekday

Time	Plan
0:15	4
6:30	1
9:30	2
15:00	3
18:30	2
22:30	4

Saturday

Time	Plan
0:15	4
8:30	5
11:00	15
18:00	5
22:30	4

Sunday

Time	Plan
0:15	4
8:30	5
11:00	15
16:00	5
22:30	4

Notes

†: Time for each direction includes amber and all red intervals
‡: Start of first phase should be used as reference point for offset
Asterisk (*) Indicates actuated phase
(fp): Fully Protected Left Turn

◄·····► *Pedestrian signal*

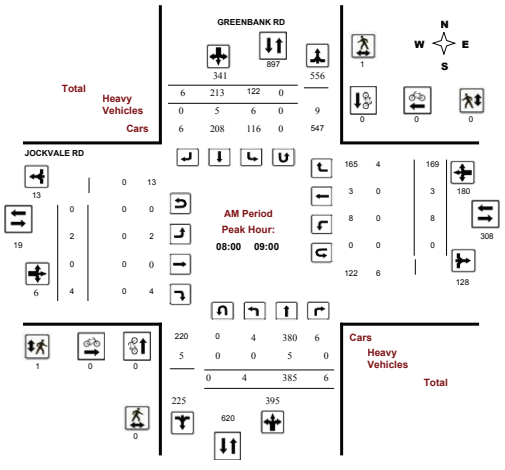
Cost is $56.50 ($50 + HST)

Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016 **WO No:** 36178
Start Time: 07:00 **Device:** Miovision



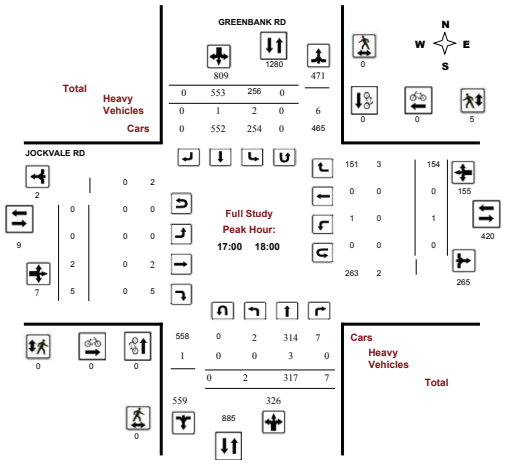
Comments

Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016 **WO No:** 36178
Start Time: 07:00 **Device:** Miovision



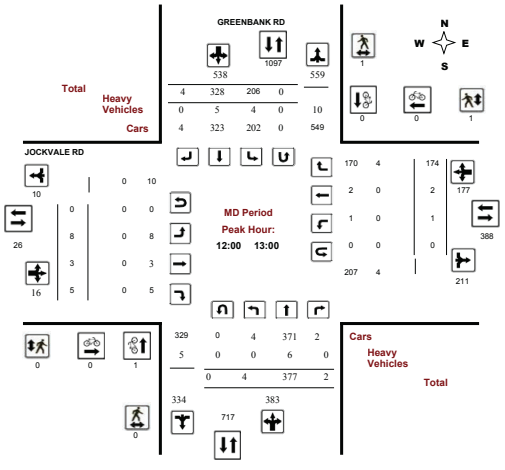
Comments

Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016 **WO No:** 36178
Start Time: 07:00 **Device:** Miovision



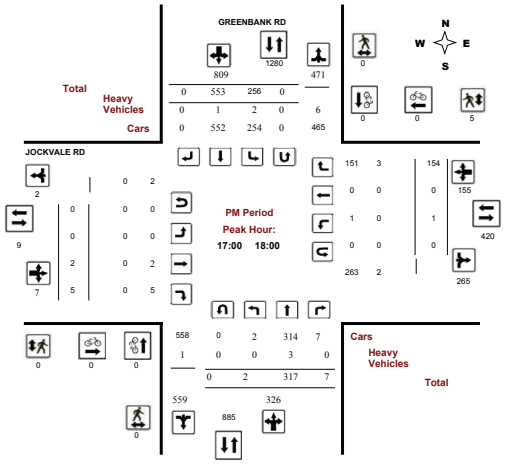
Comments

Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016 **WO No:** 36178
Start Time: 07:00 **Device:** Miovision



Comments

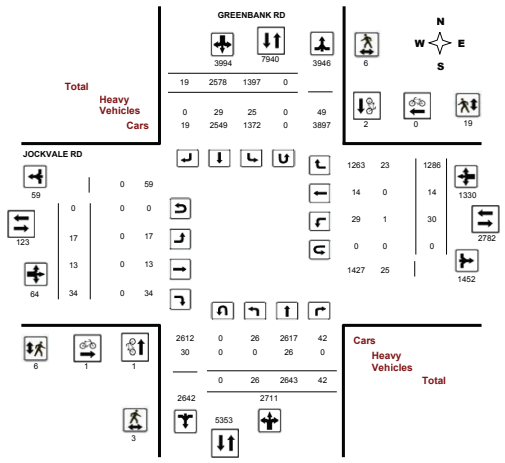
Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016 **WO#:** 36178

Device: Miovision



Comments

2017-Feb-17 Page 1 of 1

Transportation Services - Traffic Services

Turning Movement Count - Full Study Summary Report

GREENBANK RD @ JOCKVALE RD

Work Order 36178

Survey Date: Tuesday, August 16, 2016

Total Observed U-Turns Northbound: 0 Southbound: 0 Eastbound: 0 Westbound: 0

AADT Factor .90

Full Study

	GREENBANK RD							JOCKVALE RD								
	Northbound				Southbound				Eastbound				Westbound			
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	4	415	2	**421**	85	162	0	**247**	**668**	0	1	3	**4**	5	1	160	**166**	**170**	**838**
08:00 09:00	4	385	6	**395**	122	213	6	**341**	**736**	2	0	4	**6**	8	3	169	**180**	**186**	**922**
09:00 10:00	8	313	5	**326**	109	197	2	**308**	**634**	6	2	1	**9**	4	1	179	**184**	**193**	**827**
11:30 12:30	7	328	7	**342**	193	317	9	**519**	**861**	8	4	5	**17**	0	3	155	**158**	**175**	**1036**
12:30 13:30	0	318	2	**320**	210	316	2	**528**	**848**	1	3	6	**10**	2	3	201	**206**	**216**	**1064**
15:00 16:00	0	238	1	**239**	194	363	0	**557**	**796**	0	0	4	**4**	5	0	140	**145**	**149**	**945**
16:00 17:00	1	329	12	**342**	228	457	0	**685**	**1027**	0	1	6	**7**	5	3	128	**136**	**143**	**1170**
17:00 18:00	2	317	7	**326**	256	553	0	**809**	**1135**	0	2	5	**7**	1	0	154	**155**	**162**	**1297**
Sub Total	26	2643	42	**2711**	1397	2578	19	**3994**	**6705**	17	13	34	**64**	30	14	1286	**1330**	**1394**	**8099**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	26	2643	42	**2711**	1397	2578	19	**3994**	**6705**	17	13	34	**64**	30	14	1286	**1330**	**1394**	**8099**
EQ 12Hr	36	3674	58	**3768**	1942	3583	26	**5552**	**9320**	24	18	47	**89**	42	19	1788	**1849**	**1938**	**11258**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	33	3306	53	**3391**	1748	3225	24	**4996**	**8387**	21	16	43	**80**	38	18	1609	**1664**	**1744**	**10131**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													**.90**						
AVG 24Hr	43	4331	69	**4443**	2289	4225	31	**6545**	**10988**	28	21	56	**105**	49	23	2108	**2180**	**2285**	**13273**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													**1.31**						

Comments:

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

2017-Feb-17 Page 1 of 1

Transportation Services - Traffic Services

W.O. 36178

Turning Movement Count - 15 Minute Summary Report

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016

Total Observed U-Turns Northbound: 0 Southbound: 0 Eastbound: 0 Westbound: 0

	GREENBANK RD								JOCKVALE RD									
	Northbound				Southbound				Eastbound				Westbound					
Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 07:15	0	112	0	**112**	22	39	0	**61**	**173**	0	0	0	**0**	1	0	27	**28**	**28**	**201**
07:15 07:30	0	107	0	**107**	18	36	0	**54**	**161**	0	1	0	**1**	0	1	46	**47**	**48**	**209**
07:30 07:45	2	108	0	**110**	16	40	0	**56**	**166**	0	0	1	**1**	0	0	40	**40**	**41**	**207**
07:45 08:00	2	88	2	**92**	29	47	0	**76**	**168**	0	0	2	**2**	4	0	47	**51**	**53**	**221**
08:00 08:15	1	107	3	**111**	29	46	1	**76**	**187**	0	0	1	**1**	4	0	46	**50**	**51**	**238**
08:15 08:30	2	96	2	**100**	30	44	1	**75**	**175**	0	0	2	**2**	0	0	37	**37**	**39**	**214**
08:30 08:45	1	85	0	**86**	25	60	0	**85**	**171**	0	0	0	**0**	0	0	40	**40**	**40**	**211**
08:45 09:00	0	97	1	**98**	38	63	4	**105**	**203**	2	0	1	**3**	4	3	46	**53**	**56**	**259**
09:00 09:15	3	88	1	**92**	23	43	2	**68**	**160**	3	1	0	**4**	0	0	41	**41**	**45**	**205**
09:15 09:30	1	77	1	**79**	29	51	0	**80**	**159**	1	0	0	**1**	3	1	38	**42**	**43**	**202**
09:30 09:45	4	81	2	**87**	29	55	0	**84**	**171**	1	1	0	**2**	1	0	40	**41**	**43**	**214**
09:45 10:00	0	67	1	**68**	28	48	0	**76**	**144**	1	0	1	**2**	0	0	60	**60**	**62**	**206**
11:30 11:45	1	73	5	**79**	44	66	2	**112**	**191**	1	0	2	**3**	0	1	36	**37**	**40**	**231**
11:45 12:00	2	76	1	**79**	52	76	3	**131**	**210**	0	2	1	**3**	0	2	39	**41**	**44**	**254**
12:00 12:15	3	86	1	**90**	56	87	2	**145**	**235**	3	2	0	**5**	0	0	40	**40**	**45**	**280**
12:15 12:30	1	93	0	**94**	41	88	2	**131**	**225**	4	0	2	**6**	0	0	40	**40**	**46**	**271**
12:30 12:45	0	112	1	**113**	51	88	0	**139**	**252**	1	1	2	**4**	1	1	50	**52**	**56**	**308**
12:45 13:00	0	86	0	**86**	58	65	0	**123**	**209**	0	0	1	**1**	0	1	44	**45**	**46**	**255**
13:00 13:15	0	60	1	**61**	44	79	1	**124**	**185**	0	0	3	**3**	0	1	54	**55**	**58**	**243**
13:15 13:30	0	60	0	**60**	57	84	1	**142**	**202**	0	2	0	**2**	1	0	53	**54**	**56**	**258**
15:00 15:15	0	50	1	**51**	44	86	0	**130**	**181**	0	0	0	**0**	0	0	34	**34**	**34**	**215**
15:15 15:30	0	46	0	**46**	58	74	0	**132**	**178**	0	0	1	**1**	3	0	39	**42**	**43**	**221**
15:30 15:45	0	63	0	**63**	47	95	0	**142**	**205**	0	0	2	**2**	0	0	27	**27**	**29**	**234**
15:45 16:00	0	79	0	**79**	45	108	0	**153**	**232**	0	0	1	**1**	2	0	40	**42**	**43**	**275**
16:00 16:15	0	65	2	**67**	59	120	0	**179**	**246**	0	0	0	**0**	0	2	31	**33**	**33**	**279**
16:15 16:30	1	79	3	**83**	64	111	0	**175**	**258**	0	0	3	**3**	1	0	30	**31**	**34**	**292**
16:30 16:45	0	93	4	**97**	55	119	0	**174**	**271**	0	0	2	**2**	2	0	28	**30**	**32**	**303**
16:45 17:00	0	92	3	**95**	50	107	0	**157**	**252**	0	1	1	**2**	2	1	39	**42**	**44**	**296**
17:00 17:15	0	91	3	**94**	53	145	0	**198**	**292**	0	1	2	**3**	1	0	34	**35**	**38**	**330**
17:15 17:30	1	73	1	**75**	70	135	0	**205**	**280**	0	0	1	**1**	0	0	36	**36**	**37**	**317**
17:30 17:45	1	77	2	**80**	66	140	0	**206**	**286**	0	0	2	**2**	0	0	46	**46**	**48**	**334**
17:45 18:00	0	76	1	**77**	67	133	0	**200**	**277**	0	1	0	**1**	0	0	38	**38**	**39**	**316**
TOTAL:	26	2643	42	**2711**	1397	2578	19	**3994**	**6705**	17	13	34	**64**	30	14	1286	**1330**	**1394**	**8099**

Note: U-Turns are included in Totals.

Comment:

2017-Feb-17 Page 1 of 1

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 36178

GREENBANK RD @ JOCKVALE RD

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

	GREENBANK RD			JOCKVALE RD			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	0	1	**1**	1	0	**1**	**2**
08:00 09:00	0	0	**0**	0	0	**0**	**0**
09:00 10:00	0	1	**1**	0	0	**0**	**1**
11:30 12:30	1	0	**1**	0	0	**0**	**1**
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	1	2	**3**	1	0	**1**	**4**

Comment:

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

2017-Feb-17 Page 1 of 1

Transportation Services - Traffic Services

W.O. 36178

Turning Movement Count - Heavy Vehicle Report

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016

		GREENBANK RD								JOCKVALE RD									
		Northbound				Southbound				Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	08:00	0	2	0	**2**	0	5	0	**5**	**7**	0	0	0	**0**	0	0	7	**7**	**7**	**14**
08:00	09:00	0	5	0	**5**	6	5	0	**11**	**16**	0	0	0	**0**	0	0	4	**4**	**4**	**20**
09:00	10:00	0	5	0	**5**	4	8	0	**12**	**17**	0	0	0	**0**	0	0	2	**2**	**2**	**19**
11:30	12:30	0	5	0	**5**	5	4	0	**9**	**14**	0	0	0	**0**	0	0	2	**2**	**2**	**16**
12:30	13:30	0	6	0	**6**	6	3	0	**9**	**15**	0	0	0	**0**	0	0	4	**4**	**4**	**19**
15:00	16:00	0	0	0	**0**	2	2	0	**4**	**4**	0	0	0	**0**	1	0	1	**2**	**2**	**6**
16:00	17:00	0	0	0	**0**	0	1	0	**1**	**1**	0	0	0	**0**	0	0	0	**0**	**0**	**1**
17:00	18:00	0	3	0	**3**	2	1	0	**3**	**6**	0	0	0	**0**	0	0	3	**3**	**3**	**9**
Sub Total		0	26	0	**26**	25	29	0	**54**	**80**	0	0	0	**0**	1	0	23	**24**	**24**	**104**
U-Turns (Heavy Vehicles)					**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total		0	26	0	**0**	25	29	0	**54**	**80**	0	0	0	**0**	1	0	23	**24**	**24**	**104**

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

2017-Feb-1

Transportation Services - Traffic Services

Work Order 36178

Turning Movement Count - Pedestrian Volume Report

GREENBANK RD @ JOCKVALE RD

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

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	1	**1**	**1**
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	1	**1**	**1**
08:00	08:15	0	0	**0**	1	0	**1**	**1**
08:15	08:30	0	0	**0**	0	0	**0**	**0**
08:30	08:45	0	1	**1**	0	0	**0**	**1**
08:45	09:00	0	0	**0**	0	0	**0**	**0**
08:00	09:00	0	1	**1**	1	0	**1**	**2**
09:00	09:15	0	2	**2**	2	3	**5**	**7**
09:15	09:30	0	0	**0**	0	0	**0**	**0**
09:30	09:45	0	2	**2**	0	3	**3**	**5**
09:45	10:00	0	0	**0**	0	1	**1**	**1**
09:00	10:00	0	4	**4**	2	7	**9**	**13**
11:30	11:45	0	0	**0**	0	1	**1**	**1**
11:45	12:00	0	0	**0**	0	0	**0**	**0**
12:00	12:15	0	1	**1**	0	1	**1**	**2**
12:15	12:30	0	0	**0**	0	0	**0**	**0**
11:30	12:30	0	1	**1**	0	2	**2**	**3**
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	3	0	**3**	3	0	**3**	**6**
12:30	13:30	3	0	**3**	3	0	**3**	**6**
15:00	15:15	0	0	**0**	0	2	**2**	**2**
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	1	**1**	**1**
15:00	16:00	0	0	**0**	0	3	**3**	**3**
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	1	**1**	**1**
16:00	17:00	0	0	**0**	0	1	**1**	**1**
17:00	17:15	0	0	**0**	0	0	**0**	**0**
17:15	17:30	0	0	**0**	0	2	**2**	**2**
17:30	17:45	0	0	**0**	0	0	**0**	**0**
17:45	18:00	0	0	**0**	0	3	**3**	**3**
17:00	18:00	0	0	**0**	0	5	**5**	**5**
Total	.....	3	6	**9**	6	19	**25**	**34**

Comment:

2017-Feb-17

Transportation Services - Traffic Services

Work Order 36178

Turning Movement Count - Pedestrian Volume Report

GREENBANK RD @ JOCKVALE RD

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

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	1	**1**	**1**
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	1	**1**	**1**
08:00	08:15	0	0	**0**	1	0	**1**	**1**
08:15	08:30	0	0	**0**	0	0	**0**	**0**
08:30	08:45	0	1	**1**	0	0	**0**	**1**
08:45	09:00	0	0	**0**	0	0	**0**	**0**
08:00	09:00	0	1	**1**	1	0	**1**	**2**
09:00	09:15	0	2	**2**	2	3	**5**	**7**
09:15	09:30	0	0	**0**	0	0	**0**	**0**
09:30	09:45	0	2	**2**	0	3	**3**	**5**
09:45	10:00	0	0	**0**	0	1	**1**	**1**
09:00	10:00	0	4	**4**	2	7	**9**	**13**
11:30	11:45	0	0	**0**	0	1	**1**	**1**
11:45	12:00	0	0	**0**	0	0	**0**	**0**
12:00	12:15	0	1	**1**	0	1	**1**	**2**
12:15	12:30	0	0	**0**	0	0	**0**	**0**
11:30	12:30	0	1	**1**	0	2	**2**	**3**
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	3	0	**3**	3	0	**3**	**6**
12:30	13:30	3	0	**3**	3	0	**3**	**6**
15:00	15:15	0	0	**0**	0	2	**2**	**2**
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	1	**1**	**1**
15:00	16:00	0	0	**0**	0	3	**3**	**3**
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	1	**1**	**1**
16:00	17:00	0	0	**0**	0	1	**1**	**1**
17:00	17:15	0	0	**0**	0	0	**0**	**0**
17:15	17:30	0	0	**0**	0	2	**2**	**2**
17:30	17:45	0	0	**0**	0	0	**0**	**0**
17:45	18:00	0	0	**0**	0	3	**3**	**3**
17:00	18:00	0	0	**0**	0	5	**5**	**5**
Total	.....	3	6	**9**	6	19	**25**	**34**

Comment:

2017-Feb-17

Transportation Services - Traffic Services

Work Order 36178

Turning Movement Count - 15 Min U-Turn Total Report

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016

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

2017-Feb-17

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Signal Operations Unit

Intersection:	**Main:** Greenbank	**Side:** Market Place	
Controller:	MS-3200	**TSD:**	6029
Author:	Yassine Bennani	**Date:**	26-Nov-2018

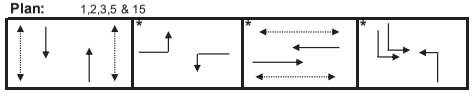
Existing Timing Plans†

	Plan						Ped Minimum Time		
	AM Peak	Off Peak	PM Peak	Night	Weekend	Weekend	*Walk*	*DW*	*A+R*
	1	2	3	4	5	15			
Cycle	120	110	120	85	110	120			
Offset	89	0	117	X	100	0			
NB Thru	58	44	52	35	34	41	7	18	3.7 + 2.5
SB Thru	58	44	52	35	34	41	7	18	3.7 + 2.5
EB Left	12	15	13	-	18	18	-	-	3.3 + 3.1
WB Left	12	15	13	-	18	18	-	-	3.3 + 3.1
EB Thru	35	35	35	35	35	35	7	21	3.3 + 3.2
WB Thru	35	35	35	35	35	35	7	21	3.3 + 3.2
NB Left (fp)	15	16	20	15	23	26	-	-	3.7 + 2.6
SB Left (fp)	15	16	20	15	23	26	-	-	3.7 + 2.6

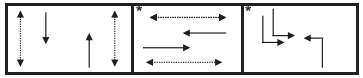
Notes: 1) For Plans 1, 2, 3, and 5 the EW Thru movements are forced off 6 seconds early if the pedestrian movements are not actuated.

Phasing Sequence‡

Plan: 1,2,3,5 & 15



Plan: 4



Schedule

Weekday		Saturday		Sunday	
Time	Plan	Time	Plan	Time	Plan
0:15	4	0:15	4	0:15	4
6:30	1	8:30	5	8:30	5
9:30	2	11:00	15	11:00	15
15:00	3	18:00	5	16:00	5
18:30	2	22:30	4	22:30	4
22:30	4				

Notes

†: Time for each direction includes amber and all red intervals

‡: Start of first phase should be used as reference point for offset

Asterisk (*) Indicates actuated phase

(fp): Fully Protected Left Turn

◄·····► Pedestrian signal

Cost is $56.50 ($50 + HST)

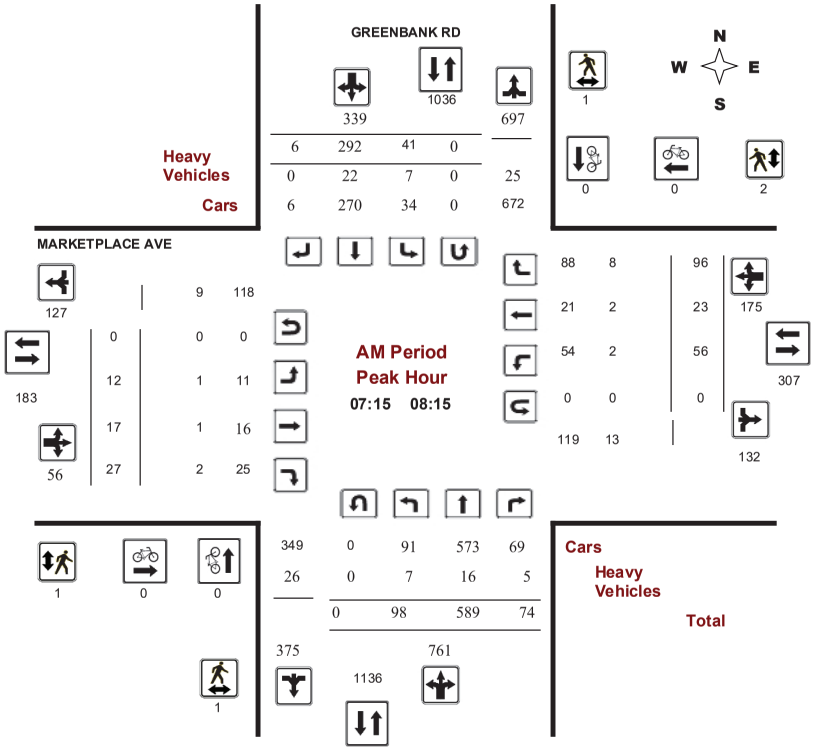
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016 **WO No:** 35721

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



Comments

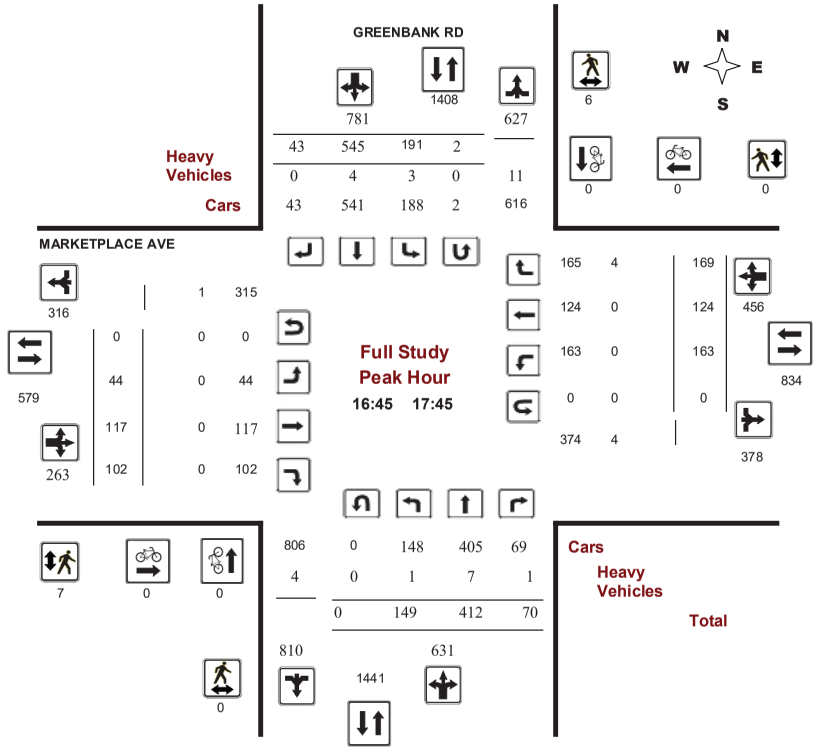
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016 **WO No:** 35721

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



Comments

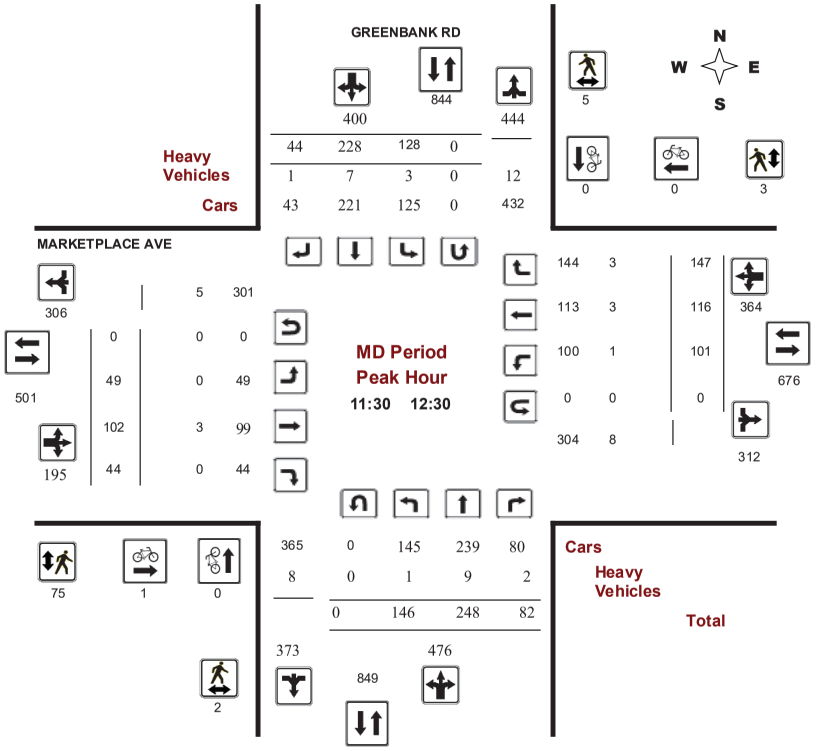
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016 **WO No:** 35721

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



Comments

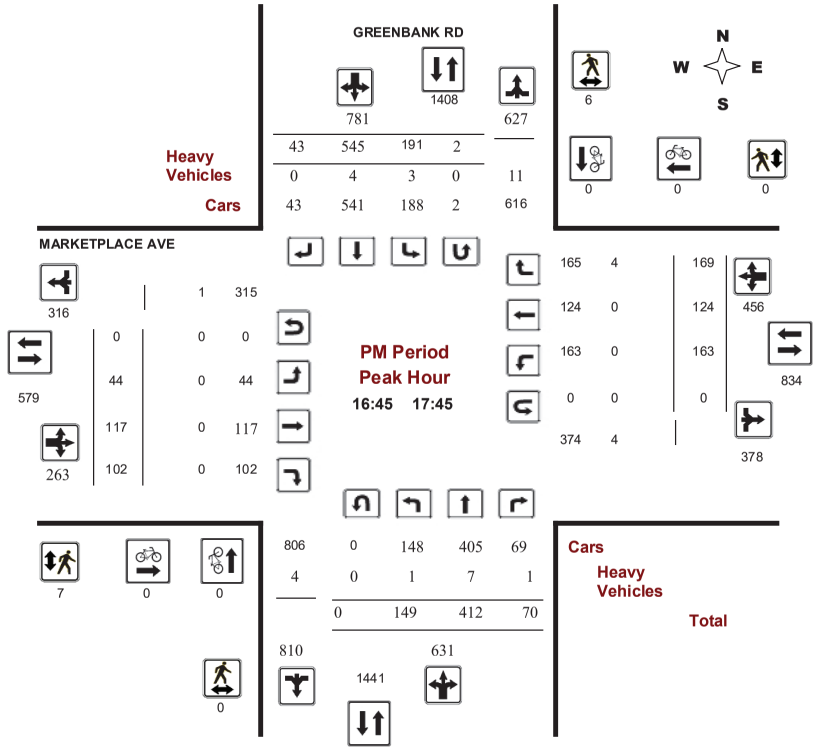
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016 **WO No:** 35721

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



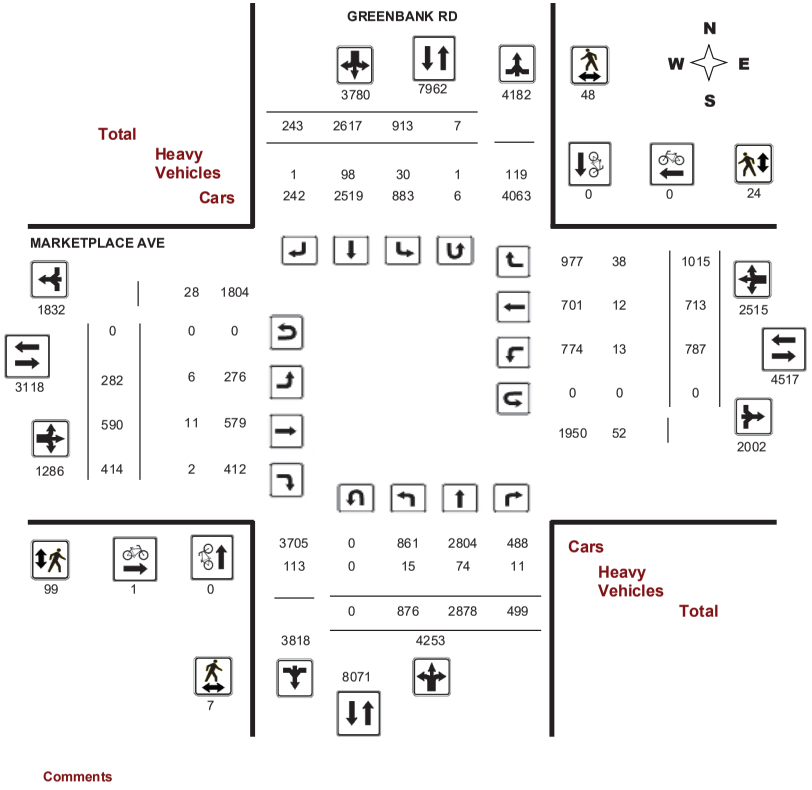
Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016 **WO#:** 35721

Device: Miovision



Transportation Services - Traffic Services

Work Order 35721

Turning Movement Count - Full Study Summary Report

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016

Total Observed U-Turns

Northbound: 0 Southbound: 7

Eastbound: 0 Westbound: 0

AADT Factor 1.00

Full Study

	GREENBANK RD									MARKETPLACE AVE									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	75	543	78	**696**	34	281	6	**321**	**1017**	10	18	20	**48**	53	25	90	**168**	**216**	**1233**
08:00 09:00	90	514	45	**649**	57	231	11	**299**	**948**	8	22	23	**53**	39	40	118	**197**	**250**	**1198**
09:00 10:00	104	300	62	**466**	82	226	37	**345**	**811**	29	52	27	**108**	66	69	81	**216**	**324**	**1135**
11:30 12:30	146	248	82	**476**	128	228	44	**400**	**876**	49	102	44	**195**	101	116	147	**364**	**559**	**1435**
12:30 13:30	93	226	57	**376**	140	237	39	**416**	**792**	52	86	46	**184**	90	110	144	**344**	**528**	**1320**
15:00 16:00	101	302	45	**448**	134	385	30	**549**	**997**	31	86	72	**189**	114	111	140	**365**	**554**	**1551**
16:00 17:00	113	324	64	**501**	149	491	39	**679**	**1180**	57	109	81	**247**	157	128	124	**409**	**656**	**1836**
17:00 18:00	154	421	66	**641**	189	538	37	**764**	**1405**	46	115	101	**262**	167	114	171	**452**	**714**	**2119**
Sub Total	876	2878	499	**4253**	913	2617	243	**3773**	**8026**	282	590	414	**1286**	787	713	1015	**2515**	**3801**	**11827**
U Turns				**0**				**7**	**7**				**0**				**0**	**0**	**7**
Total	876	2878	499	**4253**	913	2617	243	**3780**	**8033**	282	590	414	**1286**	787	713	1015	**2515**	**3801**	**11834**
EQ 12Hr	1218	4000	694	**5912**	1269	3638	338	**5254**	**11166**	392	820	575	**1788**	1094	991	1411	**3496**	**5284**	**16450**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	1218	4000	694	**5912**	1269	3638	338	**5254**	**11166**	392	820	575	**1788**	1094	991	1411	**3496**	**5284**	**16450**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													**1.00**						
AVG 24Hr	1595	5241	909	**7744**	1662	4765	442	**6883**	**14627**	513	1074	754	**2342**	1433	1298	1848	**4580**	**6922**	**21549**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													**1.31**						

Comments:

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

Transportation Services - Traffic Services

W.O. 35721

Turning Movement Count - 15 Minute Summary Report

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016

Total Observed U-Turns

Northbound: 0 Southbound: 7

Eastbound: 0 Westbound: 0

	GREENBANK RD								MARKETPLACE AVE									
	Northbound				Southbound				Eastbound				Westbound					
Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 07:15	10	112	18	**140**	5	46	0	**51**	**191**	1	5	1	**7**	11	6	14	**31**	**38**	**229**
07:15 07:30	17	143	18	**178**	6	46	2	**54**	**232**	2	3	7	**12**	8	8	21	**37**	**49**	**281**
07:30 07:45	19	152	22	**193**	10	98	1	**109**	**302**	5	6	7	**18**	22	6	28	**56**	**74**	**376**
07:45 08:00	29	136	20	**185**	13	91	3	**107**	**292**	2	4	5	**11**	12	5	27	**44**	**55**	**347**
08:00 08:15	33	158	14	**205**	12	57	0	**69**	**274**	3	4	8	**15**	14	4	20	**38**	**53**	**327**
08:15 08:30	15	97	5	**117**	6	45	3	**54**	**171**	0	8	5	**13**	8	10	35	**53**	**66**	**237**
08:30 08:45	20	119	16	**155**	18	75	4	**97**	**252**	1	4	6	**11**	11	12	35	**58**	**69**	**321**
08:45 09:00	22	140	10	**172**	21	54	4	**79**	**251**	4	6	4	**14**	6	14	28	**48**	**62**	**313**
09:00 09:15	30	109	13	**152**	21	69	15	**105**	**257**	11	11	4	**26**	10	12	13	**35**	**61**	**318**
09:15 09:30	31	69	18	**118**	17	52	11	**80**	**198**	5	11	9	**25**	17	17	22	**56**	**81**	**279**
09:30 09:45	22	67	20	**109**	17	51	4	**72**	**181**	7	16	11	**34**	18	27	31	**76**	**110**	**291**
09:45 10:00	21	55	11	**87**	27	54	7	**89**	**176**	6	14	3	**23**	21	13	15	**49**	**72**	**248**
11:30 11:45	38	60	14	**112**	33	53	11	**97**	**209**	13	26	12	**51**	12	30	34	**76**	**127**	**336**
11:45 12:00	32	57	28	**117**	22	59	9	**90**	**207**	11	22	12	**45**	22	26	38	**86**	**131**	**338**
12:00 12:15	35	60	24	**119**	36	60	14	**110**	**229**	15	29	7	**51**	29	27	35	**91**	**142**	**371**
12:15 12:30	41	71	16	**128**	37	56	10	**103**	**231**	10	25	13	**48**	38	33	40	**111**	**159**	**390**
12:30 12:45	21	63	15	**99**	33	49	12	**94**	**193**	11	19	9	**39**	17	28	43	**88**	**127**	**320**
12:45 13:00	25	55	19	**99**	36	70	11	**118**	**217**	16	13	11	**40**	19	28	32	**79**	**119**	**336**
13:00 13:15	22	62	10	**94**	36	63	8	**107**	**201**	13	31	13	**57**	24	14	30	**68**	**125**	**326**
13:15 13:30	25	46	13	**84**	35	55	8	**98**	**182**	12	23	13	**48**	30	40	39	**109**	**157**	**339**
15:00 15:15	30	84	12	**126**	34	73	7	**114**	**240**	13	23	12	**48**	21	27	34	**82**	**130**	**370**
15:15 15:30	24	82	4	**110**	24	104	7	**135**	**245**	5	16	20	**41**	32	32	37	**101**	**142**	**387**
15:30 15:45	26	78	15	**119**	41	100	7	**149**	**268**	7	23	17	**47**	35	24	30	**89**	**136**	**404**
15:45 16:00	21	58	14	**93**	35	108	9	**153**	**246**	6	24	23	**53**	26	28	39	**93**	**146**	**392**
16:00 16:15	26	73	20	**119**	32	124	10	**166**	**285**	17	30	28	**75**	29	30	24	**83**	**158**	**443**
16:15 16:30	24	93	8	**125**	30	112	12	**154**	**279**	15	25	12	**52**	34	24	26	**84**	**136**	**415**
16:30 16:45	28	69	16	**113**	42	140	5	**187**	**300**	10	30	21	**61**	51	38	41	**130**	**191**	**491**
16:45 17:00	35	89	20	**144**	45	115	12	**172**	**316**	15	24	20	**59**	43	36	33	**112**	**171**	**487**
17:00 17:15	42	115	18	**175**	48	141	9	**200**	**375**	11	33	26	**70**	42	39	45	**126**	**196**	**571**
17:15 17:30	35	106	19	**160**	48	144	9	**201**	**361**	10	28	23	**61**	38	29	51	**118**	**179**	**540**
17:30 17:45	37	102	13	**152**	50	145	13	**208**	**360**	8	32	33	**73**	40	20	40	**100**	**173**	**533**
17:45 18:00	40	98	16	**154**	43	108	6	**158**	**312**	17	22	19	**58**	47	26	35	**108**	**166**	**478**
TOTAL:	876	2878	499	**4253**	913	2617	243	**3780**	**8033**	282	590	414	**1286**	787	713	1015	**2515**	**3801**	**11834**

Note: U-Turns are included in Totals.

Comment:

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 35721

GREENBANK RD @ MARKETPLACE AVE

Count Date: Wednesday, February 10, 2016 **Start Time:** 07:00

Time Period	GREENBANK RD Northbound	GREENBANK RD Southbound	GREENBANK RD Street Total	MARKETPLACE AVE Eastbound	MARKETPLACE AVE Westbound	MARKETPLACE AVE Street Total	Grand 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**	1	0	**1**	**1**
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**	1	0	**1**	**1**

Comment:

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. 35721

Turning Movement Count - Heavy Vehicle Report

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016

Time Period	GREENBANK RD Northbound LT	ST	RT	N TOT	Southbound LT	ST	RT	S TOT	STR TOT	MARKETPLACE AVE Eastbound LT	ST	RT	E TOT	Westbound LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 08:00	7	14	5	**26**	6	22	0	**28**	**54**	2	4	2	**8**	2	2	9	**13**	**21**	**75**
08:00 09:00	3	17	2	**22**	4	15	0	**19**	**41**	2	1	0	**3**	5	1	6	**12**	**15**	**56**
09:00 10:00	2	12	1	**15**	6	9	0	**15**	**30**	0	1	0	**1**	3	2	5	**10**	**11**	**41**
11:30 12:30	1	9	2	**12**	3	7	1	**11**	**23**	0	3	0	**3**	1	3	3	**7**	**10**	**33**
12:30 13:30	1	6	0	**7**	2	16	0	**18**	**25**	2	1	0	**3**	1	2	2	**5**	**8**	**33**
15:00 16:00	0	7	0	**7**	3	15	0	**19**	**26**	0	0	0	**0**	0	2	3	**5**	**5**	**31**
16:00 17:00	0	5	0	**5**	4	12	0	**16**	**21**	0	1	0	**1**	1	0	6	**7**	**8**	**29**
17:00 18:00	1	4	1	**6**	2	2	0	**4**	**10**	0	0	0	**0**	0	0	4	**4**	**4**	**14**
Sub Total	15	74	11	**100**	30	98	1	**130**	**230**	6	11	2	**19**	13	12	38	**63**	**82**	**312**
U-Turns (Heavy Vehicles)				**0**				**1**	**1**				**0**				**0**	**0**	**1**
Total	15	74	11	**0**	30	98	1	**131**	**231**	6	11	2	**19**	13	12	38	**63**	**82**	**313**

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 35721

Turning Movement Count - Pedestrian Volume Report

GREENBANK RD @ MARKETPLACE AVE

Count Date: Wednesday, February 10, 2016 **Start Time:** 07:00

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	1	2	3	0	0	0	3
07:15 07:30	0	0	0	0	1	1	1
07:30 07:45	0	1	1	0	0	0	1
07:45 08:00	1	0	1	1	1	2	3
07:00 08:00	2	3	5	1	2	3	8
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	1	1	1	1	2	3
08:45 09:00	0	1	1	1	1	2	3
08:00 09:00	0	2	2	2	2	4	6
09:00 09:15	0	1	1	0	1	1	2
09:15 09:30	0	0	0	0	0	0	0
09:30 09:45	0	1	1	0	1	1	2
09:45 10:00	0	0	0	0	1	1	1
09:00 10:00	0	2	2	0	3	3	5
11:30 11:45	1	0	1	16	1	17	18
11:45 12:00	0	3	3	33	1	34	37
12:00 12:15	1	0	1	22	0	22	23
12:15 12:30	0	2	2	4	1	5	7
11:30 12:30	2	5	7	75	3	78	85
12:30 12:45	0	1	1	1	2	3	4
12:45 13:00	0	1	1	1	0	1	2
13:00 13:15	0	2	2	1	2	3	5
13:15 13:30	0	1	1	2	1	3	4
12:30 13:30	0	5	5	5	5	10	15
15:00 15:15	0	5	5	2	1	3	8
15:15 15:30	0	5	5	0	1	1	6
15:30 15:45	1	1	2	1	0	1	3
15:45 16:00	1	4	5	1	5	6	11
15:00 16:00	2	15	17	4	7	11	28
16:00 16:15	1	1	2	0	0	0	2
16:15 16:30	0	4	4	0	0	0	4
16:30 16:45	0	4	4	4	0	4	8
16:45 17:00	0	5	5	3	0	3	8
16:00 17:00	1	14	15	7	0	7	22
17:00 17:15	0	1	1	4	0	4	5
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	1	1	1	2	3	4
17:00 18:00	0	2	2	5	2	7	9
Total	7	48	55	99	24	123	178

Comment:

Transportation Services - Traffic Services

Work Order 35721

Turning Movement Count - 15 Min U-Turn Total Report

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	1	0	0	1
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	1	0	0	1
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	1	0	0	1
15:45	16:00	0	1	0	0	1
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	2	0	0	2
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	1	0	0	1
Total		0	7	0	0	7

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Signal Operations Unit

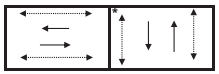
Intersection: Main: Strandherd Side: Jockvale
Controller: MS-3200 **TSD:** 5964
Author: Yassine Bennani **Date:** 26-Nov-2018

Existing Timing Plans†

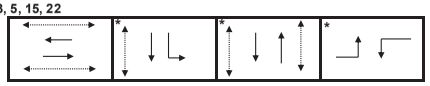
	Plan							Ped Minimum Time		
	AM Peak 1	Off Peak 2	PM Peak 3	Night 4	Weekend 5	Weekend Heavy 15	Evening 22	*Walk*	*DW*	*A+R*
Cycle	120	110	120	70	110	120	95			
Offset	22	74	82	x	74	82	75			
EB Thru	56	42	53	40	42	50	37	12	18	3.7+2.4
WB Thru	56	42	53	40	42	50	37	12	18	3.7+2.4
SB Left	22	-	22	-	18	21	15	-	-	3.7+3.2
NB Thru	29	50	29	30	32	34	30	7	16	3.7+3.2
SB Thru	51	50	51	30	50	55	45	7	16	3.7+3.2
EB Left	13	18	16	-	18	15	13	-	-	3.7+2.4
WB Left	13	18	16	-	18	15	13	-	-	3.7+2.4

Phasing Sequence‡

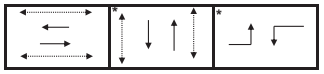
Plan: 4



Plan: 1, 3, 5, 15, 22



Plan: 2



Schedule

Weekday

Time	Plan
0:15	4
6:30	1
9:30	2
15:00	3
18:30	22
20:00	2
22:30	4

Saturday

Time	Plan
0:15	4
8:30	5
11:00	15
18:00	5
22:30	4

Sunday

Time	Plan
0:15	4
8:30	5
11:00	15
16:00	5
22:30	4

Notes

†: Time for each direction includes amber and all red intervals

‡: Start of first phase should be used as reference point for offset

Asterisk (*) Indicates actuated phase

(ϕ): Fully Protected Left Turn

Pedestrian signal

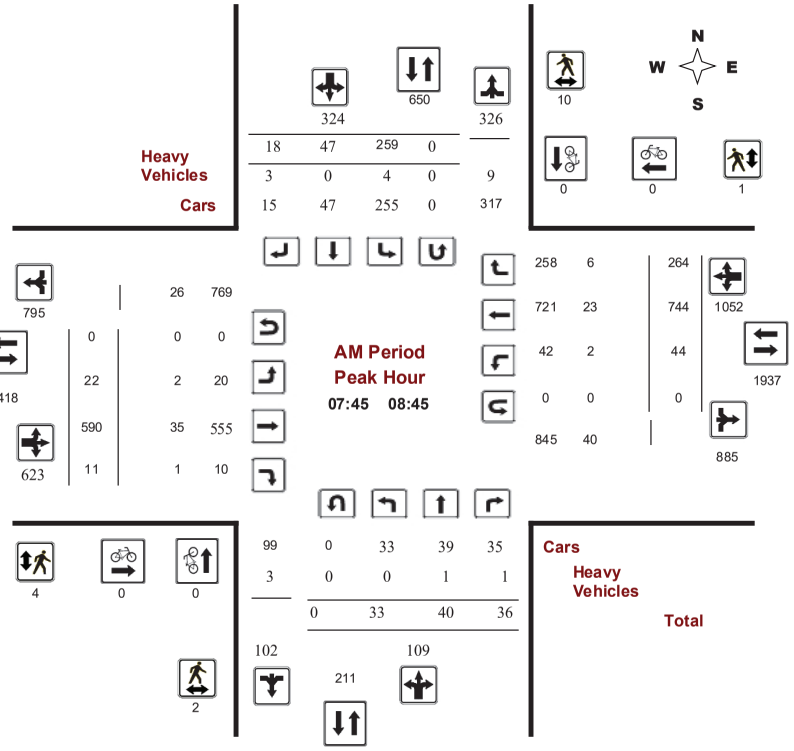
Cost is $56.50 ($50 + HST)

Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37499
Start Time: 07:00 **Device:** Miovision



Comments

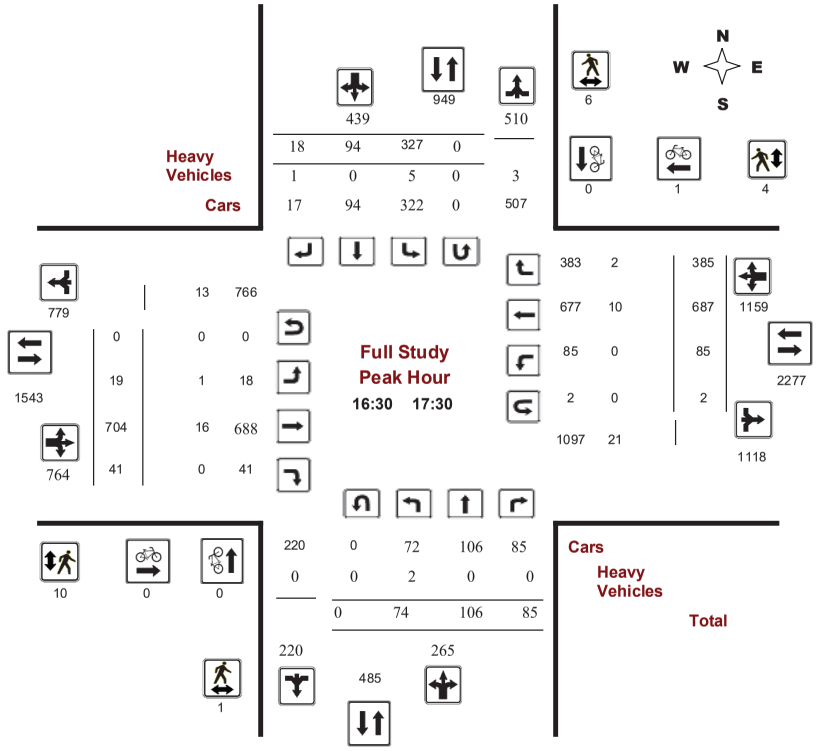
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37499

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



Comments

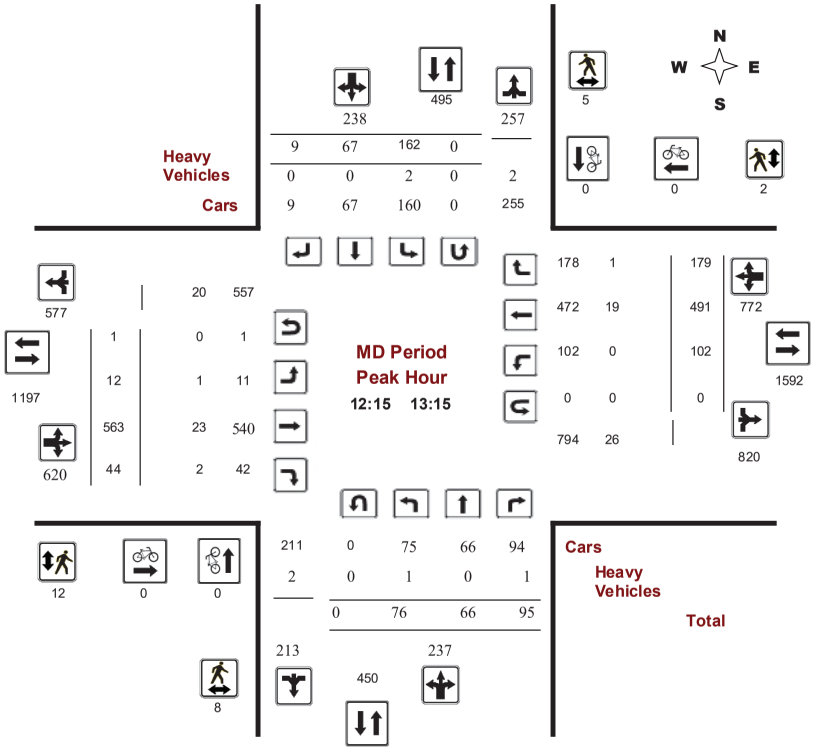
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37499

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



Comments

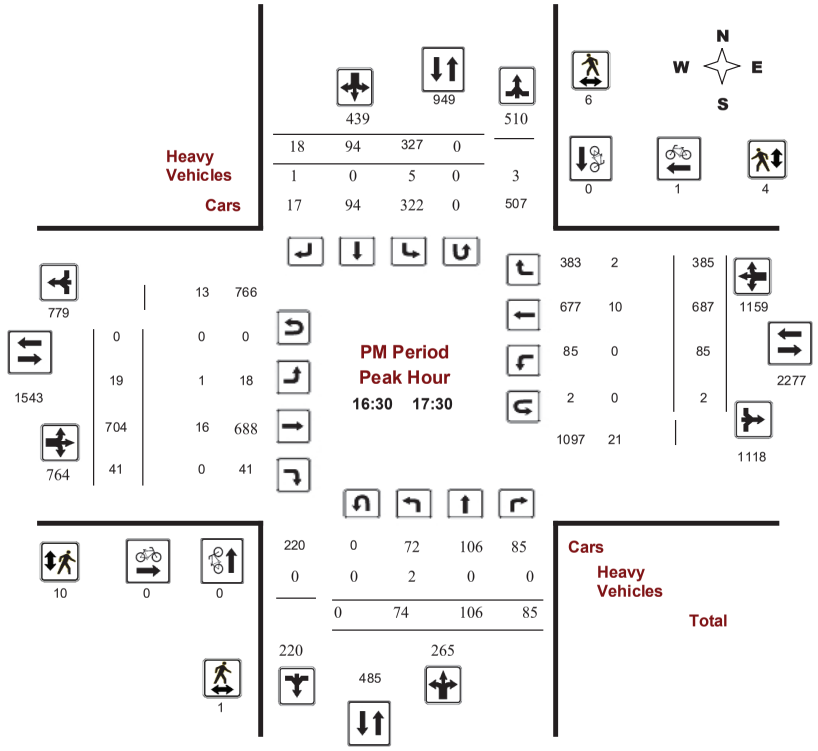
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37499

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



Comments

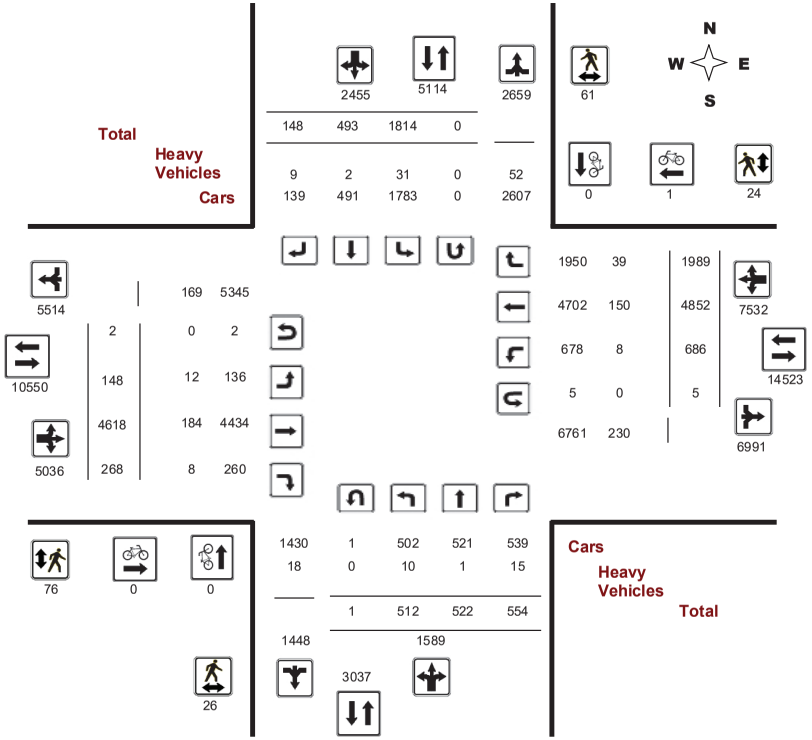
Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO#:** 37499

Device: Miovision



Comments

Transportation Services - Traffic Services

Work Order 37499

Turning Movement Count - Full Study Summary Report

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 1 Southbound: 0
Eastbound: 2 Westbound: 5

AADT Factor 1.00

Full Study

	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	36	18	20	**74**	251	42	9	**302**	**376**	16	504	9	**529**	33	599	176	**808**	**1337**	**1713**
08:00 09:00	29	44	43	**116**	234	42	21	**297**	**413**	24	551	11	**586**	49	756	259	**1064**	**1650**	**2063**
09:00 10:00	65	40	52	**157**	209	38	14	**261**	**418**	15	439	26	**480**	97	557	153	**807**	**1287**	**1705**
11:30 12:30	77	64	83	**224**	160	51	13	**224**	**448**	5	487	52	**544**	109	473	179	**761**	**1305**	**1753**
12:30 13:30	82	67	98	**247**	158	75	12	**245**	**492**	13	552	39	**604**	110	472	186	**768**	**1372**	**1864**
15:00 16:00	69	85	81	**235**	212	68	27	**307**	**542**	23	649	34	**706**	116	643	330	**1089**	**1795**	**2337**
16:00 17:00	81	101	88	**270**	297	84	26	**407**	**677**	29	727	51	**807**	88	680	356	**1124**	**1931**	**2608**
17:00 18:00	73	103	89	**265**	293	93	26	**412**	**677**	23	709	46	**778**	84	672	350	**1106**	**1884**	**2561**
Sub Total	512	522	554	**1588**	1814	493	148	**2455**	**4043**	148	4618	268	**5034**	686	4852	1989	**7527**	**12561**	**16604**
U Turns				**1**				**0**	**1**				**2**				**5**	**7**	**8**
Total	512	522	554	**1589**	1814	493	148	**2455**	**4044**	148	4618	268	**5036**	686	4852	1989	**7532**	**12568**	**16612**
EQ 12Hr	712	726	770	**2209**	2521	685	206	**3412**	**5621**	206	6419	373	**7000**	954	6744	2765	**10469**	**17469**	**23090**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	712	726	770	**2209**	2521	685	206	**3412**	**5621**	206	6419	373	**7000**	954	6744	2765	**10469**	**17469**	**23090**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													**1.00**						
AVG 24Hr	932	951	1009	**2893**	3303	898	269	**4470**	**7363**	269	8409	488	**9170**	1249	8835	3622	**13715**	**22885**	**30248**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													**1.31**						

Comments:

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

Transportation Services - Traffic Services

W.O. 37499

Turning Movement Count - 15 Minute Summary Report

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 1 Southbound: 0
Eastbound: 2 Westbound: 5

	Northbound				Southbound					Eastbound				Westbound					
Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 07:15	4	2	4	**10**	45	3	2	**50**	**60**	1	97	2	**100**	4	118	23	**145**	**245**	**305**
07:15 07:30	5	7	1	**13**	66	12	2	**80**	**93**	5	128	3	**136**	4	139	33	**176**	**312**	**405**
07:30 07:45	18	4	11	**33**	64	8	3	**75**	**108**	4	127	1	**132**	10	181	45	**236**	**368**	**476**
07:45 08:00	9	5	4	**18**	76	19	2	**97**	**115**	6	152	3	**161**	15	161	75	**251**	**412**	**527**
08:00 08:15	8	13	10	**31**	56	13	6	**75**	**106**	7	165	2	**174**	5	174	67	**246**	**420**	**526**
08:15 08:30	8	10	10	**28**	64	7	3	**74**	**102**	6	149	2	**157**	13	199	65	**277**	**434**	**536**
08:30 08:45	8	12	12	**32**	63	8	7	**78**	**110**	3	124	4	**131**	11	210	57	**278**	**409**	**519**
08:45 09:00	5	9	11	**25**	51	14	5	**70**	**95**	8	113	3	**124**	20	173	70	**263**	**387**	**482**
09:00 09:15	16	12	9	**37**	68	11	3	**82**	**119**	4	105	5	**114**	25	151	45	**222**	**336**	**455**
09:15 09:30	11	11	22	**44**	61	6	4	**71**	**115**	2	102	8	**112**	31	141	35	**207**	**319**	**434**
09:30 09:45	15	7	12	**34**	34	12	4	**50**	**84**	3	112	4	**119**	17	139	47	**203**	**322**	**406**
09:45 10:00	23	10	9	**42**	46	9	3	**58**	**100**	6	120	9	**135**	24	126	26	**176**	**311**	**411**
11:30 11:45	17	18	20	**55**	36	8	2	**46**	**101**	2	132	5	**139**	18	124	46	**188**	**327**	**428**
11:45 12:00	23	16	19	**58**	46	11	4	**61**	**119**	0	110	20	**130**	30	102	48	**181**	**311**	**430**
12:00 12:15	20	14	20	**54**	43	21	6	**70**	**124**	1	115	14	**130**	37	124	42	**204**	**334**	**458**
12:15 12:30	17	16	24	**57**	35	11	1	**47**	**104**	2	130	13	**146**	24	123	43	**190**	**336**	**440**
12:30 12:45	14	8	27	**49**	47	22	2	**71**	**120**	4	135	12	**151**	33	128	48	**209**	**360**	**480**
12:45 13:00	20	17	27	**64**	40	18	4	**62**	**126**	3	155	10	**168**	19	118	46	**183**	**351**	**477**
13:00 13:15	25	25	17	**67**	40	16	2	**58**	**125**	3	143	9	**155**	26	122	42	**190**	**345**	**470**
13:15 13:30	23	17	27	**67**	31	19	4	**54**	**121**	3	119	8	**130**	32	104	50	**186**	**316**	**437**
15:00 15:15	14	23	27	**64**	47	14	4	**65**	**129**	3	140	9	**152**	28	165	76	**269**	**421**	**550**
15:15 15:30	21	23	15	**59**	42	16	6	**64**	**123**	5	185	11	**201**	32	169	77	**278**	**479**	**602**
15:30 15:45	20	27	19	**67**	67	15	6	**88**	**155**	6	171	7	**184**	21	145	82	**248**	**432**	**587**
15:45 16:00	14	12	20	**46**	56	23	11	**90**	**136**	9	153	7	**169**	35	164	95	**294**	**463**	**599**
16:00 16:15	26	22	21	**69**	65	17	6	**88**	**157**	9	192	16	**218**	25	155	86	**266**	**484**	**641**
16:15 16:30	19	22	30	**71**	70	22	9	**101**	**172**	9	187	16	**212**	20	187	78	**285**	**497**	**669**
16:30 16:45	14	36	21	**71**	89	25	5	**119**	**190**	7	145	7	**159**	24	162	95	**282**	**441**	**631**
16:45 17:00	22	21	16	**59**	73	20	6	**99**	**158**	4	203	12	**219**	19	176	97	**292**	**511**	**669**
17:00 17:15	22	23	30	**75**	83	24	3	**110**	**185**	5	154	11	**170**	20	182	93	**296**	**466**	**651**
17:15 17:30	16	26	18	**60**	82	25	4	**111**	**171**	3	202	11	**216**	22	167	100	**289**	**505**	**676**
17:30 17:45	20	27	20	**67**	65	32	9	**106**	**173**	3	174	14	**191**	24	156	83	**263**	**454**	**627**
17:45 18:00	15	27	21	**63**	63	12	10	**85**	**148**	12	179	10	**201**	18	167	74	**259**	**460**	**608**
TOTAL:	512	522	554	**1589**	1814	493	148	**2455**	**4044**	148	4618	268	**5036**	686	4852	1989	**7532**	**12568**	**16612**

Note: U-Turns are included in Totals.

Comment:

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 37499

JOCKVALE RD @ STRANDHERD DR

Count Date: Thursday, January 18, 2018 **Start Time:** 07:00

Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand 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	1	**1**	**1**
17:00 18:00	0	0	**0**	0	0	**0**	**0**
Total	0	0	**0**	0	1	**1**	**1**

Comment:

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. 37499

Turning Movement Count - Heavy Vehicle Report

JOCKVALE RD @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018

	Northbound				Southbound					Eastbound				Westbound					
Time Period	LT	ST	RT	**N TOT**	LT	ST	RT	**S TOT**	**STR TOT**	LT	ST	RT	**E TOT**	LT	ST	RT	**W TOT**	**STR TOT**	**Grand Total**
07:00 08:00	1	0	2	**3**	9	0	0	**9**	**12**	1	32	1	**34**	2	25	3	**30**	**64**	**76**
08:00 09:00	0	1	2	**3**	2	0	3	**5**	**8**	2	29	1	**32**	2	22	10	**34**	**66**	**74**
09:00 10:00	2	0	3	**5**	3	0	1	**4**	**9**	1	26	2	**29**	1	27	6	**34**	**63**	**72**
11:30 12:30	2	0	5	**7**	1	0	1	**2**	**9**	1	22	1	**24**	2	22	1	**25**	**49**	**58**
12:30 13:30	2	0	0	**2**	2	0	2	**4**	**6**	2	30	2	**34**	0	15	6	**21**	**55**	**61**
15:00 16:00	1	0	2	**3**	4	2	0	**6**	**9**	2	10	0	**12**	0	16	9	**25**	**37**	**46**
16:00 17:00	1	0	1	**2**	6	0	2	**8**	**10**	3	23	0	**26**	1	18	4	**23**	**49**	**59**
17:00 18:00	1	0	0	**1**	4	0	0	**4**	**5**	0	12	1	**13**	0	5	0	**5**	**18**	**23**
Sub Total	10	1	15	**26**	31	2	9	**42**	**68**	12	184	8	**204**	8	150	39	**197**	**401**	**469**
U-Turns (Heavy Vehicles)				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	10	1	15	**0**	31	2	9	**42**	**68**	12	184	8	**204**	8	150	39	**197**	**401**	**469**

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 37499

Turning Movement Count - Pedestrian Volume Report

JOCKVALE RD @ STRANDHERD 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)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	0	0	2	0	2	2
07:15 07:30	0	1	1	1	0	1	2
07:30 07:45	1	2	3	5	0	5	8
07:45 08:00	0	4	4	1	1	2	6
07:00 08:00	1	7	8	9	1	10	18
08:00 08:15	0	0	0	0	0	0	0
08:15 08:30	0	3	3	1	0	1	4
08:30 08:45	2	3	5	2	0	2	7
08:45 09:00	0	2	2	2	0	2	4
08:00 09:00	2	8	10	5	0	5	15
09:00 09:15	2	3	5	1	0	1	6
09:15 09:30	1	4	5	1	0	1	6
09:30 09:45	1	0	1	0	1	1	2
09:45 10:00	0	2	2	3	1	4	6
09:00 10:00	4	9	13	5	2	7	20
11:30 11:45	1	2	3	1	1	2	5
11:45 12:00	1	2	3	3	2	5	8
12:00 12:15	0	1	1	5	1	6	7
12:15 12:30	2	3	5	3	0	3	8
11:30 12:30	4	8	12	12	4	16	28
12:30 12:45	3	1	4	3	1	4	8
12:45 13:00	1	0	1	2	1	3	4
13:00 13:15	2	1	3	4	0	4	7
13:15 13:30	1	2	3	1	3	4	7
12:30 13:30	7	4	11	10	5	15	26
15:00 15:15	1	3	4	5	0	5	9
15:15 15:30	1	1	2	2	1	3	5
15:30 15:45	0	0	0	1	0	1	1
15:45 16:00	1	4	5	5	0	5	10
15:00 16:00	3	8	11	13	1	14	25
16:00 16:15	0	2	2	1	1	2	4
16:15 16:30	0	5	5	1	2	3	8
16:30 16:45	0	1	1	2	1	3	4
16:45 17:00	1	4	5	2	3	5	10
16:00 17:00	1	12	13	6	7	13	26
17:00 17:15	0	1	1	3	0	3	4
17:15 17:30	0	0	0	3	0	3	3
17:30 17:45	1	2	3	6	2	8	11
17:45 18:00	3	2	5	4	2	6	11
17:00 18:00	4	5	9	16	4	20	29
Total	26	61	87	76	24	100	187

Comment:

Transportation Services - Traffic Services

Work Order 37499

Turning Movement Count - 15 Min U-Turn Total Report

JOCKVALE RD @ 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	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	1	1
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	1	1
12:00	12:15	0	0	0	1	1
12:15	12:30	0	0	1	0	1
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	1	0	0	0	1
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	1	0	1
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	1	1
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	1	1
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		1	0	2	5	8

Traffic Signal Timing

City of Ottawa, Public Works Department

Traffic Operations Unit

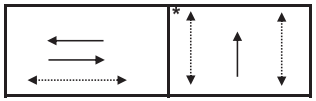
Intersection:	**Main:**	Strandherd	**Side:**	Andora	
Controller:	**MS-3200**			**TSD:**	6726
Author:	Basel Ansari			**Date:**	08-Mar-2016

Existing Timing Plans†

	Plan					Ped Minimum Time		
	AM Peak	Off Peak	PM Peak	Night	Weekend	*Walk*	*DW*	*A+R*
	1	2	3	4	5			
Cycle	100	70	100	70	95			
Offset	60	X	85	X	X			
EB Thru	70	40	70	40	66	7	12	4.2+1.8
WB Thru	70	40	70	40	66	-	-	4.2+1.8
NB Thru	30	30	30	30	29	7	10	3.3+2.5

Phasing Sequence‡

Plan: All



Schedule

Weekday

Time	Plan
0:15	4
6:30	1
9:30	2
15:00	3
18:30	2
22:30	4

Weekday

Time	Plan
0:15	4
8:30	5
22:30	4

Notes

†: Time for each direction includes amber and all red intervals

‡: Start of first phase should be used as reference point for offset

Asterisk (*) Indicates actuated phase

(fp): Fully Protected Left Turn

◄·····► Pedestrian signal

Cost is $56.50 ($50 + HST)

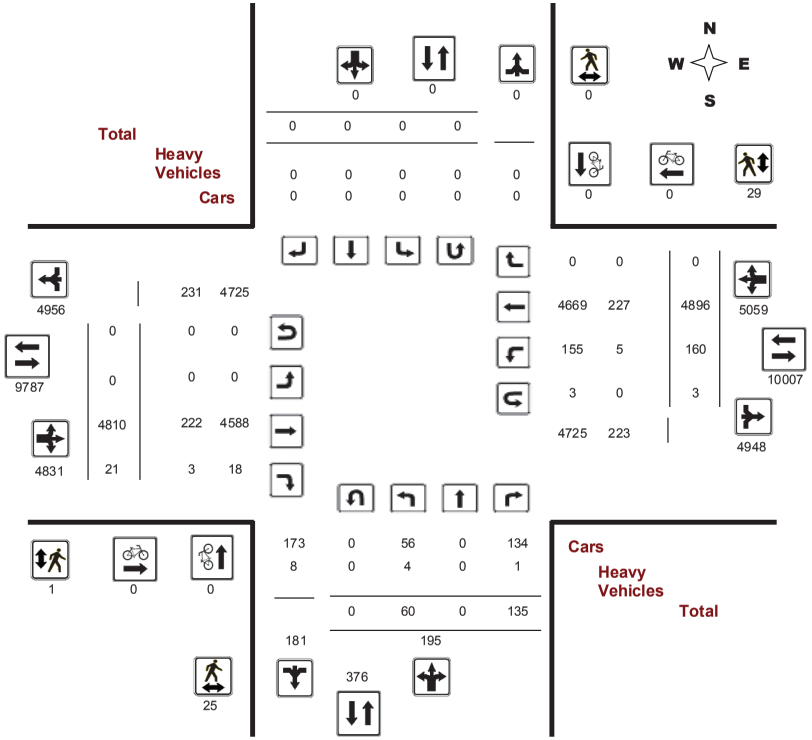
Public Works - Traffic Services

Turning Movement Count - Full Study Diagram

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015 **WO#:** 35555

Device: Miovision



Comments

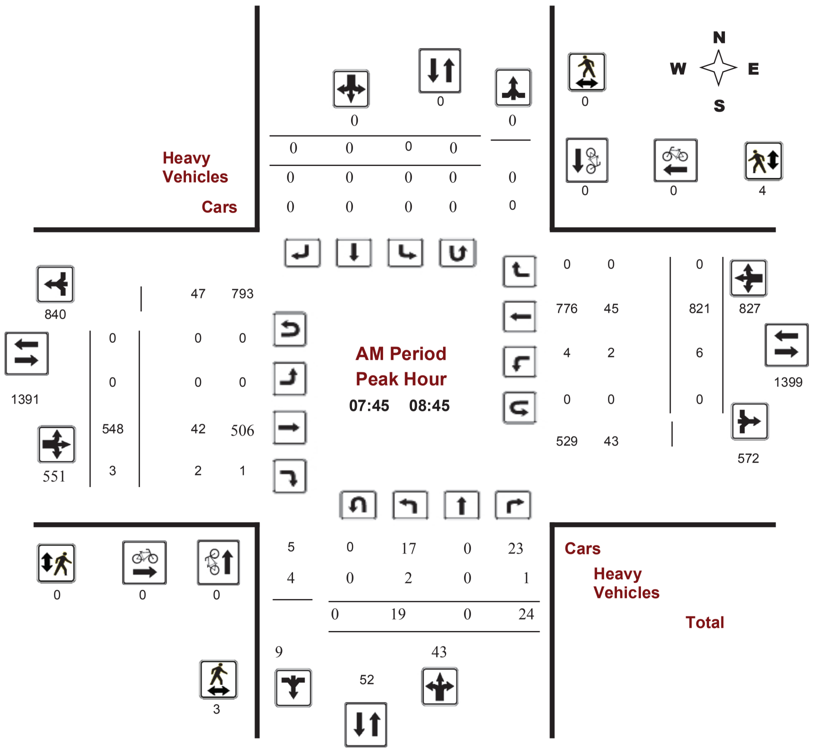
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015 **WO No:** 35555

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



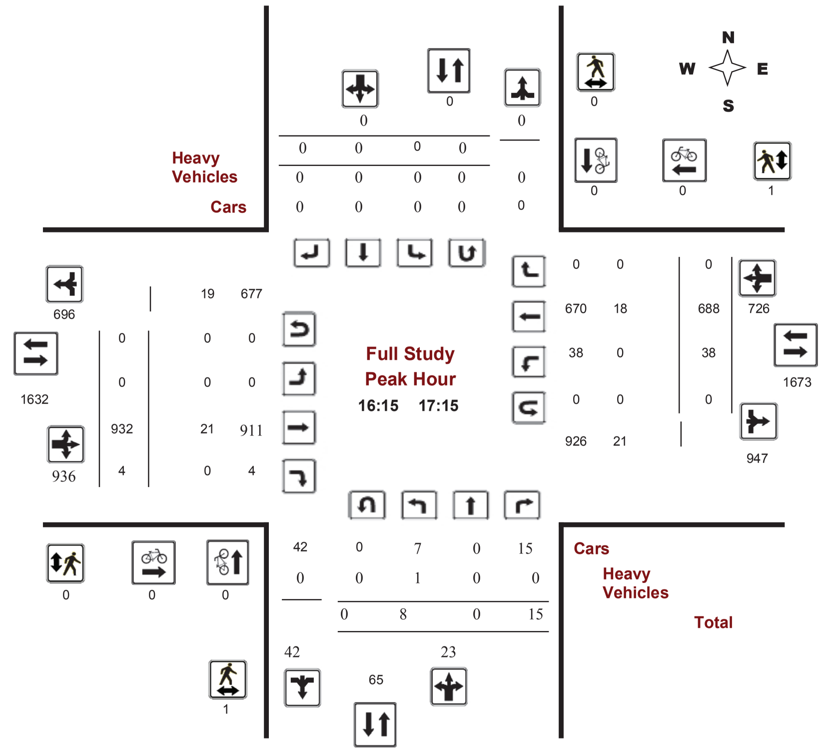
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015 **WO No:** 35555

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



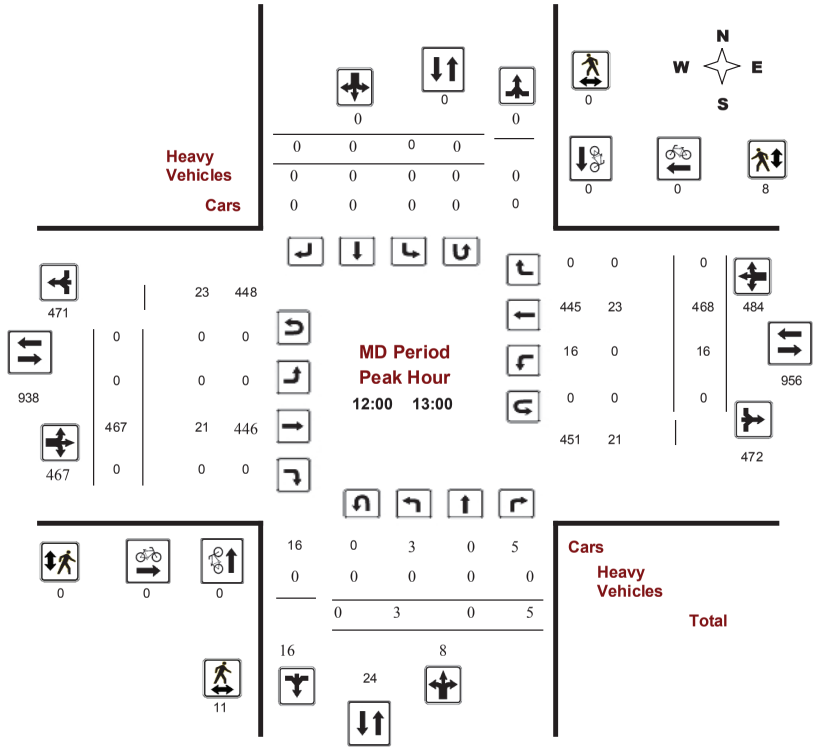
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015 **WO No:** 35555

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



Comments

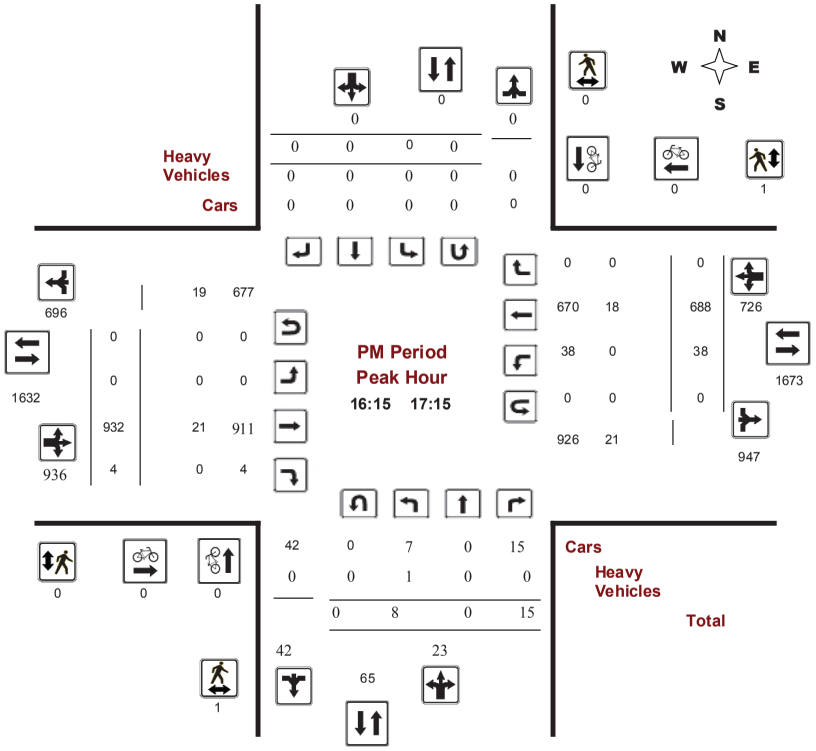
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015 **WO No:** 35555

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



Comments

Public Works - Traffic Services

W.O. 35555

Turning Movement Count - Heavy Vehicle Report

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015

Time Period		Northbound				Southbound					Eastbound				Westbound					
		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	08:00	1	0	0	**1**	0	0	0	**0**	**1**	0	39	0	**39**	2	33	0	**35**	**74**	**75**
08:00	09:00	2	0	1	**3**	0	0	0	**0**	**3**	0	47	2	**49**	1	46	0	**47**	**96**	**99**
09:00	10:00	0	0	0	**0**	0	0	0	**0**	**0**	0	30	1	**31**	0	39	0	**39**	**70**	**70**
11:30	12:30	0	0	0	**0**	0	0	0	**0**	**0**	0	25	0	**25**	0	27	0	**27**	**52**	**52**
12:30	13:30	0	0	0	**0**	0	0	0	**0**	**0**	0	23	0	**23**	0	21	0	**21**	**44**	**44**
15:00	16:00	0	0	0	**0**	0	0	0	**0**	**0**	0	28	0	**28**	2	33	0	**35**	**63**	**63**
16:00	17:00	1	0	0	**1**	0	0	0	**0**	**1**	0	20	0	**20**	0	21	0	**21**	**41**	**42**
17:00	18:00	0	0	0	**0**	0	0	0	**0**	**0**	0	10	0	**10**	0	7	0	**7**	**17**	**17**
Sub Total		4	0	1	**5**	0	0	0	**0**	**5**	0	222	3	**225**	5	227	0	**232**	**457**	**462**
U-Turns (Heavy Vehicles)					**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total		4	0	1	**0**	0	0	0	**0**	**5**	0	222	3	**225**	5	227	0	**232**	**457**	**462**

Heavy Vehicles are vehicles having one rear axle with four or more wheels, or having two or more rear axles. These vehicles include most O.C. Transpo, school and inter-city buses. Further, they ARE included in the Turning Movement Count Summary.

Public Works - Traffic Services

W.O. 35555

Turning Movement Count - 15 Minute Summary Report

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 3

Time Period		Northbound				Southbound					Eastbound				Westbound					
		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	7	0	10	**17**	0	0	0	**0**	**17**	0	99	0	**99**	0	109	0	**109**	**208**	**225**
07:15	07:30	4	0	12	**16**	0	0	0	**0**	**16**	0	130	1	**131**	2	178	0	**180**	**311**	**327**
07:30	07:45	3	0	7	**10**	0	0	0	**0**	**10**	0	147	0	**147**	5	173	0	**178**	**325**	**335**
07:45	08:00	8	0	5	**13**	0	0	0	**0**	**13**	0	148	0	**148**	3	194	0	**197**	**345**	**358**
08:00	08:15	2	0	7	**9**	0	0	0	**0**	**9**	0	137	1	**138**	1	183	0	**184**	**322**	**331**
08:15	08:30	6	0	6	**12**	0	0	0	**0**	**12**	0	131	1	**132**	1	213	0	**214**	**346**	**358**
08:30	08:45	3	0	6	**9**	0	0	0	**0**	**9**	0	132	1	**133**	1	231	0	**232**	**365**	**374**
08:45	09:00	3	0	6	**9**	0	0	0	**0**	**9**	0	113	0	**113**	5	197	0	**202**	**315**	**324**
09:00	09:15	1	0	7	**8**	0	0	0	**0**	**8**	0	109	1	**110**	0	144	0	**144**	**254**	**262**
09:15	09:30	1	0	2	**3**	0	0	0	**0**	**3**	0	125	0	**125**	5	145	0	**150**	**275**	**278**
09:30	09:45	1	0	1	**2**	0	0	0	**0**	**2**	0	109	0	**109**	1	130	0	**131**	**240**	**242**
09:45	10:00	2	0	2	**4**	0	0	0	**0**	**4**	0	105	0	**105**	1	112	0	**113**	**218**	**222**
11:30	11:45	0	0	5	**5**	0	0	0	**0**	**5**	0	101	0	**101**	2	118	0	**121**	**222**	**227**
11:45	12:00	2	0	1	**3**	0	0	0	**0**	**3**	0	116	1	**117**	1	119	0	**121**	**238**	**241**
12:00	12:15	1	0	0	**1**	0	0	0	**0**	**1**	0	123	0	**123**	0	117	0	**117**	**240**	**241**
12:15	12:30	0	0	2	**2**	0	0	0	**0**	**2**	0	114	0	**114**	4	118	0	**122**	**236**	**238**
12:30	12:45	1	0	3	**4**	0	0	0	**0**	**4**	0	108	0	**108**	5	113	0	**118**	**226**	**230**
12:45	13:00	1	0	0	**1**	0	0	0	**0**	**1**	0	122	0	**122**	7	120	0	**127**	**249**	**250**
13:00	13:15	0	0	4	**4**	0	0	0	**0**	**4**	0	117	3	**120**	6	105	0	**111**	**231**	**235**
13:15	13:30	3	0	2	**5**	0	0	0	**0**	**5**	0	98	0	**98**	4	97	0	**101**	**199**	**204**
15:00	15:15	0	0	1	**1**	0	0	0	**0**	**1**	0	137	1	**138**	6	156	0	**162**	**300**	**301**
15:15	15:30	1	0	3	**4**	0	0	0	**0**	**4**	0	169	2	**171**	8	165	0	**173**	**344**	**348**
15:30	15:45	0	0	7	**7**	0	0	0	**0**	**7**	0	176	2	**178**	9	184	0	**193**	**371**	**378**
15:45	16:00	0	0	1	**1**	0	0	0	**0**	**1**	0	192	0	**192**	10	176	0	**186**	**378**	**379**
16:00	16:15	0	0	1	**1**	0	0	0	**0**	**1**	0	189	0	**189**	8	155	0	**164**	**353**	**354**
16:15	16:30	2	0	5	**7**	0	0	0	**0**	**7**	0	235	2	**237**	10	156	0	**166**	**403**	**410**
16:30	16:45	1	0	3	**4**	0	0	0	**0**	**4**	0	234	0	**234**	16	178	0	**194**	**428**	**432**
16:45	17:00	3	0	5	**8**	0	0	0	**0**	**8**	0	235	1	**236**	6	199	0	**205**	**441**	**449**
17:00	17:15	2	0	2	**4**	0	0	0	**0**	**4**	0	228	1	**229**	6	155	0	**161**	**390**	**394**
17:15	17:30	0	0	6	**6**	0	0	0	**0**	**6**	0	213	1	**214**	7	149	0	**156**	**370**	**376**
17:30	17:45	0	0	7	**7**	0	0	0	**0**	**7**	0	220	2	**222**	8	147	0	**155**	**377**	**384**
17:45	18:00	2	0	6	**8**	0	0	0	**0**	**8**	0	198	0	**198**	12	160	0	**172**	**370**	**378**
TOTAL:		60	0	135	**195**	0	0	0	**0**	**195**	0	4810	21	**4831**	160	4896	0	**5059**	**9890**	**10085**

Note: U-Turns are included in Totals.

Comment:

Public Works - Traffic Services

Work Order
35555

Turning Movement Count - Pedestrian Volume Report

STRANDHERD DR @ ANDORA AVE

Count Date: Wednesday, December 09, 2015 **Start Time:** 07:00

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	2	**2**	**2**
07:15 07:30	0	0	**0**	0	1	**1**	**1**
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	3	**3**	**3**
08:00 08:15	0	0	**0**	0	0	**0**	**0**
08:15 08:30	0	0	**0**	0	3	**3**	**3**
08:30 08:45	3	0	**3**	0	1	**1**	**4**
08:45 09:00	1	0	**1**	1	1	**2**	**3**
08:00 09:00	4	0	**4**	1	5	**6**	**10**
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	4	0	**4**	0	0	**0**	**4**
12:00 12:15	0	0	**0**	0	1	**1**	**1**
12:15 12:30	7	0	**7**	0	4	**4**	**11**
11:30 12:30	11	0	**11**	0	5	**5**	**16**
12:30 12:45	1	0	**1**	0	0	**0**	**1**
12:45 13:00	3	0	**3**	0	3	**3**	**6**
13:00 13:15	0	0	**0**	0	0	**0**	**0**
13:15 13:30	3	0	**3**	0	2	**2**	**5**
12:30 13:30	7	0	**7**	0	5	**5**	**12**
15:00 15:15	0	0	**0**	0	1	**1**	**1**
15:15 15:30	0	0	**0**	0	1	**1**	**1**
15:30 15:45	0	0	**0**	0	1	**1**	**1**
15:45 16:00	0	0	**0**	0	2	**2**	**2**
15:00 16:00	0	0	**0**	0	5	**5**	**5**
16:00 16:15	2	0	**2**	0	5	**5**	**7**
16:15 16:30	0	0	**0**	0	0	**0**	**0**
16:30 16:45	1	0	**1**	0	1	**1**	**2**
16:45 17:00	0	0	**0**	0	0	**0**	**0**
16:00 17:00	3	0	**3**	0	6	**6**	**9**
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	25	0	**25**	1	29	**30**	**55**

Comment:

Public Works - Traffic Services

Work Order
35555

Turning Movement Count - Cyclist Volume Report

STRANDHERD DR @ ANDORA AVE

Count Date: Wednesday, December 09, 2015 **Start Time:** 07:00

Time Period	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand 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:

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

Public Works - Traffic Services

Work Order
35555

Turning Movement Count - Full Study Summary Report

STRANDHERD DR @ ANDORA AVE

Survey Date: Wednesday, December 09, 2015

Total Observed U-Turns

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

AADT Factor
1.00

Full Study

	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	22	0	34	**56**	0	0	0	**0**	**56**	0	524	1	**525**	10	654	0	**664**	**1189**	**1245**
08:00 09:00	14	0	25	**39**	0	0	0	**0**	**39**	0	513	3	**516**	8	824	0	**832**	**1348**	**1387**
09:00 10:00	5	0	12	**17**	0	0	0	**0**	**17**	0	448	1	**449**	7	531	0	**538**	**987**	**1004**
11:30 12:30	3	0	8	**11**	0	0	0	**0**	**11**	0	454	1	**455**	7	472	0	**479**	**934**	**945**
12:30 13:30	5	0	9	**14**	0	0	0	**0**	**14**	0	445	3	**448**	22	435	0	**457**	**905**	**919**
15:00 16:00	1	0	12	**13**	0	0	0	**0**	**13**	0	674	5	**679**	33	681	0	**714**	**1393**	**1406**
16:00 17:00	6	0	14	**20**	0	0	0	**0**	**20**	0	893	3	**896**	40	688	0	**728**	**1624**	**1644**
17:00 18:00	4	0	21	**25**	0	0	0	**0**	**25**	0	859	4	**863**	33	611	0	**644**	**1507**	**1532**
Sub Total	60	0	135	**195**	0	0	0	**0**	**195**	0	4810	21	**4831**	160	4896	0	**5056**	**9887**	**10082**
U Turns				**0**				**0**	**0**				**0**				**3**	**3**	**3**
Total	60	0	135	**195**	0	0	0	**0**	**195**	0	4810	21	**4831**	160	4896	0	**5059**	**9890**	**10085**
EQ 12Hr	83	0	188	**271**	0	0	0	**0**	**271**	0	6686	29	**6715**	222	6805	0	**7032**	**13747**	**14018**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	83	0	188	**271**	0	0	0	**0**	**271**	0	6686	29	**6715**	222	6805	0	**7032**	**13747**	**14018**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													**1.00**						
AVG 24Hr	109	0	246	**355**	0	0	0	**0**	**355**	0	8759	38	**8797**	291	8915	0	**9212**	**18009**	**18364**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													**1.31**						

Comments:

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

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	467	0	0	639	16	0	0	0	35	0	12
Future Vol, veh/h	4	467	0	0	639	16	0	0	0	35	0	12
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	450	-	-	380	-	800	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	519	0	0	710	18	0	0	0	39	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	729	0	0	519	0	0	-	-	519	1238	1238	711
Stage 1	-	-	-	-	-	-	-	-	-	711	711	-
Stage 2	-	-	-	-	-	-	-	-	-	527	527	-
Critical Hdwy	4.12	-	-	4.12	-	-	-	-	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	-	-	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	875	-	-	1047	-	-	0	0	557	152	176	433
Stage 1	-	-	-	-	-	-	0	0	-	424	436	-
Stage 2	-	-	-	-	-	-	0	0	-	535	528	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	874	-	-	1047	-	-	-	-	557	151	175	433
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	151	175	-
Stage 1	-	-	-	-	-	-	-	-	-	422	436	-
Stage 2	-	-	-	-	-	-	-	-	-	533	525	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	0	32.8
HCM LOS			A	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	874	-	-	1047	-	-	181
HCM Lane V/C Ratio	-	0.005	-	-	-	-	-	0.289
HCM Control Delay (s)	0	9.1	-	-	0	-	-	32.8
HCM Lane LOS	A	A	-	-	A	-	-	D
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	1.1

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	499	3	6	636	19	24
Future Volume (vph)	499	3	6	636	19	24
Satd. Flow (prot)	1743	0	1658	1745	1562	0
Flt Permitted			0.440		0.979	
Satd. Flow (perm)	1743	0	766	1745	1562	0
Satd. Flow (RTOR)	1				27	
Lane Group Flow (vph)	557	0	7	707	48	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	85.1		85.1	85.1	11.8	
Actuated g/C Ratio	0.85		0.85	0.85	0.12	
v/c Ratio	0.38		0.01	0.48	0.23	
Control Delay	4.4		3.8	5.4	23.8	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	4.4		3.8	5.4	23.8	
LOS	A		A	A	C	
Approach Delay	4.4			5.4	23.8	
Approach LOS	A			A	C	
Queue Length 50th (m)	28.7		0.3	41.9	4.0	
Queue Length 95th (m)	66.1		1.7	96.0	13.5	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	1484		652	1485	398	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.38		0.01	0.48	0.12	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 5.7	Intersection LOS: A
Intersection Capacity Utilization 54.4%	ICU Level of Service A
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

Splits and Phases: 3: Andora & Strandherd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	490	11	35	591	210	33	40	30	215	47	18
Future Volume (vph)	22	490	11	35	591	210	33	40	30	215	47	18
Satd. Flow (prot)	1658	3304	0	1658	3153	0	1658	1745	1483	1658	1658	0
Flt Permitted	0.254			0.410			0.710			0.443		
Satd. Flow (perm)	441	3304	0	714	3153	0	1227	1745	1463	772	1658	0
Satd. Flow (RTOR)		2			51				146		18	
Lane Group Flow (vph)	24	556	0	39	890	0	37	44	33	239	72	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	12.1	56.0		12.1	56.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	10.1%	46.7%		10.1%	46.7%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	71.9	68.2		72.3	68.4		12.7	12.7	12.7	31.3	31.3	
Actuated g/C Ratio	0.60	0.57		0.60	0.57		0.11	0.11	0.11	0.26	0.26	
v/c Ratio	0.07	0.30		0.08	0.49		0.28	0.24	0.12	0.77	0.16	
Control Delay	11.9	16.7		11.7	18.4		53.2	50.4	0.8	53.4	23.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	11.9	16.7		11.7	18.4		53.2	50.4	0.8	53.4	23.7	
LOS	B	B		B	B		D	D	A	D	C	
Approach Delay		16.5			18.1			37.0			46.5	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	2.1	40.2		3.5	69.6		8.8	10.4	0.0	50.9	10.2	
Queue Length 95th (m)	7.3	65.2		10.5	110.6		18.0	20.1	0.0	65.6	19.0	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	326	1877		479	1817		235	334	398	313	633	
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	0.30		0.08	0.49		0.16	0.13	0.08	0.76	0.11	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 22 (18%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
4: Strandherd & Jockvale

08-12-2019

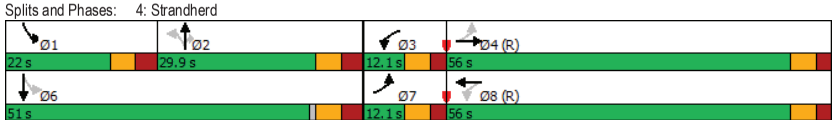
Maximum v/c Ratio: 0.77

Intersection Signal Delay: 23.3	Intersection LOS: C
Intersection Capacity Utilization 62.8%	ICU Level of Service B
Analysis Period (min) 15	

Description: As per 26-Nov-2018 timings.

As per Signals direction, northbound overage timing off next phase (EB/WB left).

Splits and Phases: 4: Strandherd



Lanes, Volumes, Timings
5: Greenbank & Marketplace

08-12-2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	17	16	34	23	96	98	358	71	43	305	6
Future Volume (vph)	12	17	16	34	23	96	98	358	71	43	305	6
Satd. Flow (prot)	1658	1607	0	1658	1518	0	1658	3225	0	3216	3304	0
Flt Permitted	0.645			0.678			0.950			0.950		
Satd. Flow (perm)	1124	1607	0	1182	1518	0	1655	3225	0	3208	3304	0
Satd. Flow (RTOR)		18			107			24			2	
Lane Group Flow (vph)	13	37	0	38	133	0	109	477	0	48	346	0
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	34.5		11.4	34.5		11.3	31.2		11.3	31.2	
Total Split (s)	12.0	35.0		12.0	35.0		15.0	58.0		15.0	58.0	
Total Split (%)	10.0%	29.2%		10.0%	29.2%		12.5%	48.3%		12.5%	48.3%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	3.1	3.2		3.1	3.2		2.6	2.5		2.6	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.5		6.4	6.5		6.3	6.2		6.3	6.2	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	17.1	13.7		18.4	16.1		12.9	75.3		7.2	67.2	
Actuated g/C Ratio	0.14	0.11		0.15	0.13		0.11	0.63		0.06	0.56	
v/c Ratio	0.07	0.19		0.19	0.45		0.61	0.23		0.25	0.19	
Control Delay	35.1	29.2		38.7	17.2		67.0	10.9		56.4	15.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	35.1	29.2		38.7	17.2		67.0	10.9		56.4	15.2	
LOS	D	C		D	B		E	B		E	B	
Approach Delay		30.7			22.0			21.3			20.2	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	2.7	4.5		8.0	5.4		26.7	23.8		5.9	22.5	
Queue Length 95th (m)	6.9	13.0		14.7	21.9		#63.9	39.0		12.3	39.0	
Internal Link Dist (m)		51.8			95.4			279.1			137.0	
Turn Bay Length (m)	15.0			55.0			61.0			61.0		
Base Capacity (vph)	185	395		203	442		178	2031		235	1851	
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	0.09		0.19	0.30		0.61	0.23		0.20	0.19	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 89 (74%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
5: Greenbank & Marketplace

08-12-2019

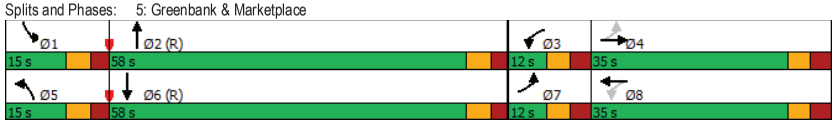
Maximum v/c Ratio: 0.61

Intersection Signal Delay: 21.5	Intersection LOS: C
Intersection Capacity Utilization 51.5%	ICU Level of Service A
Analysis Period (min) 15	

Description: As per 26-Nov-2018 timings.

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

Splits and Phases: 5: Greenbank & Marketplace



Lanes, Volumes, Timings
6: Greenbank & Jockvale

08-12-2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	9	3	169	4	356	6	126	223	6
Future Volume (vph)	2	0	4	9	3	169	4	356	6	126	223	6
Satd. Flow (prot)	0	1563	0	0	1681	1483	0	1742	0	1658	1737	0
Flt Permitted		0.884			0.885			0.998		0.496		
Satd. Flow (perm)	0	1403	0	0	1544	1463	0	1738	0	866	1737	0
Satd. Flow (RTOR)		102				188		1			3	
Lane Group Flow (vph)	0	6	0	0	13	188	0	407	0	140	255	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		pm+pt	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	1	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	5.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4	12.1	34.1	34.1		12.1	34.1	
Total Split (s)	27.0	27.0		27.0	27.0	20.0	73.0	73.0		20.0	93.0	
Total Split (%)	22.5%	22.5%		22.5%	22.5%	16.7%	60.8%	60.8%		16.7%	77.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7		3.7	3.7	
All-Red Time (s)	2.7	2.7		2.7	2.7	3.4	3.4	3.4		3.4	3.4	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lead/Lag						Lead	Lag	Lag		Lead		
Lead-Lag Optimize?						Yes	Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)		10.0			10.0	10.7		92.2		106.3	110.6	
Actuated g/C Ratio		0.08			0.08	0.09		0.77		0.89	0.92	
v/c Ratio		0.03			0.10	0.62		0.30		0.17	0.16	
Control Delay		0.2			52.9	15.0		6.2		2.6	1.7	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		0.2			52.9	15.0		6.2		2.6	1.7	
LOS		A			D	B		A		A	A	
Approach Delay		0.2			17.5			6.2			2.0	
Approach LOS		A			B			A			A	
Queue Length 50th (m)		0.0			3.0	0.0		16.8		2.1	0.5	
Queue Length 95th (m)		0.0			9.7	19.5		57.0		7.8	9.6	
Internal Link Dist (m)		154.0			454.9			648.0			279.1	
Turn Bay Length (m)												
Base Capacity (vph)		325			265	367		1336		852	1601	
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		0.02			0.05	0.51		0.30		0.16	0.16	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 100 (83%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 6.8	Intersection LOS: A
Intersection Capacity Utilization 68.7%	ICU Level of Service C
Analysis Period (min) 15	

Description: As per 26-Nov-2018 timings.

Splits and Phases: 6: Greenbank & Jockvale

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	743	0	0	589	54	0	0	0	35	0	12
Future Vol, veh/h	15	743	0	0	589	54	0	0	0	35	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	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	450	-	-	380	-	800	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	826	0	0	654	60	0	0	0	39	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	714	0	0	826	0	0	-	-	826	1514	1514	654
Stage 1	-	-	-	-	-	-	-	-	-	654	654	-
Stage 2	-	-	-	-	-	-	-	-	-	860	860	-
Critical Hdwy	4.12	-	-	4.12	-	-	-	-	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	-	-	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	886	-	-	805	-	-	0	0	372	98	120	467
Stage 1	-	-	-	-	-	-	0	0	-	456	463	-
Stage 2	-	-	-	-	-	-	0	0	-	351	373	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	886	-	-	805	-	-	-	-	372	97	118	467
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	97	118	-
Stage 1	-	-	-	-	-	-	-	-	-	447	463	-
Stage 2	-	-	-	-	-	-	-	-	-	344	366	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	0	55
HCM LOS			A	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	886	-	-	805	-	-	122
HCM Lane V/C Ratio	-	0.019	-	-	-	-	-	0.428
HCM Control Delay (s)	0	9.1	-	-	0	-	-	55
HCM Lane LOS	A	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	1.9

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	757	4	38	635	8	15
Future Volume (vph)	757	4	38	635	8	15
Satd. Flow (prot)	1743	0	1658	1745	1546	0
Flt Permitted			0.299		0.983	
Satd. Flow (perm)	1743	0	522	1745	1546	0
Satd. Flow (RTOR)					17	
Lane Group Flow (vph)	845	0	42	706	26	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	85.1		85.1	85.1	11.8	
Actuated g/C Ratio	0.85		0.85	0.85	0.12	
v/c Ratio	0.57		0.09	0.48	0.13	
Control Delay	6.8		4.1	5.4	22.5	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	6.8		4.1	5.4	22.5	
LOS	A		A	A	C	
Approach Delay	6.8			5.3	22.5	
Approach LOS	A			A	C	
Queue Length 50th (m)	57.8		1.6	41.8	1.7	
Queue Length 95th (m)	135.3		6.4	95.7	8.8	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	1484		444	1485	387	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.57		0.09	0.48	0.07	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 6.4	Intersection LOS: A
Intersection Capacity Utilization 61.4%	ICU Level of Service B
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

Splits and Phases: 3: Andora & Strandherd

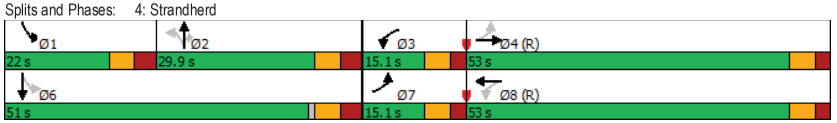
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	712	41	74	581	326	74	106	86	331	94	18
Future Volume (vph)	19	712	41	74	581	326	74	106	86	331	94	18
Satd. Flow (prot)	1658	3285	0	1658	3111	0	1658	1745	1483	1658	1691	0
Flt Permitted	0.215			0.237			0.677			0.444		
Satd. Flow (perm)	375	3285	0	412	3111	0	1155	1745	1456	771	1691	0
Satd. Flow (RTOR)		6			105				146		9	
Lane Group Flow (vph)	21	837	0	82	1008	0	82	118	96	368	124	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	15.1	53.0		15.1	53.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	12.6%	44.2%		12.6%	44.2%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	63.9	58.8		69.4	65.4		14.4	14.4	14.4	36.4	36.4	
Actuated g/C Ratio	0.53	0.49		0.58	0.54		0.12	0.12	0.12	0.30	0.30	
v/c Ratio	0.08	0.52		0.25	0.58		0.59	0.56	0.32	1.07	0.24	
Control Delay	12.7	24.0		13.7	19.4		66.8	59.7	4.4	104.9	29.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	12.7	24.0		13.7	19.4		66.8	59.7	4.4	104.9	29.4	
LOS	B	C		B	B		E	E	A	F	C	
Approach Delay		23.7			19.0			43.7			85.9	
Approach LOS		C			B			D			F	
Queue Length 50th (m)	2.0	74.2		8.2	65.8		19.7	28.2	0.0	~90.6	21.4	
Queue Length 95th (m)	6.4	108.6		17.8	123.1		35.3	45.5	4.2	#146.3	34.8	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	302	1611		335	1743		221	334	397	345	639	
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	0.52		0.24	0.58		0.37	0.35	0.24	1.07	0.19	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 82 (68%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07
Intersection Signal Delay: 35.2 Intersection LOS: D
Intersection Capacity Utilization 74.1% ICU Level of Service D
Analysis Period (min) 15
Description: As per 26-Nov-2018 timings.
As per Signals direction, northbound overage timing off next phase (EB/WB left).
~ 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: Strandherd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	117	86	137	124	169	149	347	70	162	461	36
Future Volume (vph)	44	117	86	137	124	169	149	347	70	162	461	36
Satd. Flow (prot)	1658	1633	0	1658	1575	0	1658	3233	0	3216	3271	0
Flt Permitted	0.275			0.421			0.950			0.950		
Satd. Flow (perm)	478	1633	0	735	1575	0	1645	3233	0	3216	3271	0
Satd. Flow (RTOR)		29			54			23			8	
Lane Group Flow (vph)	49	226	0	152	326	0	166	464	0	180	552	0
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	34.5		11.4	34.5		11.3	31.2		11.3	31.2	
Total Split (s)	13.0	35.0		13.0	35.0		20.0	52.0		20.0	52.0	
Total Split (%)	10.8%	29.2%		10.8%	29.2%		16.7%	43.3%		16.7%	43.3%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	3.1	3.2		3.1	3.2		2.6	2.5		2.6	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.5		6.4	6.5		6.3	6.2		6.3	6.2	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	30.4	23.9		31.9	26.5		14.4	52.4		11.7	49.7	
Actuated g/C Ratio	0.25	0.20		0.27	0.22		0.12	0.44		0.10	0.41	
v/c Ratio	0.27	0.65		0.62	0.84		0.84	0.33		0.58	0.41	
Control Delay	31.1	46.4		44.3	56.2		88.6	20.3		59.1	26.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	31.1	46.4		44.3	56.2		88.6	20.3		59.1	26.6	
LOS	C	D		D	E		F	C		E	C	
Approach Delay		43.7			52.4			38.3			34.6	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	8.3	43.7		27.4	65.3		37.4	39.1		22.2	52.1	
Queue Length 95th (m)	17.3	69.8		44.5	#109.1		#84.4	36.4		34.0	68.6	
Internal Link Dist (m)		51.8			95.4			279.1			137.0	
Turn Bay Length (m)	15.0			55.0			61.0			61.0		
Base Capacity (vph)	187	409		246	415		201	1424		367	1358	
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	0.26	0.55		0.62	0.79		0.83	0.33		0.49	0.41	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 117 (98%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

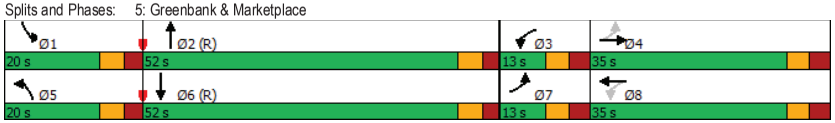
Maximum v/c Ratio: 0.84

Intersection Signal Delay: 40.9	Intersection LOS: D
Intersection Capacity Utilization 74.0%	ICU Level of Service D
Analysis Period (min) 15	

Description: As per 26-Nov-2018 timings.

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

Splits and Phases: 5: Greenbank & Marketplace



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2	4	1	0	154	2	412	7	221	463	0
Future Volume (vph)	0	2	4	1	0	154	2	412	7	221	463	0
Satd. Flow (prot)	0	1588	0	0	1658	1483	0	1741	0	1658	1745	0
Flt Permitted								0.999		0.467		
Satd. Flow (perm)	0	1588	0	0	1745	1483	0	1739	0	812	1745	0
Satd. Flow (RTOR)		4				171		1				
Lane Group Flow (vph)	0	6	0	0	1	171	0	468	0	246	514	0
Turn Type		NA		Perm	NA	pm+ov	Perm	NA		pm+pt	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	1	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	5.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4	12.1	34.1	34.1		12.1	34.1	
Total Split (s)	27.0	27.0		27.0	27.0	30.0	63.0	63.0		30.0	93.0	
Total Split (%)	22.5%	22.5%		22.5%	22.5%	25.0%	52.5%	52.5%		25.0%	77.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7		3.7	3.7	
All-Red Time (s)	2.7	2.7		2.7	2.7	3.4	3.4	3.4		3.4	3.4	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lead/Lag						Lead	Lag	Lag		Lead		
Lead-Lag Optimize?						Yes	Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)		10.0			10.0	11.3		94.5		109.6	115.3	
Actuated g/C Ratio		0.08			0.08	0.09		0.79		0.91	0.96	
v/c Ratio		0.04			0.01	0.58		0.34		0.31	0.31	
Control Delay		37.0			51.0	14.6		5.7		3.1	2.0	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		37.0			51.0	14.6		5.7		3.1	2.0	
LOS		D			D	B		A		A	A	
Approach Delay		37.0			14.8			5.7			2.4	
Approach LOS		D			B			A			A	
Queue Length 50th (m)		0.5			0.2	0.0		21.1		3.9	7.8	
Queue Length 95th (m)		4.9			2.1	18.0		73.6		14.2	36.1	
Internal Link Dist (m)		154.0			454.9			648.0			279.1	
Turn Bay Length (m)												
Base Capacity (vph)		275			299	457		1369		903	1677	
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		0.02			0.00	0.37		0.34		0.27	0.31	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 10 (8%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 5.1	Intersection LOS: A
Intersection Capacity Utilization 74.7%	ICU Level of Service D
Analysis Period (min) 15	

Description: As per 26-Nov-2018 timings.

Splits and Phases: 6: Greenbank & Jockvale

Appendix D

Collision Data

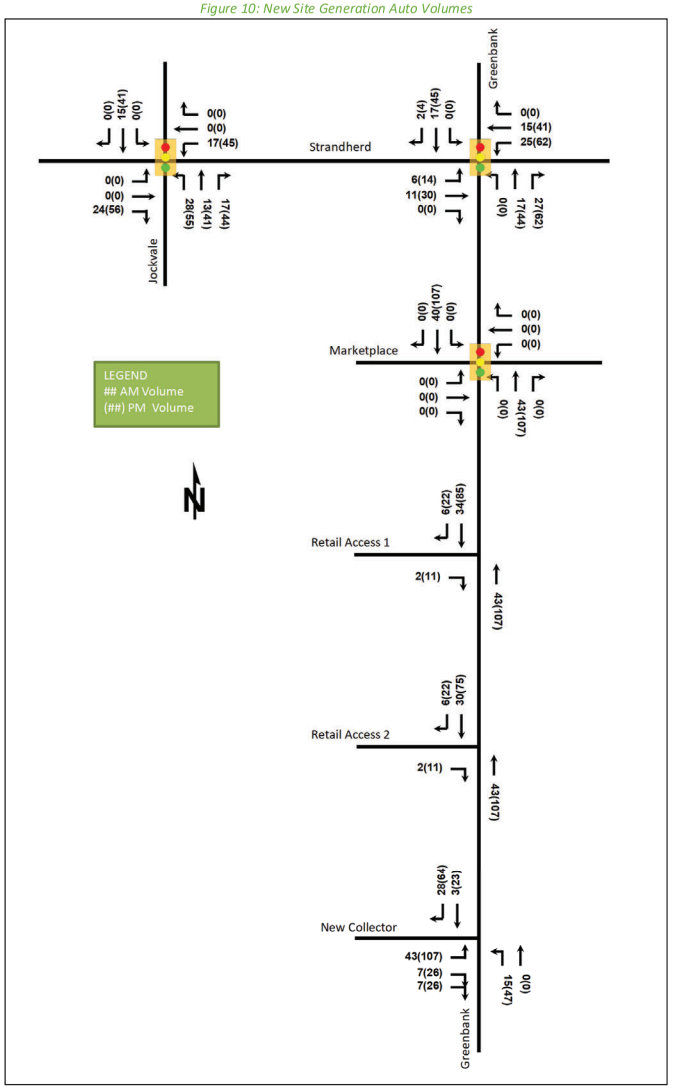
Record	Location	X	Y	Date	Time	Environment	Road_Surface	Traffic_Control	Collision_Location	Light	Collision_Classification	Impact_type
13-4177	JOCKVALE RD @ STRANDHERD DR	363560.48045	5014578.25250	2013-04-17	4:05:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	05 - Turning movement
13-4718	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	362612.24477	5013654.31754	2013-05-07	12:19:00 PM	01 - Clear	01 - Dry	10 - No control	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
13-4971	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363250.30587	5014314.17592	2013-05-14	3:57:00 PM	01 - Clear	01 - Dry	10 - No control	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
13-5649	JOCKVALE RD @ STRANDHERD DR	363555.98410	5014580.68228	2013-05-24	2:00:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	05 - Turning movement
13-5777	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363043.43876	5014089.06092	2013-06-07	10:30:00 AM	02 - Rain	02 - Wet	10 - No control	02 - Intersection related	01 - Daylight	03 - P.D. only	05 - Turning movement
13-8348	FRASER FIELDS WAY @ STRANDHERD DR	362949.58710	5013991.96410	2013-08-23	6:18:00 PM	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle
13-8841	JOCKVALE RD @ STRANDHERD DR	363559.58118	5014579.87235	2013-09-09	11:44:00 AM	01 - Clear	01 - Dry	01 - Traffic signal	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other
13-8862	JOCKVALE RD @ STRANDHERD DR	363559.58118	5014578.25250	2013-09-09	6:41:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
13-8945	JOCKVALE RD @ STRANDHERD DR	363559.58118	5014579.06242	2013-09-11	8:31:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	01 - Non intersection	07 - Dark	03 - P.D. only	05 - Turning movement
13-10319	JOCKVALE RD @ STRANDHERD DR	363561.37972	5014587.16169	2013-10-19	12:30:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-3683	GREENBANK RD @ MARKETPLACE AVE	364008.35592	5014603.40478	2013-03-29	12:20:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	02 - Angle
13-5593	GREENBANK RD @ MARKETPLACE AVE	364005.65811	5014602.59485	2013-06-02	4:45:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
13-6805	GREENBANK RD @ MARKETPLACE AVE	364008.35592	5014602.59485	2013-07-07	2:21:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
13-10555	GREENBANK RD @ MARKETPLACE AVE	364008.35592	5014600.97500	2013-10-26	4:17:00 PM	02 - Rain	02 - Wet	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-10816	GREENBANK RD @ MARKETPLACE AVE	364006.55738	5014602.59485	2013-11-01	9:30:00 AM	01 - Clear	01 - Dry	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	02 - Angle
13-12343	GREENBANK RD @ MARKETPLACE AVE	364009.25519	5014603.40478	2013-12-08	10:21:00 AM	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle
13-1112	GREENBANK RD @ JOCKVALE RD	364122.58710	5014334.06832	2013-01-25	8:16:00 AM	01 - Clear	03 - Loose snow	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-2460	GREENBANK RD @ JOCKVALE RD	364119.88929	5014331.63854	2013-02-25	10:15:00 AM	01 - Clear	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-5148	GREENBANK RD @ JOCKVALE RD	364121.68783	5014331.63854	2013-05-20	7:50:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	05 - Turning movement
13-6703	GREENBANK RD @ JOCKVALE RD	364123.48637	5014330.82861	2013-07-04	2:29:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle
13-7136	GREENBANK RD @ JOCKVALE RD	364119.88929	5014333.25839	2013-07-17	8:55:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	04 - At/near private drive	05 - Dusk	02 - Non-fatal injury	03 - Rear end
13-11761	GREENBANK RD @ JOCKVALE RD	364119.88929	5014331.63854	2013-11-25	1:00:00 PM	01 - Clear	01 - Dry	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
17	JOCKVALE RD @ STRANDHERD DR	363562.8502	5014578.785	2014-08-07	21:46	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	01 - Fatal injury	07 - SMV other
2975	JOCKVALE RD @ STRANDHERD DR	363560.4805	5014577.33	2014-01-07	15:00	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
4742	JOCKVALE RD @ STRANDHERD DR	363560.4805	5014579.105	2014-02-14	16:44	03 - Snow	03 - Loose snow	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
5665	JOCKVALE RD @ STRANDHERD DR	363561.7064	5014579.009	2014-03-26	18:40	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
6474	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363500.4332	5014543.198	2014-04-14	8:35	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
8125	JOCKVALE RD @ STRANDHERD DR	363560.9544	5014579.733	2014-07-03	16:50	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
8611	JOCKVALE RD @ STRANDHERD DR	363558.6004	5014577.209	2014-07-07	14:15	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
9318	STRANDHERD DR @ ANDORA AVE	363229.932	5014302.194	2014-07-28	17:15	02 - Rain	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
11605	JOCKVALE RD @ STRANDHERD DR	363560.9544	5014577.837	2014-09-17	15:30	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
12838	STRANDHERD DR btwn MADRID AVE & ANDORA AVE	363095.4914	5014155.396	2014-10-30	19:34	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	03 - Rear end
13400	JOCKVALE RD @ STRANDHERD DR	363558.5803	5014579.262	2014-12-09	16:45	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	05 - Dusk	03 - P.D. only	03 - Rear end
13915	FRASER FIELDS WAY @ STRANDHERD DR	362949.5871	5013991.964	2014-06-07	12:20	01 - Clear	01 - Dry		03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
14375	FRASER FIELDS WAY @ STRANDHERD DR	362949.5871	5013991.964	2014-12-18	20:15	01 - Clear	01 - Dry		02 - Intersection related	07 - Dark	03 - P.D. only	05 - Turning movement
2709	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	364014.9465	5014584.699	2014-01-07	15:45	06 - Strong wind	06 - Ice	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
2809	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	364083.665	5014421.922	2014-01-03	8:58	01 - Clear	06 - Ice	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	01 - Approaching
4479	GREENBANK RD @ MARKETPLACE AVE	364007.4058	5014599.814	2014-02-21	6:14	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	03 - Dawn	03 - P.D. only	05 - Turning movement
5127	GREENBANK RD @ MARKETPLACE AVE	364006.9341	5014602.19	2014-03-04	14:07	03 - Snow	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
6196	GREENBANK RD @ MARKETPLACE AVE	364007.882	5014602.19	2014-03-28	9:00	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
3436	GREENBANK RD @ JOCKVALE RD	364122.4773	5014332.986	2014-01-11	18:30	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	07 - SMV other
4188	GREENBANK RD @ JOCKVALE RD	364122.1948	5014330.667	2014-02-01	15:10	01 - Clear	06 - Ice	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
4529	GREENBANK RD @ JOCKVALE RD	364122.1617	5014328.518	2014-02-11	8:25	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
5939	GREENBANK RD @ JOCKVALE RD	364123.1096	5014331.361	2014-04-03	13:14	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8635	GREENBANK RD @ JOCKVALE RD	364122.1948	5014331.174	2014-07-12	14:19	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8882	GREENBANK RD @ JOCKVALE RD	364121.2139	5014331.361	2014-07-08	13:54	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
148	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	363038.2635	5014089.863	2014-01-12	17:31	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	05 - Dusk	02 - Non-fatal injury	05 - Turning movement
12925	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	362941.0971	5013976.774	2014-11-16	14:24	01 - Clear	02 - Wet	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
2699	AMBLER LANE btwn KINGSVIEW LANE & TALLGRASS LANE	363160.0302	5014149.263	2015-12-22	16:52	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	05 - Dusk	02 - Non-fatal injury	06 - SMV unattended vehicle
2700	AMBLER LANE btwn KINGSVIEW LANE & TALLGRASS LANE	363135.1111	5014122.92	2015-12-22	16:53	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	05 - Dusk	02 - Non-fatal injury	06 - SMV unattended vehicle
802	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	362324.9475	5013554.564	2015-02-17	16:00	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	05 - Turning movement
1080	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363544.5364	5014565.587	2015-04-17	16:50	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	03 - Rear end
2703	ANDORA AVE btwn STRANDHERD DR & MADRID AVE	363247.603	5014285.962	2015-12-22	16:55	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	05 - Dusk	02 - Non-fatal injury	06 - SMV unattended vehicle
3383	JOCKVALE RD @ STRANDHERD DR	363561.4444	5014575.428	2015-03-01	12:49	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
3488	FRASER FIELDS WAY @ STRANDHERD DR	362949.5871	5013991.964	2015-02-04	11:28	01 - Clear	04 - Slush	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
5087	JOCKVALE RD @ STRANDHERD DR	363561.2012	5014578.198	2015-10-01	12:39	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
6792	STRANDHERD DR @ ANDORA AVE	363229.4581	5014302.644	2015-01-16	16:01	05 - Drifting Snow	06 - Ice	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
6812	JOCKVALE RD @ STRANDHERD DR	363561.4444	5014577.355	2015-02-21	12:38	01 - Clear	06 - Ice	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
7851	JOCKVALE RD @ STRANDHERD DR	363560.4805	5014578.198	2015-05-20	13:15	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
9744	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	362489.7116	5013595.995	2015-07-01	23:12	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	03 - Rear end
12073	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	363032.3881	5014083.24	2015-10-11	19:40	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	05 - Turning movement
12898	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	362364.7261	5013559.462	2015-10-09	12:55	02 - Rain	02 - Wet	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
13072	JOCKVALE RD @ STRANDHERD DR	363560.4805	5014577.477	2015-10-17	14:20	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
14048	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363543.874	5014568.451	2015-11-27	7:02	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	03 - Dawn	03 - P.D. only	03 - Rear end
14885	JOCKVALE RD @ STRANDHERD DR	363559.3828	5014577.618	2015-12-10	11:35	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
81	GREENBANK RD @ MARKETPLACE AVE	364009.3198	5014600.744	2015-03-02	15:28	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
164	GREENBANK RD @ JOCKVALE RD	364123.6155	5014330.895	2015-01-16	10:00	01 - Clear	05 - Packed snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
172	GREENBANK RD @ MARKETPLACE AVE	364008.0291	5014604.579	2015-01-07	15:51	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	05 - Turning movement
1686	GREENBANK RD @ MARKETPLACE AVE	364008.8629	5014603.457	2015-05-18	13:39	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle
2445	GREENBANK RD @ MARKETPLACE AVE	364009.0766	5014601.829	2015-10-17	16:15	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	05 - Turning movement
4060	GREENBANK RD @ JOCKVALE RD	364121.6878	5014329.332	2015-07-10	13:20	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
4126	GREENBANK RD @ JOCKVALE RD	364121.6878	5014331.859	2015-03-17	23:57	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	02 - Angle
5255	GREENBANK RD @ JOCKVALE RD	364120.7239	5014329.931	2015-04-16	20:44	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	04 - Sideswipe
5829	GREENBANK RD @ JOCKVALE RD	364122.147	5014329.724	2015-07-26	13:00	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
7662	GREENBANK RD @ JOCKVALE RD	364119.7601	5014330.895	2015-02-21	15:00	03 - Snow	03 - Loose snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
9549	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	364061.868	5014470.593	2015-08-15	12:00	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe

9727	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	364075.5617	5014446.089	2015-07-29	11:01	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	01 - Daylight	03 - P.D. only	05 - Turning movement
9742	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	364030.9812	5014550.543	2015-08-15	11:40	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	01 - Daylight	03 - P.D. only	02 - Angle
9986	GREENBANK RD @ JOCKVALE RD	364121.6878	5014330.774	2015-08-01	13:34	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
10179	GREENBANK RD @ JOCKVALE RD	364122.4085	5014330.774	2015-06-11	18:52	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
10921	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	364084.1427	5014422.11	2015-10-25	17:44	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
13139	GREENBANK RD @ MARKETPLACE AVE	364008.3559	5014601.829	2015-10-10	9:38	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
13768	GREENBANK RD @ JOCKVALE RD	364122.4098	5014330.413	2015-12-21	9:31	02 - Rain	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
15017	GREENBANK RD @ MARKETPLACE AVE	364006.9119	5014601.468	2015-12-28	19:13	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	04 - Sideswipe
2701	MADRID AVE btwn KENTON AVE & TALLGRASS LANE	363235.4994	5014184.15	2015-12-22	16:54	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	05 - Dusk	02 - Non-fatal injury	06 - SMV unattended vehicle
8267	JOCKVALE RD @ STRANDHERD DR	363560.7	5014578.057	2016-09-07	10:22	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	05 - Turning movement
8268	JOCKVALE RD @ STRANDHERD DR	363558.9796	5014578.212	2016-01-13	13:50	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
8269	JOCKVALE RD @ STRANDHERD DR	363560.261	5014578.496	2016-08-17	11:32	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	05 - Turning movement
8270	JOCKVALE RD @ STRANDHERD DR	363559.911	5014577.962	2016-07-14	0:05	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	03 - Rear end
8271	JOCKVALE RD @ STRANDHERD DR	363561.3087	5014576.595	2016-10-20	18:50	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	07 - Dark	02 - Non-fatal injury	07 - SMV other
8272	JOCKVALE RD @ STRANDHERD DR	363559.8063	5014577.388	2016-05-14	15:03	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
8273	JOCKVALE RD @ STRANDHERD DR	363560.4805	5014575.767	2016-08-31	16:41	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8274	JOCKVALE RD @ STRANDHERD DR	363561.8582	5014578.526	2016-01-12	12:22	03 - Snow	03 - Loose snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8275	JOCKVALE RD @ STRANDHERD DR	363561.6169	5014577.383	2016-08-05	8:40	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8276	JOCKVALE RD @ STRANDHERD DR	363560.261	5014576.74	2016-08-05	8:39	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8277	JOCKVALE RD @ STRANDHERD DR	363559.562	5014576.689	2016-07-20	7:46	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
8278	JOCKVALE RD @ STRANDHERD DR	363561.016	5014579.176	2016-10-06	15:52	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8279	JOCKVALE RD @ STRANDHERD DR	363560.9539	5014578.074	2016-10-06	20:15	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
8280	JOCKVALE RD @ STRANDHERD DR	363560.4805	5014579.079	2016-12-14	14:47	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8281	JOCKVALE RD @ STRANDHERD DR	363560.4819	5014578.562	2016-12-14	18:55	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
8282	JOCKVALE RD @ STRANDHERD DR	363560.4805	5014577.423	2016-11-09	16:45	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	05 - Dusk	03 - P.D. only	03 - Rear end
8283	JOCKVALE RD @ STRANDHERD DR	363560.2545	5014577.614	2016-11-25	7:30	07 - Fog, mist, smoke, dust	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
8284	JOCKVALE RD @ STRANDHERD DR	363560.0071	5014578.074	2016-12-09	18:41	03 - Snow	06 - Ice	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
8285	JOCKVALE RD @ STRANDHERD DR	363561.3087	5014579.908	2016-12-10	12:43	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
12930	STRANDHERD DR @ ANDORA AVE	363229.4581	5014306.16	2016-12-23	14:08	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
12977	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363474.2287	5014526.849	2016-01-12	15:58	03 - Snow	03 - Loose snow	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
12978	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363390.9351	5014470.564	2016-06-24	10:30	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
12979	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363385.947	5014467.409	2016-09-17	20:30	02 - Rain	02 - Wet	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other
12980	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	362370.429	5013562.257	2016-12-16	15:15	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	03 - Rear end
12981	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	362715.9717	5013737.752	2016-12-16	21:31	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other
12989	STRANDHERD DR btwn MADRID AVE & ANDORA AVE	363063.5806	5014117.369	2016-11-01	3:00	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other
5512	GREENBANK RD @ JOCKVALE RD	364121.4623	5014331.09	2016-05-28	13:29	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
5513	GREENBANK RD @ JOCKVALE RD	364121.0219	5014331.079	2016-03-05	9:00	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
5514	GREENBANK RD @ JOCKVALE RD	364119.3221	5014333.417	2016-08-11	12:54	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
5515	GREENBANK RD @ JOCKVALE RD	364120.8596	5014330.827	2016-11-18	17:42	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
5538	GREENBANK RD @ MARKETPLACE AVE	364007.6817	5014601.74	2016-05-05	18:31	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	07 - SMV other
5539	GREENBANK RD @ MARKETPLACE AVE	364008.0896	5014601.923	2016-03-18	18:43	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
5540	GREENBANK RD @ MARKETPLACE AVE	364008.1936	5014601.887	2016-08-23	12:36	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
5541	GREENBANK RD @ MARKETPLACE AVE	364009.0377	5014603.099	2016-06-28	23:01	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	04 - Sideswipe
5542	GREENBANK RD @ MARKETPLACE AVE	364006.6996	5014600.947	2016-12-23	14:09	01 - Clear	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
5609	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	364094.6424	5014394.05	2016-06-14	20:53	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	05 - Dusk	03 - P.D. only	04 - Sideswipe
5393	FRASER FIELDS WAY @ STRANDHERD DR	362949.58710	5013991.96410	2017-02-18	7:46	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
8795	JOCKVALE RD @ STRANDHERD DR	363562.15274	5014579.17499	2017-06-12	17:46	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8796	JOCKVALE RD @ STRANDHERD DR	363560.81495	5014576.49941	2017-05-11	16:55	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	05 - Turning movement
8797	JOCKVALE RD @ STRANDHERD DR	363561.28705	5014578.48127	2017-05-25	18:40	02 - Rain	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8798	JOCKVALE RD @ STRANDHERD DR	363560.95387	5014578.07389	2017-10-11	8:47	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
8799	JOCKVALE RD @ STRANDHERD DR	363560.14605	5014579.84389	2017-11-23	9:18	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
8800	JOCKVALE RD @ STRANDHERD DR	363559.93405	5014577.29075	2017-01-29	15:56	03 - Snow	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
8801	JOCKVALE RD @ STRANDHERD DR	363559.93776	5014577.29446	2017-02-03	17:30	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
8802	JOCKVALE RD @ STRANDHERD DR	363561.48384	5014578.50610	2017-03-15	19:52	03 - Snow	03 - Loose snow	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
8803	JOCKVALE RD @ STRANDHERD DR	363559.53375	5014577.60051	2017-12-28	13:00	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
8804	JOCKVALE RD @ STRANDHERD DR	363560.95387	5014578.07389	2017-12-23	22:03	07 - Fog, mist, smoke, dust	03 - Loose snow	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	03 - Rear end
8805	JOCKVALE RD @ STRANDHERD DR	363559.52471	5014578.07615	2017-12-30	16:29	01 - Clear	03 - Loose snow	01 - Traffic signal	03 - At intersection	05 - Dusk	03 - P.D. only	03 - Rear end
13356	STRANDHERD DR @ MADRID AVE	363045.36110	5014097.60940	2017-02-05	16:00	03 - Snow	03 - Loose snow		02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
13371	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363533.39020	5014561.11479	2017-06-29	14:11	02 - Rain	02 - Wet	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other
13372	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363461.04539	5014518.09473	2017-03-24	9:07	03 - Snow	04 - Slush	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
13373	STRANDHERD DR btwn ANDORA AVE & JOCKVALE RD	363429.05876	5014499.22310	2017-12-19	7:54	03 - Snow	05 - Packed snow	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
13374	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE	363029.51635	5014079.50602	2017-12-31	13:23	01 - Clear	02 - Wet	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	03 - Rear end
5690	GREENBANK RD @ JOCKVALE RD	364121.35335	5014331.08220	2017-06-16	20:54	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	05 - Dusk	03 - P.D. only	03 - Rear end
5691	GREENBANK RD @ JOCKVALE RD	364122.69114	5014330.41330	2017-06-06	19:50	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
5692	GREENBANK RD @ JOCKVALE RD	364122.02225	5014332.41999	2017-05-04	10:10	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
5693	GREENBANK RD @ JOCKVALE RD	364121.91369	5014331.32397	2017-09-19	17:05	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
5694	GREENBANK RD @ JOCKVALE RD	364122.16117	5014331.12336	2017-11-03	16:35	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	05 - Dusk	03 - P.D. only	03 - Rear end
5695	GREENBANK RD @ JOCKVALE RD	364120.74105	5014330.17661	2017-12-07	17:04	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	03 - Rear end
5696	GREENBANK RD @ JOCKVALE RD	364123.18874	5014332.28947	2017-02-15	18:31	03 - Snow	05 - Packed snow	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
5697	GREENBANK RD @ JOCKVALE RD	364121.14135	5014329.32040	2017-01-21	11:44	01 - Clear	06 - Ice	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
5723	GREENBANK RD @ MARKETPLACE AVE	364007.71794	5014600.59470	2017-08-01	9:00	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
5724	GREENBANK RD @ MARKETPLACE AVE	364007.40915	5014602.42629	2017-12-12	15:09	03 - Snow	03 - Loose snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
5725	GREENBANK RD @ MARKETPLACE AVE	364009.21427	5014600.47286	2017-01-06	11:39	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
9640	MADRID AVE btwn KENTON AVE & TALLGRASS LANE	363163.95358	5014107.84554	2017-12-13	18:45	03 - Snow	03 - Loose snow	10 - No control	04 - At/near private drive	07 - Dark	03 - P.D. only	06 - SMV unattended vehicle

Appendix E

Background Development Volumes

Figure 10: New Site Generation Auto Volumes



PARSONS

Figure 7: 2017 Future Background Traffic Volumes

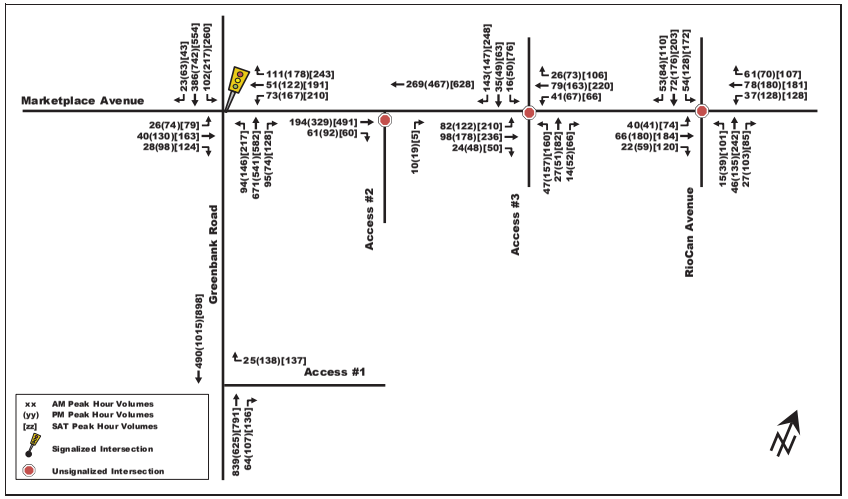


Figure 8: 2022 Future Background Traffic Volumes

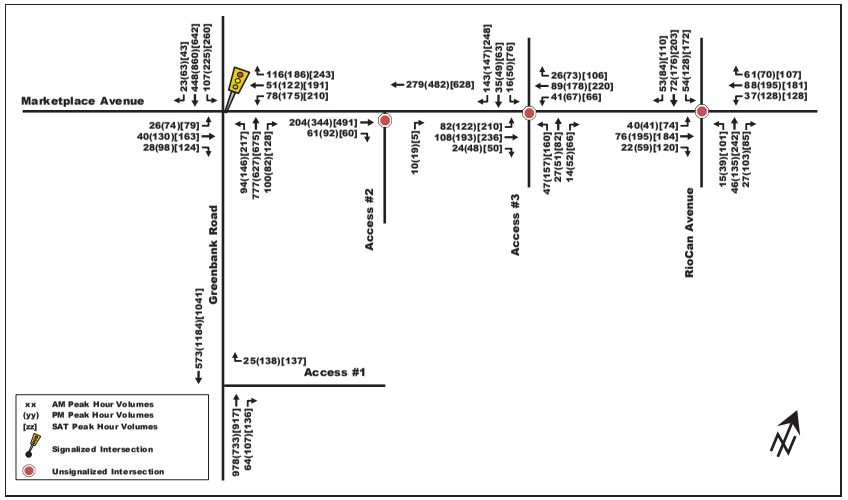
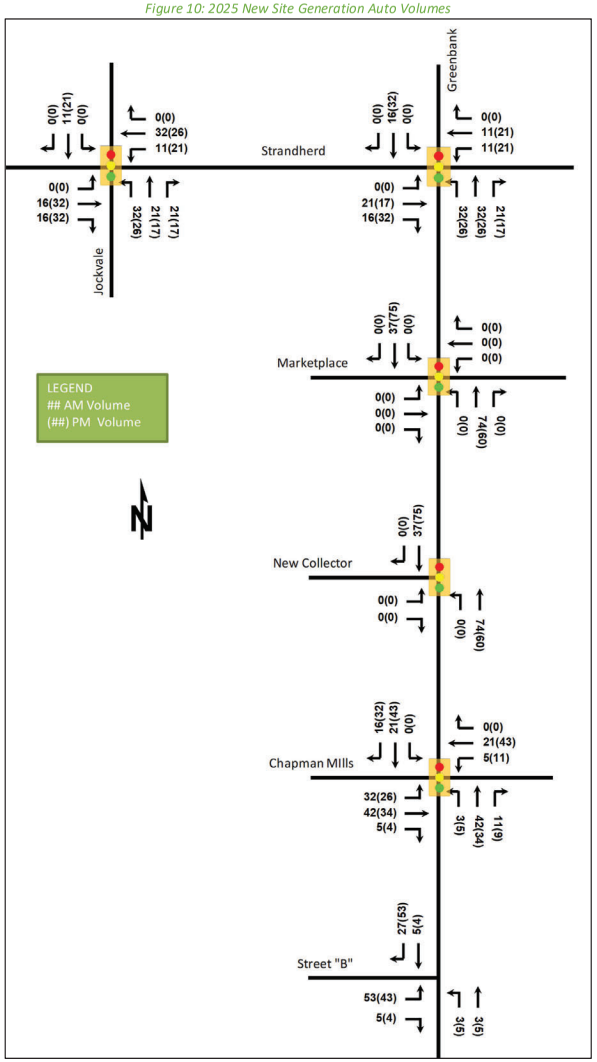
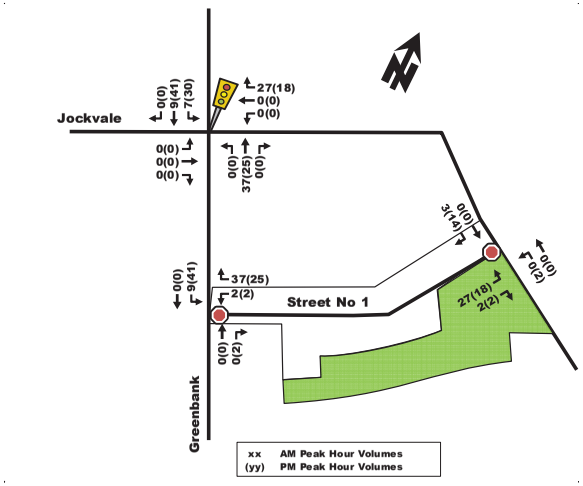


Figure 10: 2025 New Site Generation Auto Volumes



PARSONS

Figure 8: 'New' Site Generated Auto Volumes

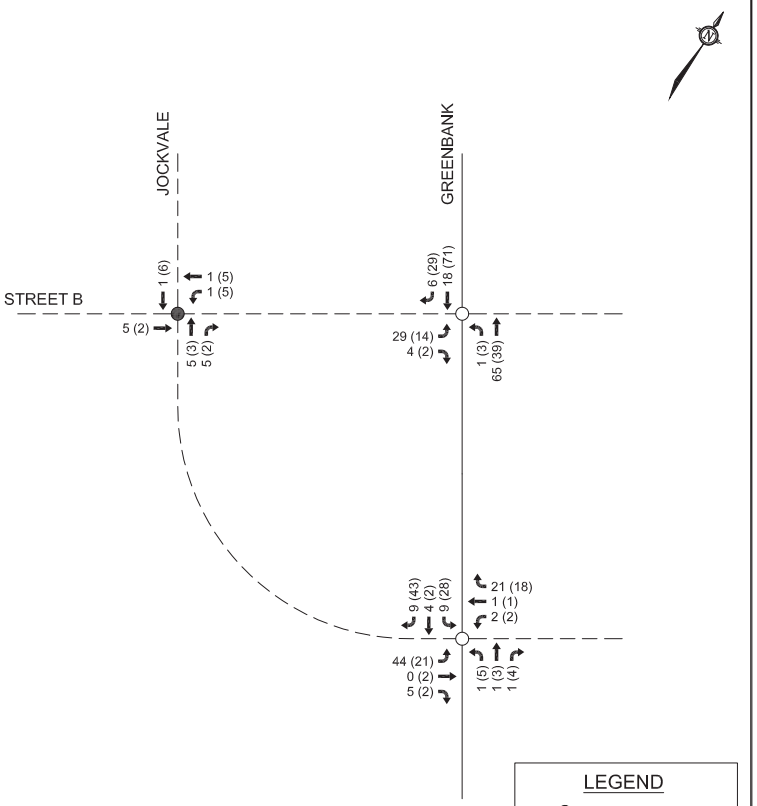


4. FUTURE TRAFFIC OPERATIONS

4.1. PROJECTED 2020 CONDITIONS AT FULL SITE DEVELOPMENT

The total projected 2020 volumes associated with the proposed development were derived by superimposing 'new' site-generated traffic volumes (Figure 8) onto projected 2020 background traffic volumes (Figure 6). The resulting total projected 2020 volumes are illustrated as Figure 9.

The following Table 10 provides a projected performance summary for study area intersections, based on total projected 2020 traffic volumes. The detailed SYNCHRO model output of projected conditions is provided within Appendix F.



NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

3370 GREENBANK ROAD
BURNETT LANDS

ULTIMATE SITE
GENERATED TRAFFIC

JAN 2018 111117 FIGURE 7

SHT8X11.DWG - 216mmX278mm

M:\2011\111117\CAD\Design\Figures\Traffic\Addendum\111117 - VOLUME FIGURES.dwg, 2027 SITE, Jan 25, 2018 - 3:01pm, bbyvelis

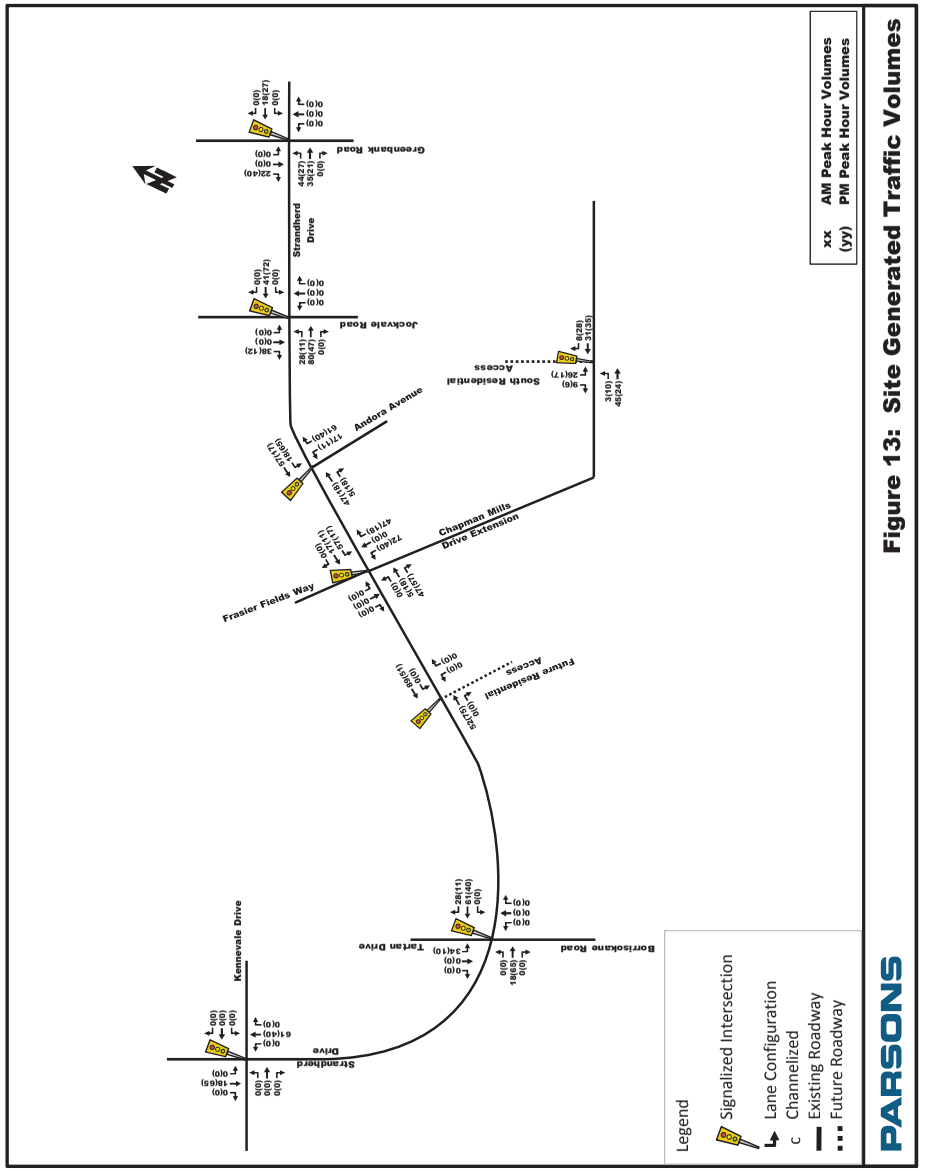
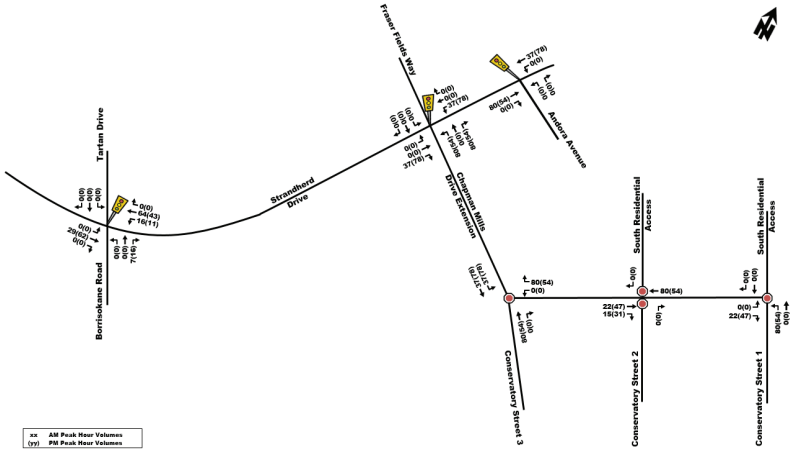


Figure 13: Site Generated Traffic Volumes

PARSONS

Figure 9: Site Generated Trip Volumes



10. BACKGROUND NETWORK TRAFFIC

10.1. CHANGES TO THE BACKGROUND TRANSPORTATION NETWORK

Please see Section 3.1.

10.2. OTHER AREA DEVELOPMENTS

The City of Ottawa's Development Applications webtool has been used to determine if there are proposed developments within the area of influence of the proposed development. These developments have been discussed in greater detail in Section 3.2. Figure 10, Figure 11, and Figure 12 document the traffic impact of each of the Citi-Gate Development, 4401 Fallowfield, and 4025 Strandherd Drive, on the subject development.

Appendix F

Synchro Intersection Worksheets – 2022 Background Conditions

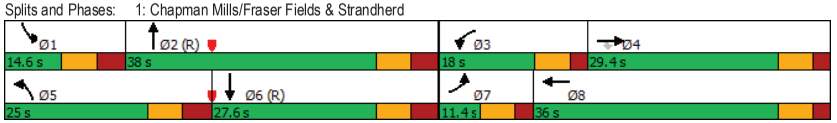
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	526	107	109	721	16	171	0	179	35	0	12
Future Volume (vph)	4	526	107	109	721	16	171	0	179	35	0	12
Satd. Flow (prot)	1658	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1656	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			359		2			306			345	
Lane Group Flow (vph)	4	526	107	109	737	0	171	179	0	35	12	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	29.4	29.4	18.0	36.0		25.0	38.0		14.6	27.6	
Total Split (%)	11.4%	29.4%	29.4%	18.0%	36.0%		25.0%	38.0%		14.6%	27.6%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	20.3	20.3	10.4	34.8		14.6	40.0		6.6	26.6	
Actuated g/C Ratio	0.05	0.20	0.20	0.10	0.35		0.15	0.40		0.07	0.27	
v/c Ratio	0.05	0.78	0.18	0.64	0.64		0.71	0.23		0.32	0.02	
Control Delay	46.8	46.4	0.7	55.7	42.8		56.7	0.7		52.3	0.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	46.8	46.4	0.7	55.7	42.8		56.7	0.7		52.3	0.1	
LOS	D	D	A	E	D		E	A		D	A	
Approach Delay		38.7			44.4			28.0			39.0	
Approach LOS		D			D			C			D	
Queue Length 50th (m)	0.8	53.5	0.0	21.4	76.5		33.3	0.0		6.9	0.0	
Queue Length 95th (m)	4.4	70.6	0.0	39.5	105.3		55.0	0.0		17.1	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	762	617	192	1152		286	776		116	647	
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	0.05	0.69	0.17	0.57	0.64		0.60	0.23		0.30	0.02	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 39.3	Intersection LOS: D
Intersection Capacity Utilization 65.1%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	732	8	24	811	36	85
Future Volume (vph)	732	8	24	811	36	85
Satd. Flow (prot)	1743	0	1658	3316	1536	0
Flt Permitted			0.332		0.985	
Satd. Flow (perm)	1743	0	579	3316	1536	0
Satd. Flow (RTOR)	1				85	
Lane Group Flow (vph)	740	0	24	811	121	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	76.4		76.4	76.4	11.8	
Actuated g/C Ratio	0.76		0.76	0.76	0.12	
v/c Ratio	0.56		0.05	0.32	0.47	
Control Delay	9.2		4.0	4.4	20.8	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	9.2		4.0	4.4	20.8	
LOS	A		A	A	C	
Approach Delay	9.2			4.4	20.8	
Approach LOS	A			A	C	
Queue Length 50th (m)	70.1		0.9	19.8	6.9	
Queue Length 95th (m)	91.9		4.0	40.5	22.2	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	1331		441	2532	436	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.56		0.05	0.32	0.28	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 7.7	Intersection LOS: A
Intersection Capacity Utilization 60.3%	ICU Level of Service B
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

Splits and Phases: 3: Andora & Strandherd

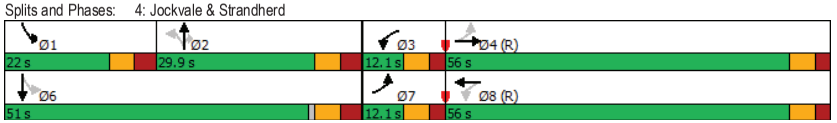
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	785	11	35	782	216	33	40	30	221	47	18
Future Volume (vph)	22	785	11	35	782	216	33	40	30	221	47	18
Satd. Flow (prot)	1658	3308	0	1658	3182	0	1658	1745	1483	1658	1663	0
Flt Permitted	0.214			0.292			0.715			0.443		
Satd. Flow (perm)	372	3308	0	509	3182	0	1241	1745	1463	772	1663	0
Satd. Flow (RTOR)		1			36				146		18	
Lane Group Flow (vph)	22	796	0	35	998	0	33	40	30	221	65	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	12.1	56.0		12.1	56.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	10.1%	46.7%		10.1%	46.7%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	72.2	68.5		72.5	68.7		12.6	12.6	12.6	31.0	31.0	
Actuated g/C Ratio	0.60	0.57		0.60	0.57		0.10	0.10	0.10	0.26	0.26	
v/c Ratio	0.08	0.42		0.10	0.54		0.25	0.22	0.11	0.72	0.15	
Control Delay	12.0	18.3		11.9	19.7		52.2	50.0	0.7	49.8	23.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	12.0	18.3		11.9	19.7		52.2	50.0	0.7	49.8	23.1	
LOS	B	B		B	B		D	D	A	D	C	
Approach Delay		18.1			19.5			36.4			43.8	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	1.9	63.0		3.1	83.5		7.8	9.5	0.0	46.5	8.8	
Queue Length 95th (m)	7.0	99.1		9.6	131.2		16.6	18.5	0.0	60.8	17.4	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	289	1888		367	1836		237	334	398	312	634	
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	0.08	0.42		0.10	0.54		0.14	0.12	0.08	0.71	0.10	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 22 (18%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 63.2% ICU Level of Service B
Analysis Period (min) 15
Description: As per 26-Nov-2018 timings.
As per Signals direction, northbound overage timing off next phase (EB/WB left).

Splits and Phases: 4: Jockvale & Strandherd



Intersection	
Int Delay, s/veh	4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	80	80	0	37	37
Future Vol, veh/h	0	80	80	0	37	37
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	-	-	-	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	0	80	80	0	37	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	191	80	0	0	80	0
Stage 1	80	-	-	-	-	-
Stage 2	111	-	-	-	-	-
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	798	980	-	-	1518	-
Stage 1	943	-	-	-	-	-
Stage 2	914	-	-	-	-	-
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	779	980	-	-	1518	-
Mov Cap-2 Maneuver	779	-	-	-	-	-
Stage 1	943	-	-	-	-	-
Stage 2	892	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	3.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	980	1518	-
HCM Lane V/C Ratio	-	-	0.082	0.024	-
HCM Control Delay (s)	-	-	9	7.4	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	843	142	150	671	54	97	0	106	18	0	8
Future Volume (vph)	15	843	142	150	671	54	97	0	106	18	0	8
Satd. Flow (prot)	1658	3316	1483	1658	3274	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1658	3316	1483	1658	3274	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			275		10			276			261	
Lane Group Flow (vph)	15	843	142	150	725	0	97	106	0	18	8	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	37.0	37.0	19.0	44.6		16.0	30.6		13.4	28.0	
Total Split (%)	11.4%	37.0%	37.0%	19.0%	44.6%		16.0%	30.6%		13.4%	28.0%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	29.0	29.0	11.9	42.7		8.4	33.2		5.7	22.5	
Actuated g/C Ratio	0.05	0.29	0.29	0.12	0.43		0.08	0.33		0.06	0.22	
v/c Ratio	0.18	0.88	0.23	0.76	0.52		0.70	0.16		0.19	0.01	
Control Delay	50.9	45.2	0.8	63.0	23.8		71.3	0.5		50.0	0.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	50.9	45.2	0.8	63.0	23.8		71.3	0.5		50.0	0.0	
LOS	D	D	A	E	C		E	A		D	A	
Approach Delay		39.0			30.6			34.3			34.6	
Approach LOS		D			C			C			C	
Queue Length 50th (m)	3.0	83.8	0.0	29.7	55.0		19.6	0.0		3.6	0.0	
Queue Length 95th (m)	9.8	#109.1	0.0	#59.8	89.2		#45.4	0.0		11.0	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	1014	644	208	1404		142	677		94	536	
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	0.18	0.83	0.22	0.72	0.52		0.68	0.16		0.19	0.01	

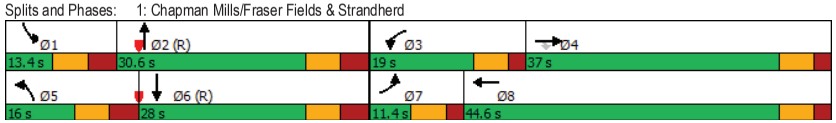
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 35.0	Intersection LOS: C
Intersection Capacity Utilization 62.8%	ICU Level of Service B
Analysis Period (min) 15	

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

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	948	22	103	856	19	55
Future Volume (vph)	948	22	103	856	19	55
Satd. Flow (prot)	3304	0	1658	3316	1535	0
Flt Permitted			0.286		0.987	
Satd. Flow (perm)	3304	0	499	3316	1535	0
Satd. Flow (RTOR)	4				55	
Lane Group Flow (vph)	970	0	103	856	74	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	80.8		80.8	80.8	11.8	
Actuated g/C Ratio	0.81		0.81	0.81	0.12	
v/c Ratio	0.36		0.26	0.32	0.32	
Control Delay	5.5		6.0	4.0	19.0	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	5.5		6.0	4.0	19.0	
LOS	A		A	A	B	
Approach Delay	5.5			4.2	19.0	
Approach LOS	A			A	B	
Queue Length 50th (m)	2.0		4.6	21.3	3.6	
Queue Length 95th (m)	126.5		16.0	43.3	15.6	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	2669		403	2678	413	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.36		0.26	0.32	0.18	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.36

Intersection Signal Delay: 5.4	Intersection LOS: A
Intersection Capacity Utilization 60.1%	ICU Level of Service B
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

Splits and Phases: 3: Andora & Strandherd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	938	41	74	867	335	74	106	86	339	94	18
Future Volume (vph)	19	938	41	74	867	335	74	106	86	339	94	18
Satd. Flow (prot)	1658	3293	0	1658	3147	0	1658	1745	1483	1658	1696	0
Flt Permitted	0.147			0.187			0.685			0.464		
Satd. Flow (perm)	257	3293	0	326	3147	0	1179	1745	1456	806	1696	0
Satd. Flow (RTOR)		4			55				146		9	
Lane Group Flow (vph)	19	979	0	74	1202	0	74	106	86	339	112	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	15.1	53.0		15.1	53.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	12.6%	44.2%		12.6%	44.2%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	64.4	59.4		69.0	65.5		14.3	14.3	14.3	36.3	36.3	
Actuated g/C Ratio	0.54	0.50		0.58	0.55		0.12	0.12	0.12	0.30	0.30	
v/c Ratio	0.09	0.60		0.27	0.69		0.53	0.51	0.28	0.97	0.22	
Control Delay	13.3	25.5		14.6	23.7		61.8	57.0	2.8	78.7	28.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	13.3	25.5		14.6	23.7		61.8	57.0	2.8	78.7	28.5	
LOS	B	C		B	C		E	E	A	E	C	
Approach Delay		25.3			23.2			40.8			66.2	
Approach LOS		C			C			D			E	
Queue Length 50th (m)	1.8	90.2		7.2	90.2		17.8	25.4	0.0	75.0	19.3	
Queue Length 95th (m)	6.2	135.5		17.3	#188.2		31.4	40.3	1.4	#111.6	30.4	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	247	1630		287	1742		225	334	397	351	641	
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	0.08	0.60		0.26	0.69		0.33	0.32	0.22	0.97	0.17	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 82 (68%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
4: Jockvale & Strandherd

08-12-2019

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 32.0	Intersection LOS: C
Intersection Capacity Utilization 83.4%	ICU Level of Service E
Analysis Period (min) 15	

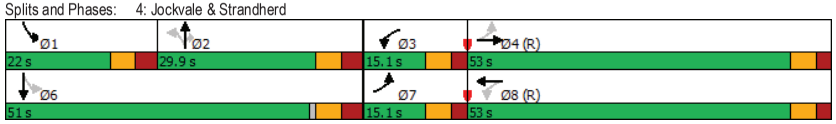
Description: As per 26-Nov-2018 timings.

As per Signals direction, northbound overage timing off next phase (EB/WB left).

\# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Jockvale & Strandherd



HCM 6th TWSC
9: Chapman Mills

08-12-2019

Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	54	54	0	78	78
Future Vol, veh/h	0	54	54	0	78	78
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	-	-	-	380	-
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	60	60	0	87	87

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	321	60	0	0	60	0
Stage 1	60	-	-	-	-	-
Stage 2	261	-	-	-	-	-
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	673	1005	-	-	1544	-
Stage 1	963	-	-	-	-	-
Stage 2	783	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	635	1005	-	-	1544	-
Mov Cap-2 Maneuver	635	-	-	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	739	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	3.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1005	1544	-
HCM Lane V/C Ratio	-	-	0.06	0.056	-
HCM Control Delay (s)	-	-	8.8	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Appendix G

Synchro Intersection Worksheets – 2027 Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	619	107	109	843	16	171	0	179	35	0	12
Future Volume (vph)	4	619	107	109	843	16	171	0	179	35	0	12
Satd. Flow (prot)	1658	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1656	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			359		2			292			345	
Lane Group Flow (vph)	4	619	107	109	859	0	171	179	0	35	12	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	29.4	29.4	18.0	36.0		25.0	38.0		14.6	27.6	
Total Split (%)	11.4%	29.4%	29.4%	18.0%	36.0%		25.0%	38.0%		14.6%	27.6%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	21.8	21.8	10.4	36.3		14.6	38.6		6.5	25.1	
Actuated g/C Ratio	0.05	0.22	0.22	0.10	0.36		0.15	0.39		0.06	0.25	
v/c Ratio	0.05	0.86	0.18	0.64	0.72		0.71	0.24		0.32	0.02	
Control Delay	46.8	50.2	0.6	55.0	43.6		56.7	0.7		52.8	0.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	46.8	50.2	0.6	55.0	43.6		56.7	0.7		52.8	0.1	
LOS	D	D	A	D	D		E	A		D	A	
Approach Delay		43.0			44.9			28.1			39.3	
Approach LOS		D			D			C			D	
Queue Length 50th (m)	0.8	63.1	0.0	21.4	84.5		33.3	0.0		6.9	0.0	
Queue Length 95th (m)	4.4	#89.3	0.0	39.6	#126.7		55.0	0.0		17.1	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	762	617	192	1200		286	751		114	630	
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	0.05	0.81	0.17	0.57	0.72		0.60	0.24		0.31	0.02	

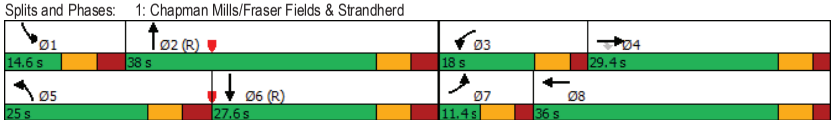
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 41.3	Intersection LOS: D
Intersection Capacity Utilization 68.7%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	825	8	24	935	36	85
Future Volume (vph)	825	8	24	935	36	85
Satd. Flow (prot)	1743	0	1658	3316	1536	0
Flt Permitted			0.286		0.985	
Satd. Flow (perm)	1743	0	499	3316	1536	0
Satd. Flow (RTOR)	1				85	
Lane Group Flow (vph)	833	0	24	935	121	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	76.4		76.4	76.4	11.8	
Actuated g/C Ratio	0.76		0.76	0.76	0.12	
v/c Ratio	0.63		0.06	0.37	0.47	
Control Delay	11.1		4.2	4.7	20.8	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	11.1		4.2	4.7	20.8	
LOS	B		A	A	C	
Approach Delay	11.1			4.7	20.8	
Approach LOS	B			A	C	
Queue Length 50th (m)	91.3		0.9	24.1	6.9	
Queue Length 95th (m)	108.2		4.1	48.6	22.2	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	1331		381	2532	436	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.63		0.06	0.37	0.28	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 8.5	Intersection LOS: A
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

Splits and Phases: 3: Andora & Strandherd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	824	67	63	843	226	93	74	68	231	73	18
Future Volume (vph)	22	824	67	63	843	226	93	74	68	231	73	18
Satd. Flow (prot)	1658	3273	0	1658	3183	0	1658	1745	1483	1658	1687	0
Flt Permitted	0.181			0.226			0.698			0.484		
Satd. Flow (perm)	315	3273	0	394	3183	0	1211	1745	1463	844	1687	0
Satd. Flow (RTOR)		9			34				146		12	
Lane Group Flow (vph)	22	891	0	63	1069	0	93	74	68	231	91	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	12.1	56.0		12.1	56.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	10.1%	46.7%		10.1%	46.7%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	64.8	59.6		67.6	62.8		14.9	14.9	14.9	36.5	36.5	
Actuated g/C Ratio	0.54	0.50		0.56	0.52		0.12	0.12	0.12	0.30	0.30	
v/c Ratio	0.09	0.55		0.21	0.64		0.62	0.34	0.22	0.65	0.17	
Control Delay	13.1	24.0		13.8	24.0		66.7	51.0	1.6	42.2	26.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	13.1	24.0		13.8	24.0		66.7	51.0	1.6	42.2	26.0	
LOS	B	C		B	C		E	D	A	D	C	
Approach Delay		23.7			23.4			42.9			37.6	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	2.2	80.7		6.3	101.2		22.3	17.1	0.0	46.2	14.3	
Queue Length 95th (m)	6.7	113.8		14.7	144.3		38.6	30.7	0.0	65.1	25.4	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	241	1630		297	1682		232	334	398	359	640	
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	0.09	0.55		0.21	0.64		0.40	0.22	0.17	0.64	0.14	

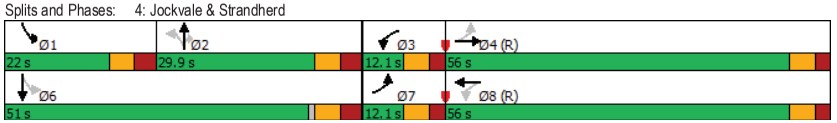
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 22 (18%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 27.1	Intersection LOS: C
Intersection Capacity Utilization 72.7%	ICU Level of Service C
Analysis Period (min) 15	

Description: As per 26-Nov-2018 timings.
As per Signals direction, northbound overage timing off next phase (EB/WB left).

Splits and Phases: 4: Jockvale & Strandherd



Intersection	
Int Delay, s/veh	4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	80	80	0	37	37
Future Vol, veh/h	0	80	80	0	37	37
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	-	-	-	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	0	80	80	0	37	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	191	80	0	0	80	0
Stage 1	80	-	-	-	-	-
Stage 2	111	-	-	-	-	-
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	798	980	-	-	1518	-
Stage 1	943	-	-	-	-	-
Stage 2	914	-	-	-	-	-
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	779	980	-	-	1518	-
Mov Cap-2 Maneuver	779	-	-	-	-	-
Stage 1	943	-	-	-	-	-
Stage 2	892	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	3.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	980	1518	-
HCM Lane V/C Ratio	-	-	0.082	0.024	-
HCM Control Delay (s)	-	-	9	7.4	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	977	142	150	807	54	97	0	106	18	0	8
Future Volume (vph)	15	977	142	150	807	54	97	0	106	18	0	8
Satd. Flow (prot)	1658	3316	1483	1658	3281	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1656	3316	1483	1658	3281	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			275		8			267			261	
Lane Group Flow (vph)	15	977	142	150	861	0	97	106	0	18	8	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	37.0	37.0	19.0	44.6		16.0	30.6		13.4	28.0	
Total Split (%)	11.4%	37.0%	37.0%	19.0%	44.6%		16.0%	30.6%		13.4%	28.0%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	30.7	30.7	11.9	44.5		8.1	31.5		5.7	21.1	
Actuated g/C Ratio	0.05	0.31	0.31	0.12	0.44		0.08	0.32		0.06	0.21	
v/c Ratio	0.18	0.96	0.22	0.76	0.59		0.73	0.16		0.19	0.02	
Control Delay	50.9	54.8	0.8	62.4	24.8		75.2	0.5		50.0	0.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	50.9	54.8	0.8	62.4	24.8		75.2	0.5		50.0	0.0	
LOS	D	D	A	E	C		E	A		D	A	
Approach Delay		48.0			30.4			36.2			34.6	
Approach LOS		D			C			D			C	
Queue Length 50th (m)	3.0	102.6	0.0	29.7	69.2		19.6	0.0		3.6	0.0	
Queue Length 95th (m)	9.8	#145.9	0.0	#59.9	110.3		#45.4	0.0		11.0	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	1019	646	208	1464		137	649		94	518	
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	0.18	0.96	0.22	0.72	0.59		0.71	0.16		0.19	0.02	

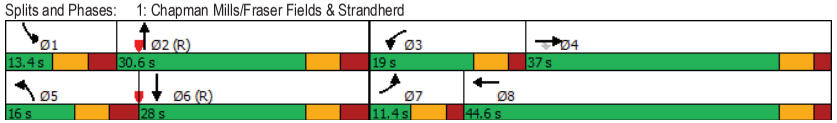
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 39.4	Intersection LOS: D
Intersection Capacity Utilization 66.7%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1089	22	103	990	19	55
Future Volume (vph)	1089	22	103	990	19	55
Satd. Flow (prot)	3304	0	1658	3316	1550	0
Flt Permitted			0.242		0.987	
Satd. Flow (perm)	3304	0	422	3316	1550	0
Satd. Flow (RTOR)	4				55	
Lane Group Flow (vph)	1111	0	103	990	74	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	80.8		80.8	80.8	11.8	
Actuated g/C Ratio	0.81		0.81	0.81	0.12	
v/c Ratio	0.42		0.30	0.37	0.32	
Control Delay	6.4		7.1	4.3	18.9	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	6.4		7.1	4.3	18.9	
LOS	A		A	A	B	
Approach Delay	6.4			4.6	18.9	
Approach LOS	A			A	B	
Queue Length 50th (m)	2.1		4.8	26.1	3.6	
Queue Length 95th (m)	m131.0		17.8	52.5	15.6	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	2669		341	2678	416	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.42		0.30	0.37	0.18	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
3: Andora & Strandherd

08-12-2019

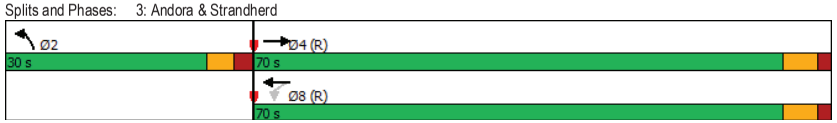
Maximum v/c Ratio: 0.42

Intersection Signal Delay: 5.9	Intersection LOS: A
Intersection Capacity Utilization 64.0%	ICU Level of Service C
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Andora & Strandherd



Lanes, Volumes, Timings
4: Jockvale & Strandherd

08-12-2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	982	129	140	920	350	155	164	147	351	156	18
Future Volume (vph)	19	982	129	140	920	350	155	164	147	351	156	18
Satd. Flow (prot)	1658	3251	0	1658	3151	0	1658	1745	1483	1658	1712	0
Flt Permitted	0.107			0.102			0.647			0.411		
Satd. Flow (perm)	187	3251	0	178	3151	0	1115	1745	1456	714	1712	0
Satd. Flow (RTOR)		14			54				147		6	
Lane Group Flow (vph)	19	1111	0	140	1270	0	155	164	147	351	174	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	15.1	53.0		15.1	53.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	12.6%	44.2%		12.6%	44.2%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	56.0	49.8		63.2	59.6		20.1	20.1	20.1	42.1	42.1	
Actuated g/C Ratio	0.47	0.42		0.53	0.50		0.17	0.17	0.17	0.35	0.35	
v/c Ratio	0.12	0.82		0.69	0.80		0.83	0.56	0.40	0.95	0.29	
Control Delay	16.0	37.6		36.4	30.6		81.2	53.0	10.0	70.4	27.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	16.0	37.6		36.4	30.6		81.2	53.0	10.0	70.4	27.8	
LOS	B	D		D	C		F	D	B	E	C	
Approach Delay		37.2			31.2			48.8			56.3	
Approach LOS		D			C			D			E	
Queue Length 50th (m)	2.2	130.6		17.5	122.1		36.6	36.8	0.0	68.8	28.8	
Queue Length 95th (m)	6.2	161.6		#44.9	#207.2		#68.7	59.3	17.8	#127.9	46.7	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	201	1356		207	1593		213	334	397	369	645	
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	0.09	0.82		0.68	0.80		0.73	0.49	0.37	0.95	0.27	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 82 (68%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

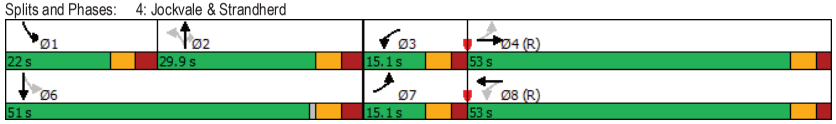
Intersection Signal Delay: 39.2	Intersection LOS: D
Intersection Capacity Utilization 95.6%	ICU Level of Service F
Analysis Period (min) 15	

Description: As per 26-Nov-2018 timings.

As per Signals direction, northbound overage timing off next phase (EB/WB left).

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

Splits and Phases: 4: Jockvale & Strandherd



Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	54	54	0	78	78
Future Vol, veh/h	0	54	54	0	78	78
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	-	-	-	380	-
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	60	60	0	87	87

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	321	60	0	0	60	0
Stage 1	60	-	-	-	-	-
Stage 2	261	-	-	-	-	-
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	673	1005	-	-	1544	-
Stage 1	963	-	-	-	-	-
Stage 2	783	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	635	1005	-	-	1544	-
Mov Cap-2 Maneuver	635	-	-	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	739	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	3.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1005	1544	-
HCM Lane V/C Ratio	-	-	0.06	0.056	-
HCM Control Delay (s)	-	-	8.8	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Appendix H

MMLOS Analysis

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation Inc**	**Project**	**2019-22**
Scenario	**Mion Parcel - 3232 Jockvale Road**	**Date**	**2019-06-25**
Comments			

	INTERSECTIONS	Strandherd & Chapman Mills/Fraser Fields				Strandherd & Jockvale Road				Strandherd & Andora			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	3	4	6	5	3	5	5	5		0 - 2	5	4
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m
	Conflicting Left Turns	Protected	Protected	Protected	Protected	Protected/ Permissive	Protected/ Permissive	Protected/ Permissive	Permissive		Permissive	No left turn / Prohib.	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
	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
	Ped Signal Leading Interval?	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
	Corner Radius	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m		10-15m	10-15m	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**78**	**61**	**28**	**45**	**70**	**37**	**37**	**37**		**85**	**45**	**55**
	Ped. Exposure to Traffic LoS	**B**	**C**	**F**	**D**	**C**	**E**	**E**	**E**	**-**	**B**	**D**	**D**
	Cycle Length												
	Effective Walk Time												
	Average Pedestrian Delay												
	Pedestrian Delay LoS	-	-	-	-	-	-	-	-	-	-	-	-
	Level of Service	**B**	**C**	**F**	**D**	**C**	**E**	**E**	**E**	**-**	**B**	**D**	**D**
		F				**E**				**D**			
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic		Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
	Right Turn Lane Configuration	≤ 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		≤ 25 km/h		
	Cyclist relative to RT motorists	**D**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**D**	**D**	**Not Applicable**	**D**	**-**	**D**	**Not Applicable**	**Not Applicable**
	Separated or Mixed Traffic	**Mixed Traffic**	**Separated**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Mixed Traffic**	**-**	**Mixed Traffic**	**Separated**	**Separated**
	Left Turn Approach	No lane crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	No lane crossed	No lane crossed	No lane crossed	One lane crossed		No lane crossed	2-stage, LT box	2-stage, LT box
	Operating Speed	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h		> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h
	Left Turning Cyclist	**B**	**A**	**A**	**A**	**C**	**C**	**C**	**F**	**-**	**B**	**A**	**A**
	Level of Service	**D**	**A**	**A**	**A**	**D**	**D**	**C**	**F**	**-**	**D**	**A**	**A**
		D				**F**				**D**			
Transit	Average Signal Delay	≤ 40 sec	≤ 40 sec	≤ 30 sec	> 40 sec	> 40 sec	> 40 sec	≤ 40 sec	> 40 sec		≤ 20 sec	≤ 20 sec	≤ 30 sec
	Level of Service	**E**	**E**	**D**	**F**	**F**	**F**	**E**	**F**	**-**	**C**	**C**	**D**
		F				**F**				**D**			
Truck	Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m		10 - 15 m		10 - 15 m
	Number of Receiving Lanes on Departure from Intersection	≥ 2	≥ 2	1	1	≥ 2	≥ 2	1	≥ 2		≥ 2		1
	Level of Service	**B**	**B**	**E**	**E**	**B**	**B**	**E**	**B**	**-**	**B**	**-**	**E**
		E				**E**				**E**			
Auto	Volume to Capacity Ratio	0.81 - 0.90				0.81 - 0.90				0.0 - 0.60			
	Level of Service	**D**				**D**				**A**			

Multi-Modal Level of Service - Segments Form

Consultant	**CGH Transportation Inc**	**Project**	**2019-22**
Scenario	**Mion Parcel - 3232 Jockvale Road**	**Date**	**2019-06-25**
Comments			

SEGMENTS		**Street A**	CMD Interim	CMD Ultimate	Section
			1	2	3
Pedestrian	Sidewalk Width Boulevard Width	**B**	≥ 2 m > 2 m	≥ 2 m > 2 m	
	Avg Daily Curb Lane Traffic Volume		≤ 3000	> 3000	
	Operating Speed On-Street Parking		> 50 to 60 km/h yes	> 50 to 60 km/h yes	
	Exposure to Traffic PLoS		**A**	**B**	**-**
	Effective Sidewalk Width		2.0 m	2.0 m	
	Pedestrian Volume		250 ped/hr	250 ped/hr	
	Crowding PLoS		**B**	**B**	**-**
	Level of Service		**B**	**B**	**-**
Bicycle	Type of Cycling Facility	**A**	Physically Separated	Physically Separated	
	Number of Travel Lanes				
	Operating Speed				
	# of Lanes & Operating Speed LoS		**-**	**-**	**-**
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS		**-**	**-**	**-**
	Bike Lane Blockages				
	Blockage LoS		**-**	**-**	**-**
	Median Refuge Width (no median = < 1.8 m)				
	No. of Lanes at Unsignalized Crossing				
	Sidestreet Operating Speed				
	Unsignalized Crossing - Lowest LoS		**A**	**A**	**-**
	Level of Service		**A**	**A**	**-**
Transit	Facility Type	**A**	Segregated ROW	Segregated ROW	
	Friction or Ratio Transit:Posted Speed				
	Level of Service		**A**	**A**	**-**
Truck	Truck Lane Width	**C**	≤ 3.5 m	≤ 3.5 m	
	Travel Lanes per Direction		1	1	
	Level of Service		**C**	**C**	**-**
Auto	**Level of Service**	**Not Applicable**			

Appendix I

Synchro Intersection Worksheets – 2022 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	530	120	116	728	16	193	0	191	35	0	12
Future Volume (vph)	4	530	120	116	728	16	193	0	191	35	0	12
Satd. Flow (prot)	1658	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1656	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			359		2			306			345	
Lane Group Flow (vph)	4	530	120	116	744	0	193	191	0	35	12	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	29.4	29.4	18.0	36.0		25.0	38.0		14.6	27.6	
Total Split (%)	11.4%	29.4%	29.4%	18.0%	36.0%		25.0%	38.0%		14.6%	27.6%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	20.4	20.4	10.5	35.0		15.3	39.7		6.6	25.6	
Actuated g/C Ratio	0.05	0.20	0.20	0.10	0.35		0.15	0.40		0.07	0.26	
v/c Ratio	0.05	0.79	0.20	0.67	0.64		0.76	0.25		0.32	0.02	
Control Delay	46.8	46.5	0.8	57.6	43.0		59.8	0.8		52.3	0.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	46.8	46.5	0.8	57.6	43.0		59.8	0.8		52.3	0.1	
LOS	D	D	A	E	D		E	A		D	A	
Approach Delay		38.1			45.0			30.5			39.0	
Approach LOS		D			D			C			D	
Queue Length 50th (m)	0.8	53.8	0.0	22.9	76.6		37.4	0.0		6.9	0.0	
Queue Length 95th (m)	4.4	71.2	0.0	#44.4	106.1		#65.6	0.0		17.1	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	762	617	192	1158		286	773		116	635	
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	0.05	0.70	0.19	0.60	0.64		0.67	0.25		0.30	0.02	

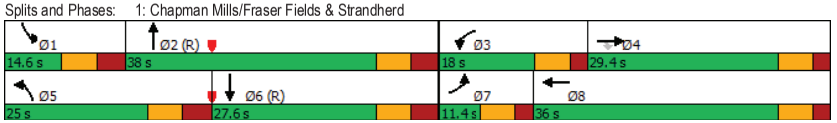
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 39.7	Intersection LOS: D
Intersection Capacity Utilization 66.1%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	744	12	28	818	43	92
Future Volume (vph)	744	12	28	818	43	92
Satd. Flow (prot)	1741	0	1658	3316	1540	0
Flt Permitted			0.323		0.984	
Satd. Flow (perm)	1741	0	564	3316	1540	0
Satd. Flow (RTOR)	2				92	
Lane Group Flow (vph)	756	0	28	818	135	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	76.2		76.2	76.2	12.0	
Actuated g/C Ratio	0.76		0.76	0.76	0.12	
v/c Ratio	0.57		0.07	0.32	0.51	
Control Delay	9.4		4.2	4.5	21.9	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	9.4		4.2	4.5	21.9	
LOS	A		A	A	C	
Approach Delay	9.4			4.5	21.9	
Approach LOS	A			A	C	
Queue Length 50th (m)	79.8		1.0	20.1	8.3	
Queue Length 95th (m)	93.3		4.6	41.0	24.5	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	1327		430	2527	442	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.57		0.07	0.32	0.31	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 8.0	Intersection LOS: A
Intersection Capacity Utilization 61.6%	ICU Level of Service B
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

Splits and Phases: 3: Andora & Strandherd

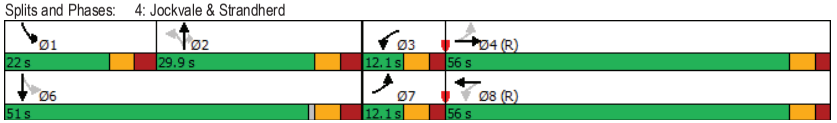
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	805	11	35	793	216	33	40	30	221	47	18
Future Volume (vph)	22	805	11	35	793	216	33	40	30	221	47	18
Satd. Flow (prot)	1658	3308	0	1658	3182	0	1658	1745	1483	1658	1663	0
Flt Permitted	0.210			0.283			0.715			0.443		
Satd. Flow (perm)	365	3308	0	493	3182	0	1241	1745	1463	772	1663	0
Satd. Flow (RTOR)		1			35				146		18	
Lane Group Flow (vph)	22	816	0	35	1009	0	33	40	30	221	65	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	12.1	56.0		12.1	56.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	10.1%	46.7%		10.1%	46.7%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	72.2	68.5		72.5	68.7		12.6	12.6	12.6	31.0	31.0	
Actuated g/C Ratio	0.60	0.57		0.60	0.57		0.10	0.10	0.10	0.26	0.26	
v/c Ratio	0.08	0.43		0.10	0.55		0.25	0.22	0.11	0.72	0.15	
Control Delay	12.0	18.5		11.9	19.9		52.2	50.0	0.7	49.8	23.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	12.0	18.5		11.9	19.9		52.2	50.0	0.7	49.8	23.1	
LOS	B	B		B	B		D	D	A	D	C	
Approach Delay		18.3			19.6			36.4			43.8	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	1.9	65.2		3.1	85.0		7.8	9.5	0.0	46.5	8.8	
Queue Length 95th (m)	7.0	102.2		9.6	133.4		16.6	18.5	0.0	60.8	17.4	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	285	1888		358	1835		237	334	398	312	634	
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	0.08	0.43		0.10	0.55		0.14	0.12	0.08	0.71	0.10	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 22 (18%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 63.2% ICU Level of Service B
Analysis Period (min) 15
Description: As per 26-Nov-2018 timings.
As per Signals direction, northbound overage timing off next phase (EB/WB left).

Splits and Phases: 4: Jockvale & Strandherd



Intersection	
Int Delay, s/veh	5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	112	80	0	55	37
Future Vol, veh/h	0	112	80	0	55	37
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	-	-	-	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	0	112	80	0	55	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	227	80	0	0	80	0
Stage 1	80	-	-	-	-	-
Stage 2	147	-	-	-	-	-
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	761	980	-	-	1518	-
Stage 1	943	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	734	980	-	-	1518	-
Mov Cap-2 Maneuver	734	-	-	-	-	-
Stage 1	943	-	-	-	-	-
Stage 2	848	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	4.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	980	1518	-
HCM Lane V/C Ratio	-	-	0.114	0.036	-
HCM Control Delay (s)	-	-	9.1	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	40	5	0	88	0	0	0	0	0	0	8
Future Vol, veh/h	0	40	5	0	88	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	40	5	0	88	0	0	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	43	-	-	88
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	1027	0	0	970
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	1027	-	-	970
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	970
HCM Lane V/C Ratio	-	-	-	-	-	0.008
HCM Control Delay (s)	0	-	-	-	-	8.7
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	45	5	0	96	0	0	0	0	0	0	8
Future Vol, veh/h	0	45	5	0	96	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	45	5	0	96	0	0	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	48	-	-	96
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	1021	0	0	960
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	1021	-	-	960
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	960
HCM Lane V/C Ratio	-	-	-	-	-	0.008
HCM Control Delay (s)	0	-	-	-	-	8.8
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.4											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	50	5	0	104	0	0	0	0	0	0	8
Future Vol, veh/h	0	50	5	0	104	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	50	5	0	104	0	0	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	53	-	-	104
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	1014	0	0	951
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	1014	-	-	951
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	951
HCM Lane V/C Ratio	-	-	-	-	-	0.008
HCM Control Delay (s)	0	-	-	-	-	8.8
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	850	164	162	677	54	116	0	117	18	0	8
Future Volume (vph)	15	850	164	162	677	54	116	0	117	18	0	8
Satd. Flow (prot)	1658	3316	1483	1658	3274	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1658	3316	1483	1658	3274	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			275		10			297			261	
Lane Group Flow (vph)	15	850	164	162	731	0	116	117	0	18	8	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	36.2	36.2	20.1	44.9		17.9	30.4		13.3	25.8	
Total Split (%)	11.4%	36.2%	36.2%	20.1%	44.9%		17.9%	30.4%		13.3%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	28.6	28.6	12.8	43.3		9.8	32.8		5.6	20.6	
Actuated g/C Ratio	0.05	0.29	0.29	0.13	0.43		0.10	0.33		0.06	0.21	
v/c Ratio	0.18	0.90	0.26	0.76	0.51		0.71	0.17		0.20	0.02	
Control Delay	50.9	47.3	1.0	61.3	22.5		68.0	0.5		50.2	0.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	50.9	47.3	1.0	61.3	22.5		68.0	0.5		50.2	0.0	
LOS	D	D	A	E	C		E	A		D	A	
Approach Delay		40.0			29.6			34.1			34.8	
Approach LOS		D			C			C			C	
Queue Length 50th (m)	3.0	85.8	0.0	32.1	53.8		23.3	0.0		3.6	0.0	
Queue Length 95th (m)	9.8	#119.0	0.0	#62.4	87.3		#49.3	0.0		11.0	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	988	634	227	1421		171	685		92	512	
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	0.18	0.86	0.26	0.71	0.51		0.68	0.17		0.20	0.02	

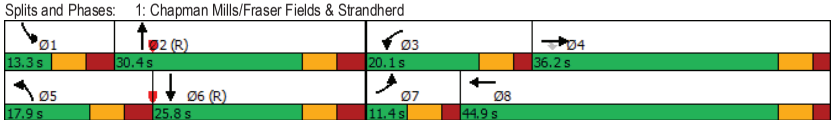
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 35.0	Intersection LOS: D
Intersection Capacity Utilization 64.8%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	959	29	110	868	25	61
Future Volume (vph)	959	29	110	868	25	61
Satd. Flow (prot)	3300	0	1658	3316	1541	0
Flt Permitted			0.280		0.986	
Satd. Flow (perm)	3300	0	488	3316	1541	0
Satd. Flow (RTOR)	6				61	
Lane Group Flow (vph)	988	0	110	868	86	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	80.8		80.8	80.8	11.8	
Actuated g/C Ratio	0.81		0.81	0.81	0.12	
v/c Ratio	0.37		0.28	0.32	0.36	
Control Delay	6.6		6.3	4.0	19.8	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	6.6		6.3	4.0	19.8	
LOS	A		A	A	B	
Approach Delay	6.6			4.3	19.8	
Approach LOS	A			A	B	
Queue Length 50th (m)	2.2		5.0	21.7	4.8	
Queue Length 95th (m)	m127.5		17.6	44.2	17.6	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	2666		394	2678	419	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.37		0.28	0.32	0.21	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

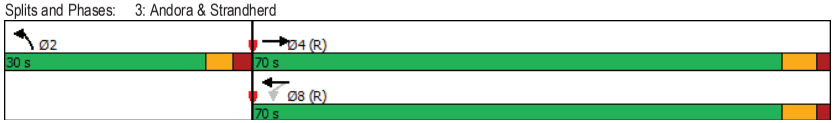
Maximum v/c Ratio: 0.37

Intersection Signal Delay: 6.1	Intersection LOS: A
Intersection Capacity Utilization 60.7%	ICU Level of Service B
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Andora & Strandherd



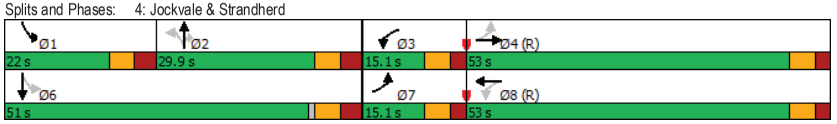
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	955	41	74	887	335	74	106	86	339	94	18
Future Volume (vph)	19	955	41	74	887	335	74	106	86	339	94	18
Satd. Flow (prot)	1658	3293	0	1658	3151	0	1658	1745	1483	1658	1696	0
Flt Permitted	0.141			0.181			0.685			0.464		
Satd. Flow (perm)	246	3293	0	316	3151	0	1179	1745	1456	806	1696	0
Satd. Flow (RTOR)		4			54				146		9	
Lane Group Flow (vph)	19	996	0	74	1222	0	74	106	86	339	112	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	15.1	53.0		15.1	53.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	12.6%	44.2%		12.6%	44.2%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	64.4	59.4		69.0	65.5		14.3	14.3	14.3	36.3	36.3	
Actuated g/C Ratio	0.54	0.50		0.58	0.55		0.12	0.12	0.12	0.30	0.30	
v/c Ratio	0.09	0.61		0.28	0.70		0.53	0.51	0.28	0.97	0.22	
Control Delay	13.4	25.8		14.7	24.1		61.8	57.0	2.8	78.7	28.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	13.4	25.8		14.7	24.1		61.8	57.0	2.8	78.7	28.5	
LOS	B	C		B	C		E	E	A	E	C	
Approach Delay		25.6			23.5			40.8			66.2	
Approach LOS		C			C			D			E	
Queue Length 50th (m)	1.8	92.5		7.2	92.7		17.8	25.4	0.0	75.0	19.3	
Queue Length 95th (m)	6.2	138.5		17.3	#193.6		31.4	40.3	1.4	#111.6	30.4	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	242	1630		282	1744		225	334	397	351	641	
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	0.08	0.61		0.26	0.70		0.33	0.32	0.22	0.97	0.17	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 82 (68%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97
Intersection Signal Delay: 32.1 Intersection LOS: C
Intersection Capacity Utilization 83.9% ICU Level of Service E
Analysis Period (min) 15
Description: As per 26-Nov-2018 timings.
As per Signals direction, northbound overage timing off next phase (EB/WB left).
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Jockvale & Strandherd



Intersection	
Int Delay, s/veh	4.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	82	54	0	110	78
Future Vol, veh/h	0	82	54	0	110	78
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	-	-	-	380	-
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	91	60	0	122	87

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	391	60	0	0	60	0
Stage 1	60	-	-	-	-	-
Stage 2	331	-	-	-	-	-
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	613	1005	-	-	1544	-
Stage 1	963	-	-	-	-	-
Stage 2	728	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	565	1005	-	-	1544	-
Mov Cap-2 Maneuver	565	-	-	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	670	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	4.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1005	1544	-
HCM Lane V/C Ratio	-	-	0.091	0.079	-
HCM Control Delay (s)	-	-	8.9	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.3	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	80	10	0	61	0	0	0	0	0	0	7
Future Vol, veh/h	0	80	10	0	61	0	0	0	0	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	80	10	0	61	0	0	0	0	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	85	-	-	61
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	974	0	0	1004
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	974	-	-	1004
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	1004
HCM Lane V/C Ratio	-	-	-	-	-	0.007
HCM Control Delay (s)	0	-	-	-	-	8.6
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	90	10	0	68	0	0	0	0	0	0	7
Future Vol, veh/h	0	90	10	0	68	0	0	0	0	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	90	10	0	68	0	0	0	0	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	95	-	-	68
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	962	0	0	995
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	962	-	-	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	995
HCM Lane V/C Ratio	-	-	-	-	-	0.007
HCM Control Delay (s)	0	-	-	-	-	8.6
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	100	10	0	75	0	0	0	0	0	0	7
Future Vol, veh/h	0	100	10	0	75	0	0	0	0	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	100	10	0	75	0	0	0	0	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	105	-	-	75
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	949	0	0	986
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	949	-	-	986
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	986
HCM Lane V/C Ratio	-	-	-	-	-	0.007
HCM Control Delay (s)	0	-	-	-	-	8.7
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Appendix J

Synchro Intersection Worksheets – 2027 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	623	120	116	850	16	193	0	191	35	0	12
Future Volume (vph)	4	623	120	116	850	16	193	0	191	35	0	12
Satd. Flow (prot)	1658	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1656	3316	1483	1658	3304	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			359		2			291			345	
Lane Group Flow (vph)	4	623	120	116	866	0	193	191	0	35	12	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	29.4	29.4	18.0	36.0		25.0	38.0		14.6	27.6	
Total Split (%)	11.4%	29.4%	29.4%	18.0%	36.0%		25.0%	38.0%		14.6%	27.6%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	21.9	21.9	10.5	36.5		15.3	38.3		6.5	24.0	
Actuated g/C Ratio	0.05	0.22	0.22	0.10	0.36		0.15	0.38		0.06	0.24	
v/c Ratio	0.05	0.86	0.20	0.67	0.72		0.76	0.26		0.32	0.02	
Control Delay	46.8	50.5	0.7	57.1	43.6		59.8	1.0		52.8	0.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	46.8	50.5	0.7	57.1	43.6		59.8	1.0		52.8	0.1	
LOS	D	D	A	E	D		E	A		D	A	
Approach Delay		42.5			45.2			30.6			39.3	
Approach LOS		D			D			C			D	
Queue Length 50th (m)	0.8	63.7	0.0	22.8	85.1		37.4	0.0		6.9	0.0	
Queue Length 95th (m)	4.4	#90.0	0.0	#44.7	#128.5		#65.6	0.4		17.1	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	762	617	192	1208		286	747		114	618	
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	0.05	0.82	0.19	0.60	0.72		0.67	0.26		0.31	0.02	

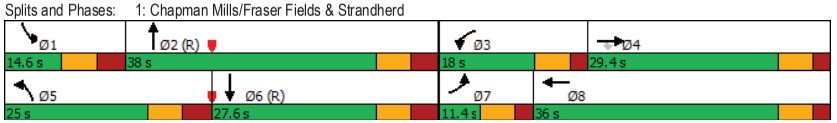
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 41.5	Intersection LOS: D
Intersection Capacity Utilization 69.7%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	837	12	28	942	43	92
Future Volume (vph)	837	12	28	942	43	92
Satd. Flow (prot)	3308	0	1658	3316	1540	0
Flt Permitted			0.325		0.984	
Satd. Flow (perm)	3308	0	566	3316	1540	0
Satd. Flow (RTOR)	3				92	
Lane Group Flow (vph)	849	0	28	942	135	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	76.2		76.2	76.2	12.0	
Actuated g/C Ratio	0.76		0.76	0.76	0.12	
v/c Ratio	0.34		0.06	0.37	0.51	
Control Delay	1.6		4.2	4.8	21.9	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	1.6		4.2	4.8	21.9	
LOS	A		A	A	C	
Approach Delay	1.6			4.8	21.9	
Approach LOS	A			A	C	
Queue Length 50th (m)	3.6		1.0	24.4	8.3	
Queue Length 95th (m)	7.0		4.5	49.2	24.5	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	2522		431	2527	442	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.34		0.06	0.37	0.31	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 4.6	Intersection LOS: A
Intersection Capacity Utilization 47.0%	ICU Level of Service A
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

Splits and Phases: 3: Andora & Strandherd

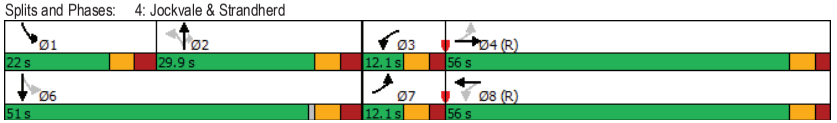
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	844	67	63	854	226	93	74	68	231	73	18
Future Volume (vph)	22	844	67	63	854	226	93	74	68	231	73	18
Satd. Flow (prot)	1658	3273	0	1658	3186	0	1658	1745	1483	1658	1687	0
Flt Permitted	0.176			0.218			0.698			0.489		
Satd. Flow (perm)	306	3273	0	380	3186	0	1211	1745	1463	852	1687	0
Satd. Flow (RTOR)		8			34				146		12	
Lane Group Flow (vph)	22	911	0	63	1080	0	93	74	68	231	91	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	12.1	56.0		12.1	56.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	10.1%	46.7%		10.1%	46.7%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	64.5	59.6		67.1	62.7		15.3	15.3	15.3	36.9	36.9	
Actuated g/C Ratio	0.54	0.50		0.56	0.52		0.13	0.13	0.13	0.31	0.31	
v/c Ratio	0.10	0.56		0.22	0.64		0.60	0.33	0.22	0.64	0.17	
Control Delay	13.5	24.3		14.4	24.3		64.7	50.1	1.6	41.4	25.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	13.5	24.3		14.4	24.3		64.7	50.1	1.6	41.4	25.5	
LOS	B	C		B	C		E	D	A	D	C	
Approach Delay		24.0			23.7			41.8			36.9	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	2.2	83.3		6.3	102.8		22.3	17.1	0.0	46.2	14.3	
Queue Length 95th (m)	7.0	117.3		15.2	147.3		37.8	30.1	0.0	63.5	24.7	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	233	1629		285	1681		232	334	398	363	640	
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	0.09	0.56		0.22	0.64		0.40	0.22	0.17	0.64	0.14	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 22 (18%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64
Intersection Signal Delay: 27.1 Intersection LOS: C
Intersection Capacity Utilization 73.0% ICU Level of Service D
Analysis Period (min) 15
Description: As per 26-Nov-2018 timings.
As per Signals direction, northbound overage timing off next phase (EB/WB left).

Splits and Phases: 4: Jockvale & Strandherd



Intersection	
Int Delay, s/veh	5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	112	80	0	55	37
Future Vol, veh/h	0	112	80	0	55	37
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	-	-	-	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	0	112	80	0	55	37

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	227	80	0	0	80	0
Stage 1	80	-	-	-	-	-
Stage 2	147	-	-	-	-	-
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	761	980	-	-	1518	-
Stage 1	943	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	734	980	-	-	1518	-
Mov Cap-2 Maneuver	734	-	-	-	-	-
Stage 1	943	-	-	-	-	-
Stage 2	848	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	4.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	980	1518	-
HCM Lane V/C Ratio	-	-	0.114	0.036	-
HCM Control Delay (s)	-	-	9.1	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	40	5	0	88	0	0	0	0	0	0	8
Future Vol, veh/h	0	40	5	0	88	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	40	5	0	88	0	0	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	43	-	-	88
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	1027	0	0	970
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	1027	-	-	970
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	970
HCM Lane V/C Ratio	-	-	-	-	-	0.008
HCM Control Delay (s)	0	-	-	-	-	8.7
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	45	5	0	96	0	0	0	0	0	0	8
Future Vol, veh/h	0	45	5	0	96	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	45	5	0	96	0	0	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	48	-	-	96
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	1021	0	0	960
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	1021	-	-	960
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	960
HCM Lane V/C Ratio	-	-	-	-	-	0.008
HCM Control Delay (s)	0	-	-	-	-	8.8
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.4											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	50	5	0	104	0	0	0	0	0	0	8
Future Vol, veh/h	0	50	5	0	104	0	0	0	0	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	50	5	0	104	0	0	0	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	53	-	-	104
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	1014	0	0	951
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	1014	-	-	951
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	951
HCM Lane V/C Ratio	-	-	-	-	-	0.008
HCM Control Delay (s)	0	-	-	-	-	8.8
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	984	164	162	813	54	116	0	117	18	0	8
Future Volume (vph)	15	984	164	162	813	54	116	0	117	18	0	8
Satd. Flow (prot)	1658	3316	1483	1658	3282	0	1658	1483	0	1658	1483	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1658	3316	1483	1658	3282	0	1658	1483	0	1658	1483	0
Satd. Flow (RTOR)			275		8			289			261	
Lane Group Flow (vph)	15	984	164	162	867	0	116	117	0	18	8	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phase	7	4	4	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	11.4	24.4	24.4	11.4	24.4		12.7	25.7		12.7	25.7	
Total Split (s)	11.4	36.2	36.2	20.1	44.9		17.9	30.4		13.3	25.8	
Total Split (%)	11.4%	36.2%	36.2%	20.1%	44.9%		17.9%	30.4%		13.3%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		4.2	4.2		4.2	4.2	
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	
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		7.7	7.7		7.7	7.7	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	5.0	30.7	30.7	12.8	45.3		9.7	30.7		5.6	18.6	
Actuated g/C Ratio	0.05	0.31	0.31	0.13	0.45		0.10	0.31		0.06	0.19	
v/c Ratio	0.18	0.97	0.25	0.76	0.58		0.72	0.18		0.20	0.02	
Control Delay	50.9	56.5	0.9	60.7	23.2		68.9	0.6		50.3	0.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	50.9	56.5	0.9	60.7	23.2		68.9	0.6		50.3	0.0	
LOS	D	E	A	E	C		E	A		D	A	
Approach Delay		48.6			29.1			34.6			34.8	
Approach LOS		D			C			C			C	
Queue Length 50th (m)	3.0	105.1	0.0	32.1	67.6		23.3	0.0		3.6	0.0	
Queue Length 95th (m)	9.8	#150.7	0.0	#61.6	108.0		#49.3	0.0		11.0	0.0	
Internal Link Dist (m)		320.1			392.0			352.4			77.2	
Turn Bay Length (m)	40.0		145.0	40.0			105.0			40.0		
Base Capacity (vph)	82	1018	645	227	1492		169	655		92	488	
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	0.18	0.97	0.25	0.71	0.58		0.69	0.18		0.20	0.02	

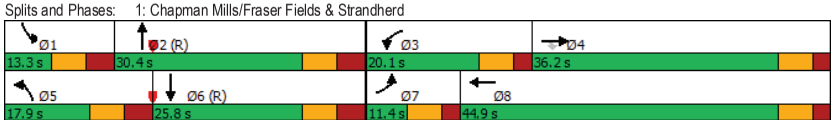
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 38.9	Intersection LOS: D
Intersection Capacity Utilization 68.7%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 1: Chapman Mills/Fraser Fields & Strandherd



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1100	29	110	1002	25	61
Future Volume (vph)	1100	29	110	1002	25	61
Satd. Flow (prot)	3300	0	1658	3316	1541	0
Flt Permitted			0.237		0.986	
Satd. Flow (perm)	3300	0	414	3316	1541	0
Satd. Flow (RTOR)	5				61	
Lane Group Flow (vph)	1129	0	110	1002	86	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	23.0		24.0	24.0	24.8	
Total Split (s)	70.0		70.0	70.0	30.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Yellow Time (s)	4.2		4.2	4.2	3.3	
All-Red Time (s)	1.8		1.8	1.8	2.5	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	5.8	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
Act Effct Green (s)	80.8		80.8	80.8	11.8	
Actuated g/C Ratio	0.81		0.81	0.81	0.12	
v/c Ratio	0.42		0.33	0.37	0.36	
Control Delay	7.6		7.7	4.3	19.8	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	7.6		7.7	4.3	19.8	
LOS	A		A	A	B	
Approach Delay	7.6			4.7	19.8	
Approach LOS	A			A	B	
Queue Length 50th (m)	2.3		5.3	26.5	4.8	
Queue Length 95th (m)	m132.4		19.9	53.3	17.6	
Internal Link Dist (m)	392.0			412.4	85.9	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	2666		334	2678	419	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.42		0.33	0.37	0.21	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 4:EBT and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

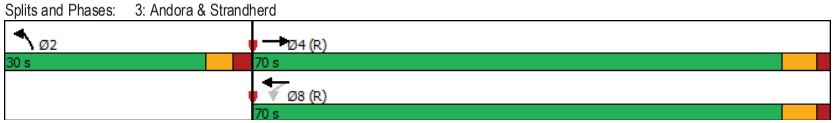
Maximum v/c Ratio: 0.42

Intersection Signal Delay: 6.6	Intersection LOS: A
Intersection Capacity Utilization 64.8%	ICU Level of Service C
Analysis Period (min) 15	

Description: As per 20-Mar-2016 timings.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Andora & Strandherd



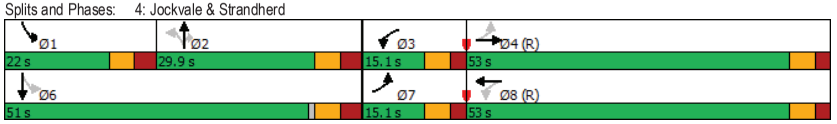
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	999	129	140	940	350	155	164	147	351	156	18
Future Volume (vph)	19	999	129	140	940	350	155	164	147	351	156	18
Satd. Flow (prot)	1658	3251	0	1658	3152	0	1658	1745	1483	1658	1712	0
Flt Permitted	0.100			0.096			0.647			0.411		
Satd. Flow (perm)	175	3251	0	167	3152	0	1115	1745	1456	714	1712	0
Satd. Flow (RTOR)		14			52				147		6	
Lane Group Flow (vph)	19	1128	0	140	1290	0	155	164	147	351	174	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phase	7	4		3	8		2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	11.1	36.1		11.1	36.1		29.9	29.9	29.9	11.9	29.9	
Total Split (s)	15.1	53.0		15.1	53.0		29.9	29.9	29.9	22.0	51.0	
Total Split (%)	12.6%	44.2%		12.6%	44.2%		24.9%	24.9%	24.9%	18.3%	42.5%	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.4	2.4		2.4	2.4		3.2	3.2	3.2	3.2	3.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.1	6.1		6.1	6.1		6.9	6.9	6.9	6.9	6.9	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes		
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	56.0	49.7		63.2	59.6		20.1	20.1	20.1	42.1	42.1	
Actuated g/C Ratio	0.47	0.41		0.53	0.50		0.17	0.17	0.17	0.35	0.35	
v/c Ratio	0.12	0.83		0.70	0.81		0.83	0.56	0.40	0.95	0.29	
Control Delay	16.1	38.3		39.1	31.2		81.2	53.0	10.0	70.4	27.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	16.1	38.3		39.1	31.2		81.2	53.0	10.0	70.4	27.8	
LOS	B	D		D	C		F	D	B	E	C	
Approach Delay		37.9			32.0			48.8			56.3	
Approach LOS		D			C			D			E	
Queue Length 50th (m)	2.2	133.8		17.5	125.7		36.6	36.8	0.0	68.8	28.8	
Queue Length 95th (m)	6.2	#167.6		#47.2	#213.3		#68.7	59.3	17.8	#127.9	46.7	
Internal Link Dist (m)		412.4			189.1			101.8			60.4	
Turn Bay Length (m)	65.0			115.0			90.0		51.0	38.0		
Base Capacity (vph)	196	1355		202	1592		213	334	397	369	645	
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	0.10	0.83		0.69	0.81		0.73	0.49	0.37	0.95	0.27	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 82 (68%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95
Intersection Signal Delay: 39.7 Intersection LOS: D
Intersection Capacity Utilization 96.1% ICU Level of Service F
Analysis Period (min) 15
Description: As per 26-Nov-2018 timings.
As per Signals direction, northbound overage timing off next phase (EB/WB left).
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Jockvale & Strandherd



Intersection	
Int Delay, s/veh	4.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	82	54	0	110	78
Future Vol, veh/h	0	82	54	0	110	78
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	-	-	-	380	-
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	91	60	0	122	87

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	391	60	0	0	60	0
Stage 1	60	-	-	-	-	-
Stage 2	331	-	-	-	-	-
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	613	1005	-	-	1544	-
Stage 1	963	-	-	-	-	-
Stage 2	728	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	565	1005	-	-	1544	-
Mov Cap-2 Maneuver	565	-	-	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	670	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	4.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1005	1544	-
HCM Lane V/C Ratio	-	-	0.091	0.079	-
HCM Control Delay (s)	-	-	8.9	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.3	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	80	10	0	61	0	0	0	0	0	0	7
Future Vol, veh/h	0	80	10	0	61	0	0	0	0	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	80	10	0	61	0	0	0	0	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	85	-	-	61
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	974	0	0	1004
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	974	-	-	1004
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	1004
HCM Lane V/C Ratio	-	-	-	-	-	0.007
HCM Control Delay (s)	0	-	-	-	-	8.6
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	90	10	0	68	0	0	0	0	0	0	7
Future Vol, veh/h	0	90	10	0	68	0	0	0	0	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	90	10	0	68	0	0	0	0	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	95	-	-	68
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	962	0	0	995
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	962	-	-	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	995
HCM Lane V/C Ratio	-	-	-	-	-	0.007
HCM Control Delay (s)	0	-	-	-	-	8.6
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Intersection												
Int Delay, s/veh	0.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	100	10	0	75	0	0	0	0	0	0	7
Future Vol, veh/h	0	100	10	0	75	0	0	0	0	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	100	10	0	75	0	0	0	0	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	105	-	-	75
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	949	0	0	986
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	949	-	-	986
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0	8.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	-	-	986
HCM Lane V/C Ratio	-	-	-	-	-	0.007
HCM Control Delay (s)	0	-	-	-	-	8.7
HCM Lane LOS	A	-	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-	-	0

Appendix K

TDM Checklist

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

Legend

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

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

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

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

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

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