3288 Greenbank Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report (revised)

Prepared for:

Caivan Communities
2934 Baseline Road Suite 302
Ottawa, Ontario, K2H 1B2

Prepared by:

13 Markham Avenue
Nepean, ON K2G 3Z1

September 2019

PN: 2019-09

Table of Contents

List of Figures

Table of Tables

List of Appendices

1 Screening

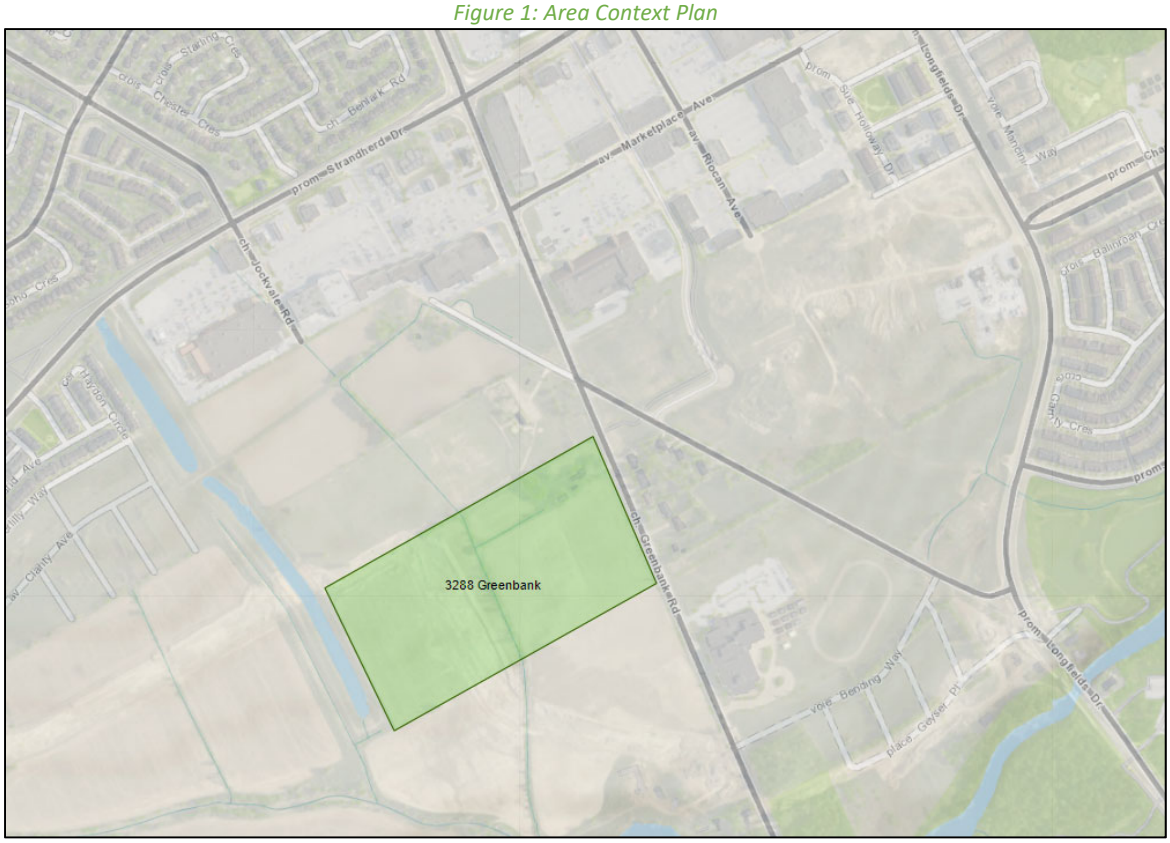
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required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

2 Existing and Planned Conditions

2.1 Proposed Development

The proposed development, located at 3288 Greenbank Road, is currently zoned as Development Reserve (DR). The existing land is currently a mix of farm fields and a private dwelling. The proposed development is for a zoning by-law amendment and plan of subdivision application and includes a total of 328 apartment units and 429 townhome units within a single development phase. Jockvale Road will be extended south from the adjacent development to the north, Chapman Mills Drive will be extended west of Greenbank Road with the adjacent development to the north, and a new east-west road Street 'B' will be constructed along the south frontage with the adjacent project owner to connect to Greenbank Road. Two right-in/right-out accesses are proposed along Chapman Mills Road, with a signalized full movement intersection at Jockvale Road and Chapman Mills. Three local road intersections will connect to Street 'B'. The anticipated full build-out and occupancy horizon is 2025. The development is located within the Nepean Towncentre Design Priority and Community Design Plan area, and the Nepean Area 7 Secondary Plan area. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: March 13, 2019

NORTH

scale | 1:2000

legend

- Rear Lane Town
- Back to Back Town
- Stacked Back to Back Town
- Apartment
- Park
- School
- Utility Corridor

unit count

Rear Lane Town	41
B2B Town	76
Stacked B2B Town	312
TOTAL	429

parking count

Parking Required	312
Parking Provided	320

mattamyHOMES

NAK design strategies
421 Roncesvalles Avenue | Toronto, Ontario | M6R 2N1
tel: 416.340.8700 | fax: 416.340.7100 | info@nak-design.com

MATTAMY | BARRHAVEN TOWN CENTRE

due diligence plan

VERSION 5 - SERVICED BLOCK / 4ac. SCHOOL SITE

date | 04 September 2019

2.2 Existing Conditions

2.2.1 Area Road Network

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 metre west of Greenbank Road and 20.0 metre to the east.

Strandherd Drive: Strandherd Drive is a City of Ottawa arterial road with a four-lane urban cross-section, including sidewalks. The posted speed limit is 60 km/h and the Ottawa Official Plan reserves a 44.5 metre right of way.

Marketplace Avenue: Marketplace Avenue is a City of Ottawa collector road with a two-lane urban cross-section, including sidewalks and on-street parking. The posted speed limit is 50 km/h and the right-of-way is 20.0 metre.

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 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, otherwise an unposted 50km/h speed limit, and the right-of-way is 41.0 metres.

2.2.2 Existing Intersections

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.
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.
Strandherd Drive / Greenbank 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, two through lanes, an auxiliary channelized right-turn lane, and a pocket bike lane. The northbound approach consists of dual auxiliary left-turn lanes, a through lane, a shared through/right-turn lane and a bike lane. The southbound approach consists of dual auxiliary left-turn lanes, two through lanes, an auxiliary channelized right-turn lane, and a pocket bike lane. No turn restrictions were noted.

2.2.3 Existing Driveways

Along Greenbank Road, there are two accesses to the Barrhaven Towncentre, two accesses to the Loblaws site in the Chapman Mills Marketplace, and a residential driveways and St Joseph High School accesses are south of the Jockvale Road intersection. The Barrhaven Towncentre accesses are both right-in/right-out, the Loblaws access to the parking lot is right-in/right-out, and the loading access at the back of Loblaws permits full movements.

Along Strandherd Drive, there are an additional three right-in/right-out accesses and a signalized intersection for the Barrhaven Towncentre.

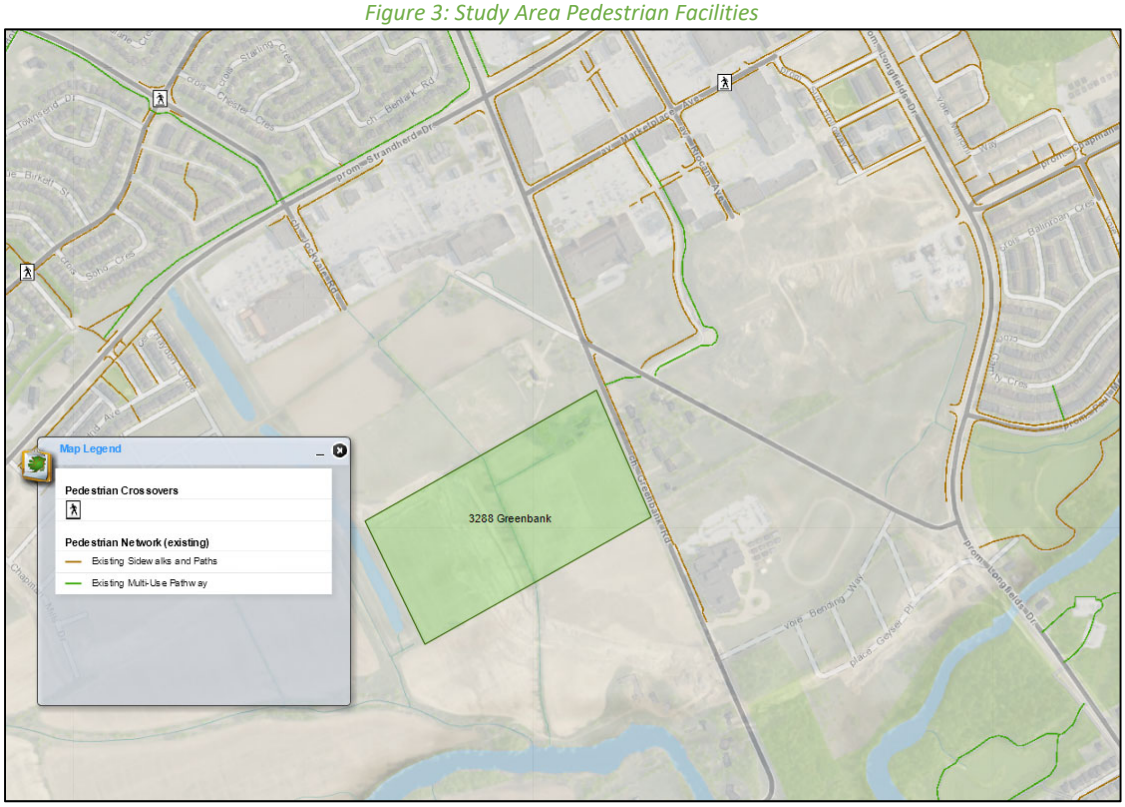
The On The Green golf range and mini putt access is located on Jockvale Road, west of Greenbank Road.

2.2.4 Cycling and Pedestrian Facilities

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

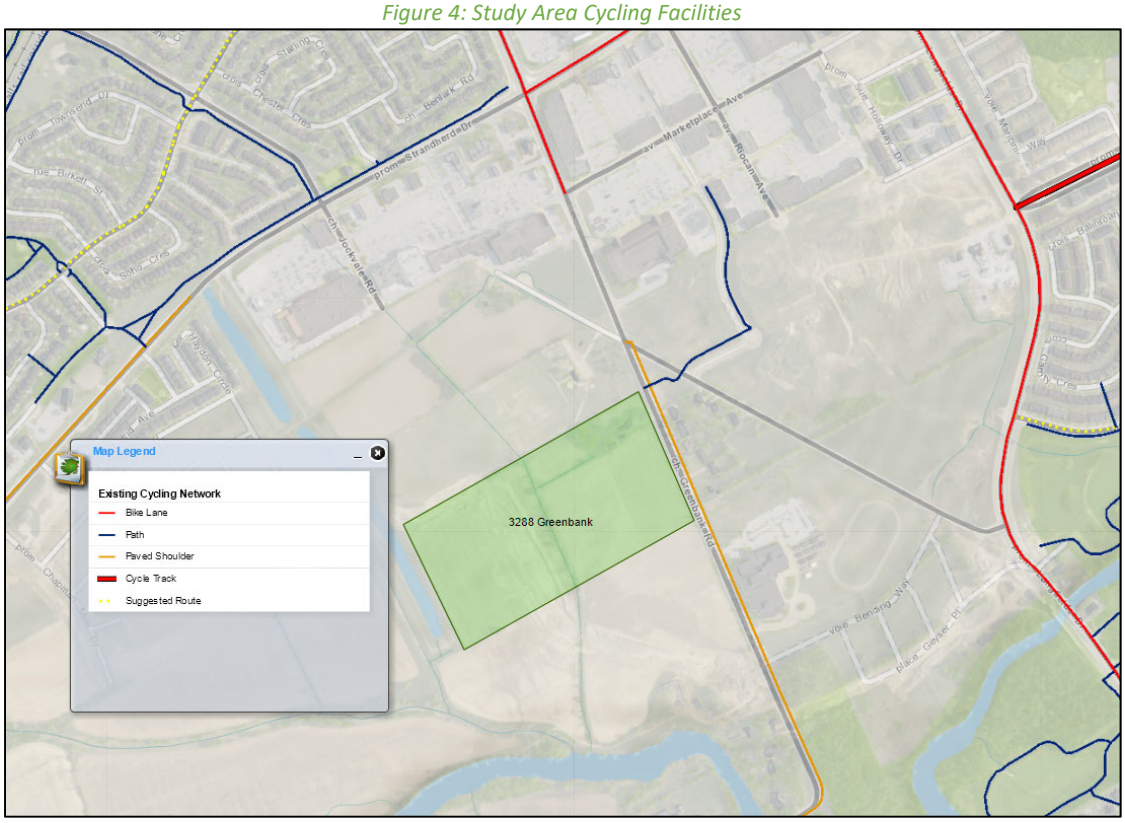
Sidewalks are provided along both sides of the roadways in the study area with a multi-use pathway on the north side of Strandherd Drive and along the Southwest Transitway. The cycling network consists of the bike lanes north and east of the Greenbank Road and Strandherd Drive intersection, the multi-use pathways and a path along the east side of Greenbank Road, south of Jockvale Road.

Figure 3: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: March 13, 2019

Figure 4: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: March 13, 2019

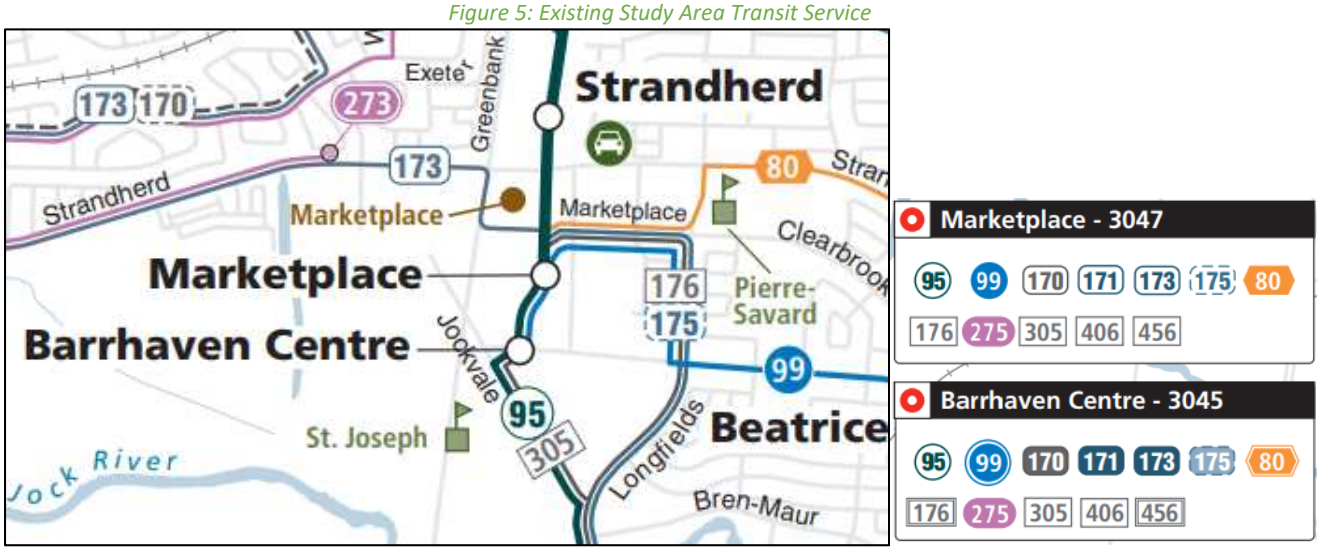
2.2.5 Existing Transit

Within the study area, the Southwest Transitway ends at the Barrhaven Towncentre Station, and includes Marketplace and Strandherd Stations. Routes #80, 95, 99, 170, 171, 173, 175, 176, 276, 305, 406, and 456 stop at the Marketplace and Barrhaven Towncentre Stations, with route #173 traveling along Marketplace Avenue to Greenbank Road and west on Strandherd Drive, and routes #95 and 305 south on Greenbank Road from Jockvale Road. An additional route #273 travels along Strandherd Drive, west of Jockvale Road. The frequency of these routes within proximity of the proposed site currently are:

- Route #95 – under 5 minutes in the peak direction, and 10-15 minutes or 30 minutes in the off-peak direction and off-peak times
- Route #99 – every 15 minutes in the peak direction, and 30 minutes in the off-peak direction and off-peak times
- Route #173 – every 30 minutes

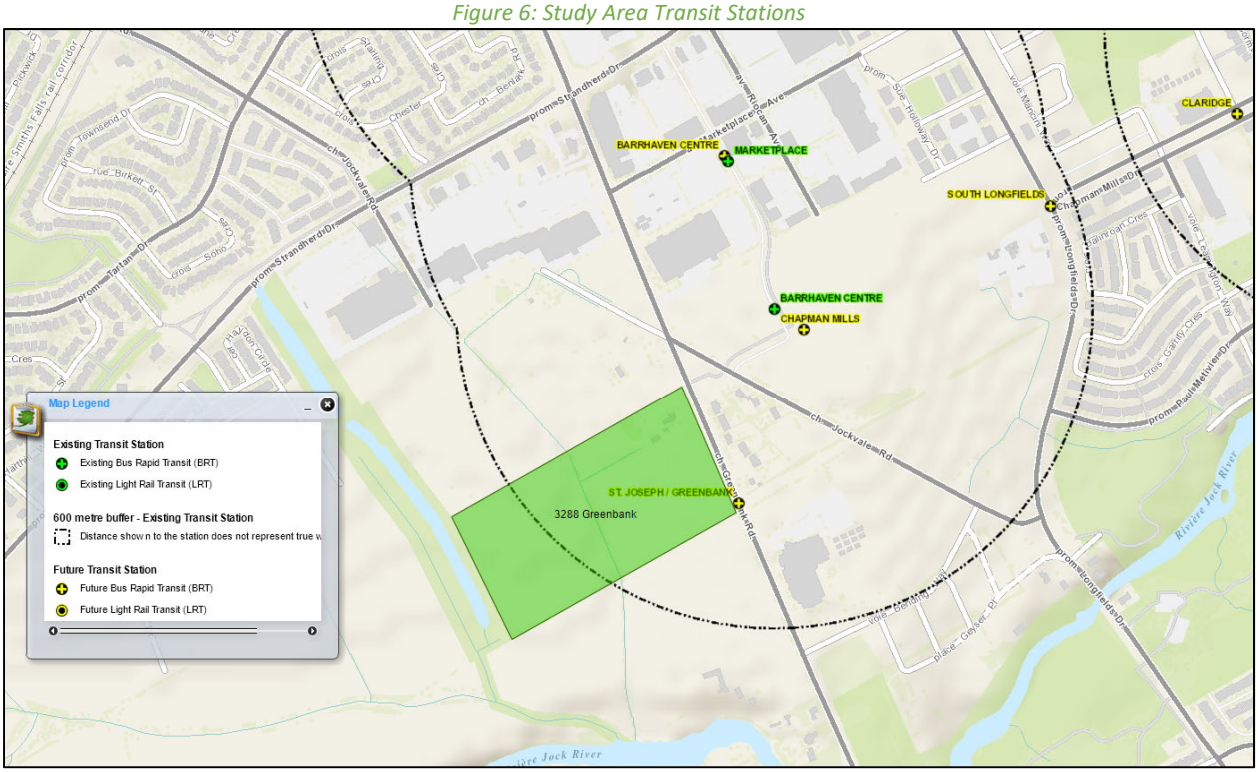
Figure 5 illustrates the transit system map in the study area and Figure 6 illustrates the walking distance for the Southwest Transitway. The existing Transitway stations are within the 600m walk distance for half the site, and the future Greenbank-St Joseph station will be directly adjacent to the proposed site.

Figure 5: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: March 13, 2019

Figure 6: Study Area Transit Stations



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: August 21, 2019

2.2.6 Existing Area Traffic Management Measures

Greenbank Road has a school zone south of Jockvale Road for St. Joseph Highschool. The posted speed limit is 40km/h between the hours of 7:00-9:00AM, 11:30AM-1:00PM and 2:00-3:30PM on school days.

2.2.7 Existing Peak Hour Travel Demand

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

Table 1: Intersection Count Date

Intersection	Count Date
Greenbank Road and Jockvale Road	August 16, 2016
Greenbank Road and Marketplace Avenue	February 10, 2016
Strandherd Drive and Greenbank Road	August 16, 2016

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

Figure 7: Existing Traffic Counts

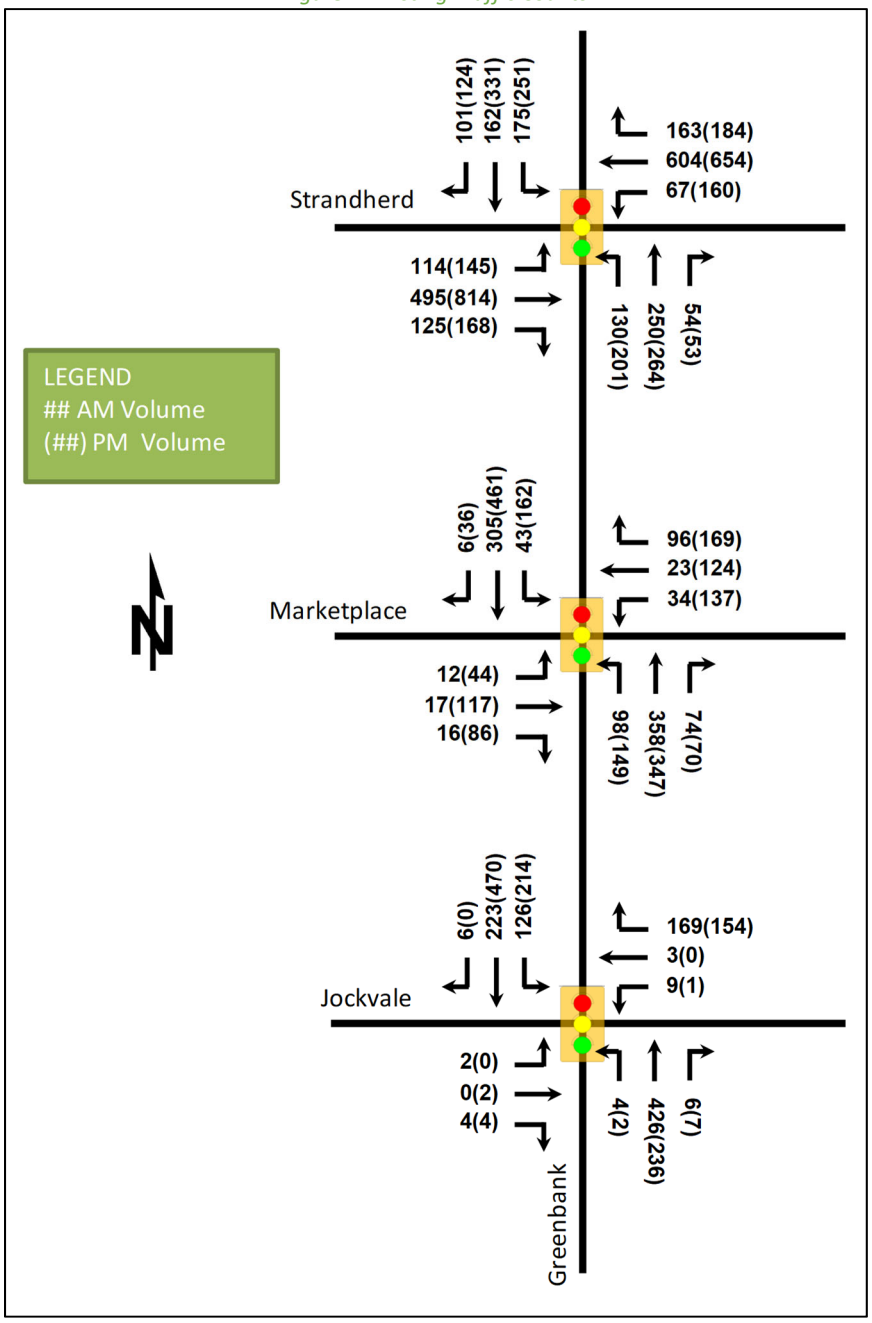


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Greenbank Road & Jockvale Road *Signalized*	EB	A	0.03	0.2	0.0	A	0.04	37.0	4.9
	WBL/T	A	0.10	48.5	8.8	A	0.01	51.0	2.1
	WBR	A	0.57	12.0	17.0	A	0.58	14.7	18.1
	NB	A	0.37	8.6	95.5	A	0.20	4.6	38.8
	SBL	A	0.19	3.2	6.9	A	0.25	1.7	13.4
	SBT/R	A	0.16	1.9	11.0	A	0.31	1.6	36.2
	Overall	**A**	-	**7.3**	-	**A**	-	**4.3**	-
Greenbank Road & Marketplace Avenue *Signalized*	EBL	A	0.07	35.1	6.9	A	0.27	31.1	17.3
	EBT/R	A	0.19	29.2	13.0	B	0.65	46.4	69.8
	WBL	A	0.19	38.7	14.7	B	0.62	44.3	44.5
	WBT/R	A	0.45	17.2	21.9	D	0.84	56.2	#109.1
	NBL	B	0.61	65.6	#64.2	D	0.84	85.5	#83.8
	NBT/R	A	0.24	11.7	41.1	A	0.33	21.7	45.1
	SBL	A	0.25	62.2	13.1	A	0.58	63.5	m34.3
	SBT/R	A	0.19	14.6	28.6	A	0.41	21.2	m44.3
	Overall	**C**	-	**21.7**	-	**D**	-	**39.9**	-
Greenbank Road & Strandherd Drive *Signalized*	EBL	A	0.46	25.8	31.7	B	0.64	34.3	40.0
	EBT	A	0.49	34.4	79.2	E	0.94	60.4	#157.7
	EBR	A	0.24	5.2	13.2	A	0.34	6.3	17.3
	WBL	A	0.23	21.7	20.1	D	0.84	59.4	#68.2
	WBT	B	0.67	40.8	100.4	C	0.75	44.3	110.2
	WBR	A	0.32	6.3	17.2	A	0.35	6.2	18.2
	NBL	A	0.50	70.6	30.6	B	0.61	69.4	m42.5
	NBT/R	A	0.36	30.6	34.4	A	0.39	25.8	m28.2
	SBL	A	0.58	57.9	35.3	B	0.69	58.9	48.4
	SBT	A	0.18	31.9	27.8	A	0.38	36.3	55.5
	SBR	A	0.20	3.0	6.8	A	0.26	5.9	13.8
	Overall	**C**	-	**33.5**	-	**D**	-	**43.1**	-

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

The existing intersection operations generally operate satisfactorily during the peak hours, with the exception of the northbound left-turn movement at the Greenbank Road and Marketplace Avenue intersection.

The northbound left-turn at the Greenbank Road and Marketplace Avenue intersection may experience high delays with residual volume-to-capacity available for this movement. Greenbank Road provides space for a dual left-turn movement, but this will require modification to the Barrhaven Town Centre access, limiting the feasibility of this modification until redevelopment occurs.

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		**224**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	47	21%
	Property Damage Only	177	79%
Initial Impact Type	**Approaching**	6	3%
	Angle	16	7%
	Rear end	114	51%
	Sideswipe	28	13%
	Turning Movement	40	18%
	SMV Unattended	1	0%
	SMV Other	17	8%
	Other	2	1%
Road Surface Condition	**Dry**	146	65%
	Wet	44	20%
	Loose Snow	16	7%
	Slush	3	1%
	Packed Snow	6	3%
	Ice	8	4%
	Unknown	1	0%
Pedestrian Involved		2	1%
Cyclists Involved		5	2%

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

Table 4: Summary of Collision Locations

	Number	%
Intersections / Segments	**224**	**100%**
Greenbank Rd @ Jockvale Rd	33	15%
Greenbank Rd @ Marketplace Ave	23	10%
Greenbank Rd @ Strandherd Dr	127	57%
Greenbank Rd btwn Jockvale Rd & Cambrian Rd	29	13%
Greenbank Rd btwn Marketplace Ave & Jockvale Rd	7	3%
Greenbank Rd btwn Strandherd Dr & Marketplace Ave	5	2%

Within the study area, the intersection of Greenbank Road at Strandherd Drive is noted to have significantly higher collision rates than the other study area intersections. Table 5 summarizes the collision types and conditions for each of the Greenbank Road at Strandherd Drive intersection.

Table 5: Greenbank Road at Strandherd Drive Collision Summary

		Number	%
Total Collisions		**127**	**100%**
Classification	Fatality	0	0%
	Non-Fatal Injury	26	20%
	Property Damage Only	101	80%
Initial Impact Type	Angle	5	4%
	Rear end	69	54%
	Sideswipe	16	13%
	Turning Movement	33	26%
	SMV Other	2	2%
	Other	2	2%
Road Surface Condition	Dry	87	69%
	Wet	25	20%
	Loose Snow	9	7%
	Slush	2	2%
	Packed Snow	1	1%
	Ice	2	2%
	Unknown	1	1%
Pedestrian Involved		0	0%
Cyclists Involved		2	2%

The Greenbank Road at Strandherd Drive intersection had a total of 127 collisions during the 2013-2017 time period, with 101 involving property damage only, and the remaining 26 having non-fatal injuries. The high volume of rear end and turning movement collisions would indicate congestion being a major factor in the cause for the high collision rates. Combined with the predominantly property damage classification, these are low speed impacts. The turning movement collisions typically present a potential hazard to pedestrians and cyclists, in which the only documented cyclist collisions occurred in 2013. Weather conditions are not considered to have a major impact on the collisions.

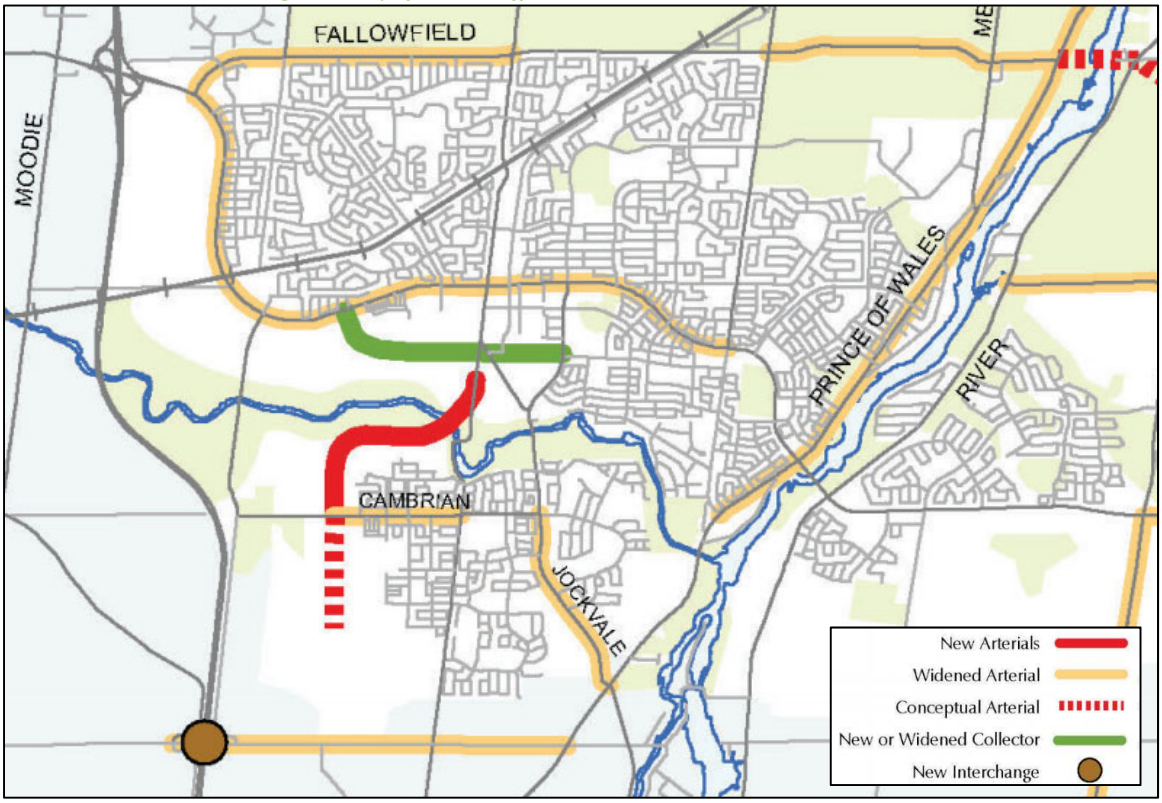
2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

The subject development is within the South Nepean Towncentre (SNTC) Community Design Plan (CDP) and the Nepean South Area 7 Secondary Plan. A revision to the SNTC CDP is currently underway and this development is being proposed within the context of these revisions. The following projects are currently included within the 2031 Affordable Network and illustrated in Figure 9:

- Strandherd Drive Widening is in the process of being designed and constructed between Kennevale Road and Jockvale Road, including a 4-lane cross-section, and is estimated to be completed by 2023
- Chapman Mills Drive Extension from Longfields Drive to Strandherd Drive, including the extension of the bus rapid transit (BRT) corridor to the Southwest Transitway/Greenbank Road within the centre median
- Greenbank Road Re-Alignment, south of Chapman Mills Drive, to loop west around the existing Half Moon Bay development and connect to Cambrian Road, and will include cycle tracks and a future BRT extension within the centre median

Figure 9: City of Ottawa Affordable Network – Barrhaven Context



Beyond the 2031 Affordable Network horizon, the following network improvements are planned for the study area:

- Chapman Mills Drive BRT extension from Greenbank Road to Borrisokane Road
- Greenbank Road Re-Alignment extension south of Cambrian Road that will ultimately connect to Barnsdale Road and include connectivity improvements to Manotick

2.3.2 Other Study Area Developments

3195 Jockvale Road (Richcraft)

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.

3311 Greenbank Road
A residential subdivision has been proposed south of St Joseph High School by Minto Communities, in conjunction with the City of Ottawa. A total 144 townhome units (119 Minto and 25 City), and 64 mid-rise units (City) will ultimately be constructed within the proposed lands.

3201 Greenbank Road
Currently under construction, 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.

Barrhaven Towncentre – 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.

Burnett Lands – 3370 Greenbank Road (Claridge)
The Burnett Lands are located south of the 3288 Greenbank Road development 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 South – South of the Jock River
Beyond the study area, Barrhaven South includes various developments from Caivan, Mattamy, Minto, and Tamarack. These lands will be considered within the background growth percentage applied to the study area.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of Greenbank Road and Street 'B', Greenbank Road and Jockvale Road, Greenbank Road and Marketplace Avenue, Greenbank Road and Strandherd Drive, and Strandherd Drive and Jockvale Road. Greenbank Road is noted as the boundary road.

The TIA guidelines requirement for all signals within a 1.0km radius of the site to be analyzed is recommended to be waived for this site at the signalized intersections located at:

- Strandherd Drive and Barrhaven Town Centre Access 210 metres west of Greenbank Road
- Strandherd Drive and Riocan Avenue
- Strandherd Drive and Jockvale Road
- Strandherd Drive and Andora Avenue
- Greenbank Road and Village Square Access
- Marketplace Avenue and SW Transitway
- Future Chapman Mills Drive signals:
    - At Strandherd Drive
    - On west side of Kennedy Burnett SWM Pond
    - Between Greenbank Road and Longfields Drive

The impact to these intersections is to be minimal (e.g. south of the site), will not be impacted by the site trips (e.g. Marketplace Avenue), or have through traffic only and with no turning movements having an undue effect on signal operations (e.g. Greenbank Road north of Strandherd Drive, or Strandherd Drive east and west of Greenbank Road).

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 2025. As a result, the full build-out plus five years horizon year is 2030.

4 Exemption Review

Table 6 summarizes the exemptions for this TIA.

Table 6: 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	Exempt
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 (Official Plan Amendment has been adopted to revise the land use designations, minimum building heights, permit 18.0m local roads, and realign the east-west local road. The area land-use designations are High Rise Residential and Mid Rise Residential)	Exempt

5 Development-Generated Travel Demand

5.1 Trip Generation and Mode Shares

This TIA has been prepared using the vehicle and person trip rates for the residential components using the TRANS Trip Generation Study Report (2009). Table 7 summarizes the person trip rates for the proposed land uses.

Table 7: Trip Generation Person Trip Rates

Dwelling Type	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
Townhomes	224 (TRANS)	AM	0.54	0.98
		PM	0.71	1.16
Mid-Rise Apartments	223 (TRANS)	AM	0.29	0.66
		PM	0.37	0.84

Using the above Person Trip rates, the total person trip generation has been estimates. Table 8 below illustrates the total person trip generation by dwelling type.

Table 8: Total Person Trip Generation

Land Use	Units / GFA	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Townhomes	429	155	265	420	264	234	498
Mid-Rise Apartments	328	52	164	216	171	105	276
Total		**207**	**429**	**636**	**435**	**339**	**774**

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 9.

Table 9: Mode Share

Travel Mode	South Nepean	BRT Area
Auto Driver	60%	40%
Auto Passenger	15%	15%
Transit	15%	35%
Non-Auto	10%	10%
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 10 summarizes the trip generation by mode.

Table 10: Trip Generation by Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Auto Driver	40%	83	172	254	174	136	309
Auto Passenger	15%	31	65	95	66	51	116
Transit	35%	72	150	223	152	119	271
Non-Auto Modes	10%	21	43	64	43	34	78
Total	**100%**	**207**	**429**	**636**	**435**	**339**	**774**

As shown above, 254 AM and 309 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 component patterns were applied based on the build-out of Barrhaven. Table 11 below summarizes the distributions.

Table 11: 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 and Figure 11 illustrate the new site generated volumes.

Figure 10: 2025 New Site Generation Auto Volumes

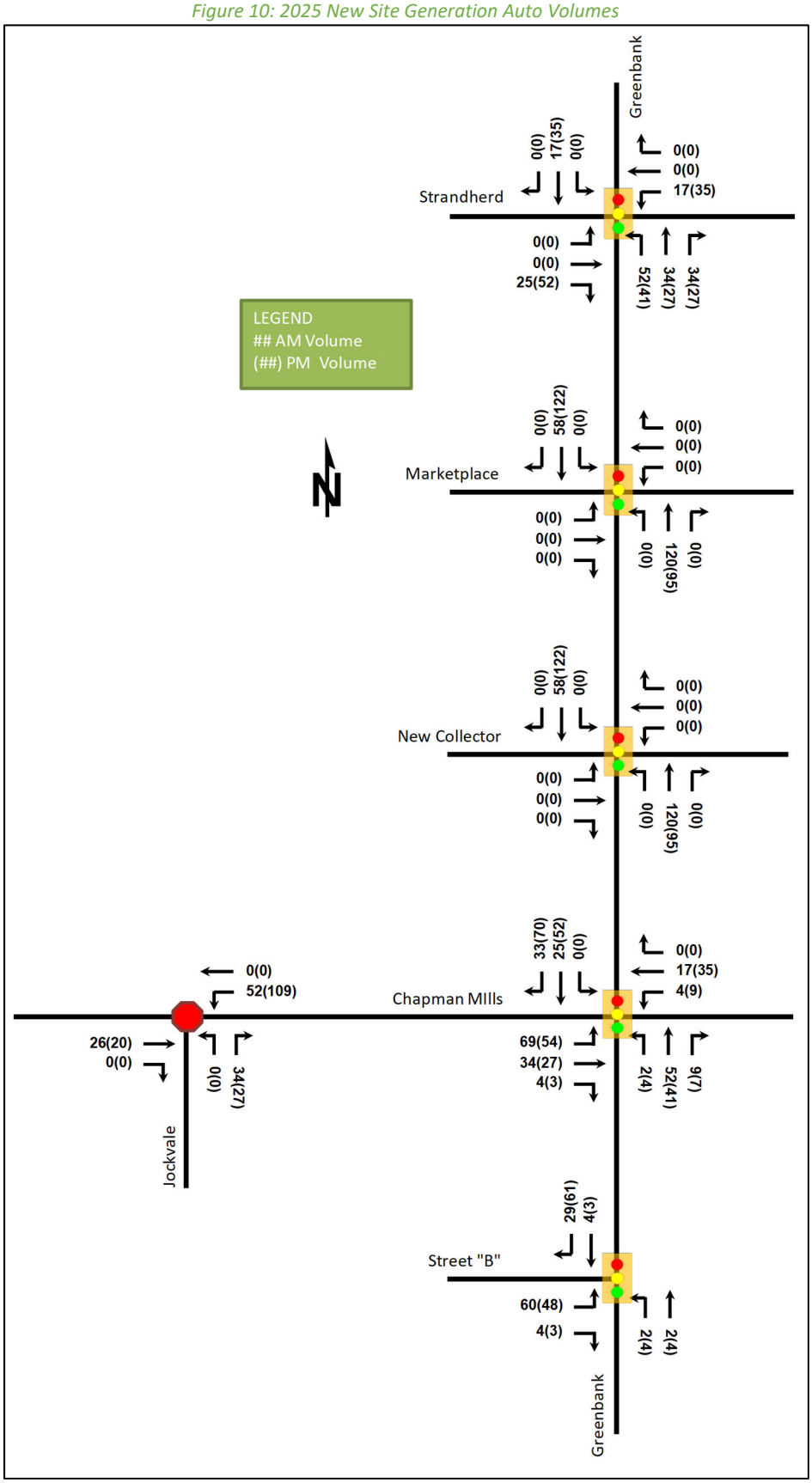
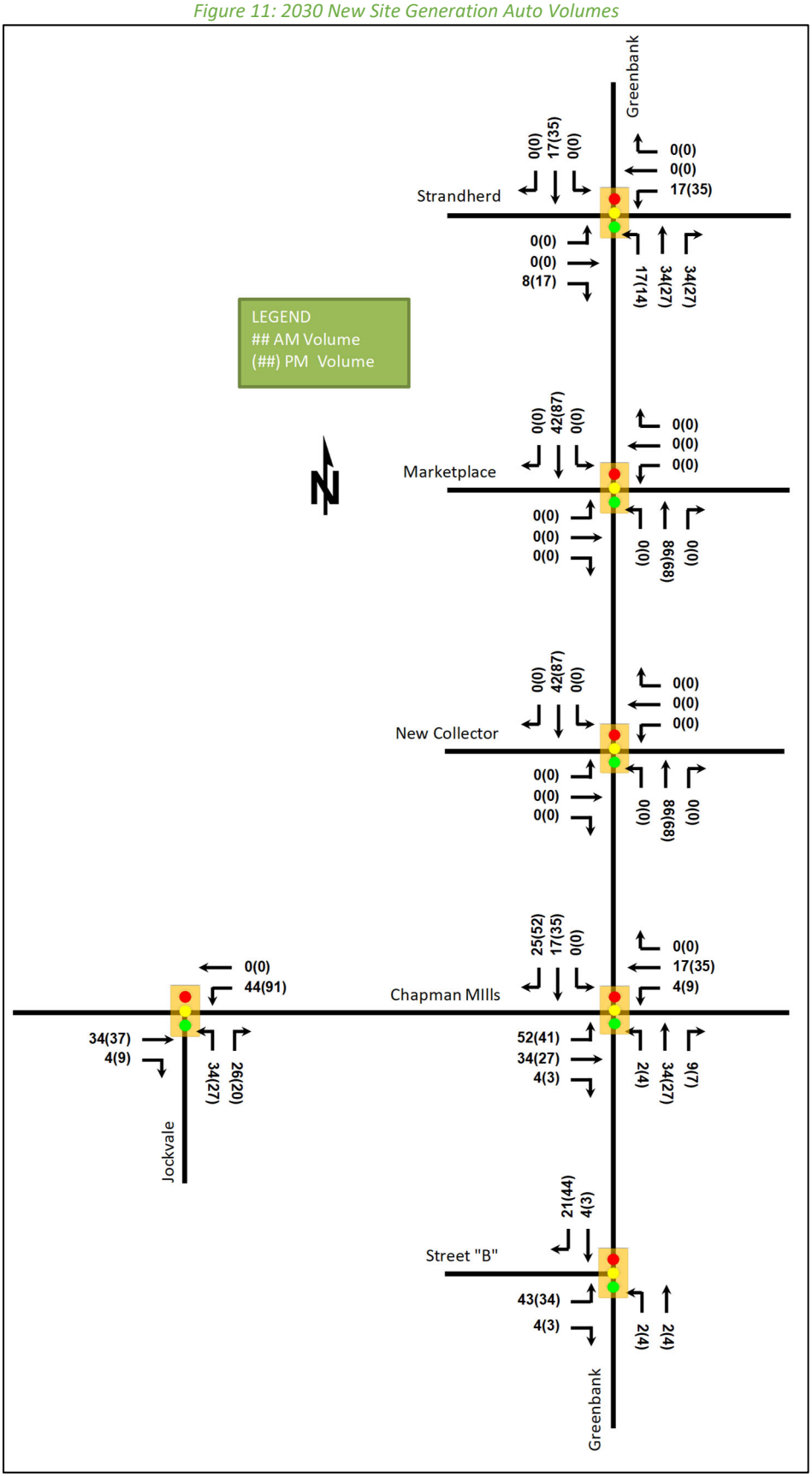


Figure 11: 2030 New Site Generation Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. The widening of Strandherd Drive (west of the study area) and the re-alignment of Greenbank Road (south of the study area) are 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 anticipated to have an impact along Greenbank Road, as commuters are likely going to travel west from Greenbank Road along Chapman Mills Drive, as an alternative to the Greenbank Road and Strandherd intersection.

To account for the diversion of traffic along Greenbank Road to the Chapman Mills Drive extension, two scenarios were developed for the build-out of the site. The 2025 and 2030 background horizons assume that Chapman Mills Drive will be extended between Greenbank Road and Longfields Drive, the 2025 total horizon assumes Chapman Mills Drive extended from Greenbank Road to the Kennedy Burnette Pond, and the 2030 total horizon assumes that Chapman Mills Drive will be extended across the Kennedy-Burnett Pond. As the Chapman Mills Drive corridor intersects Jockvale Road and the two intersections would be in close proximity along Greenbank Road, Jockvale Road will be decommissioned. Therefore, the Greenbank Road and Jockvale Road intersection is not considered during the background and future build-out horizons.

The background traffic redistributions are illustrated in Figure 12 and Figure 13.

Figure 12: Chapman Mills Extension to Greenbank Road –2025 and 2030 Background Traffic Redistribution

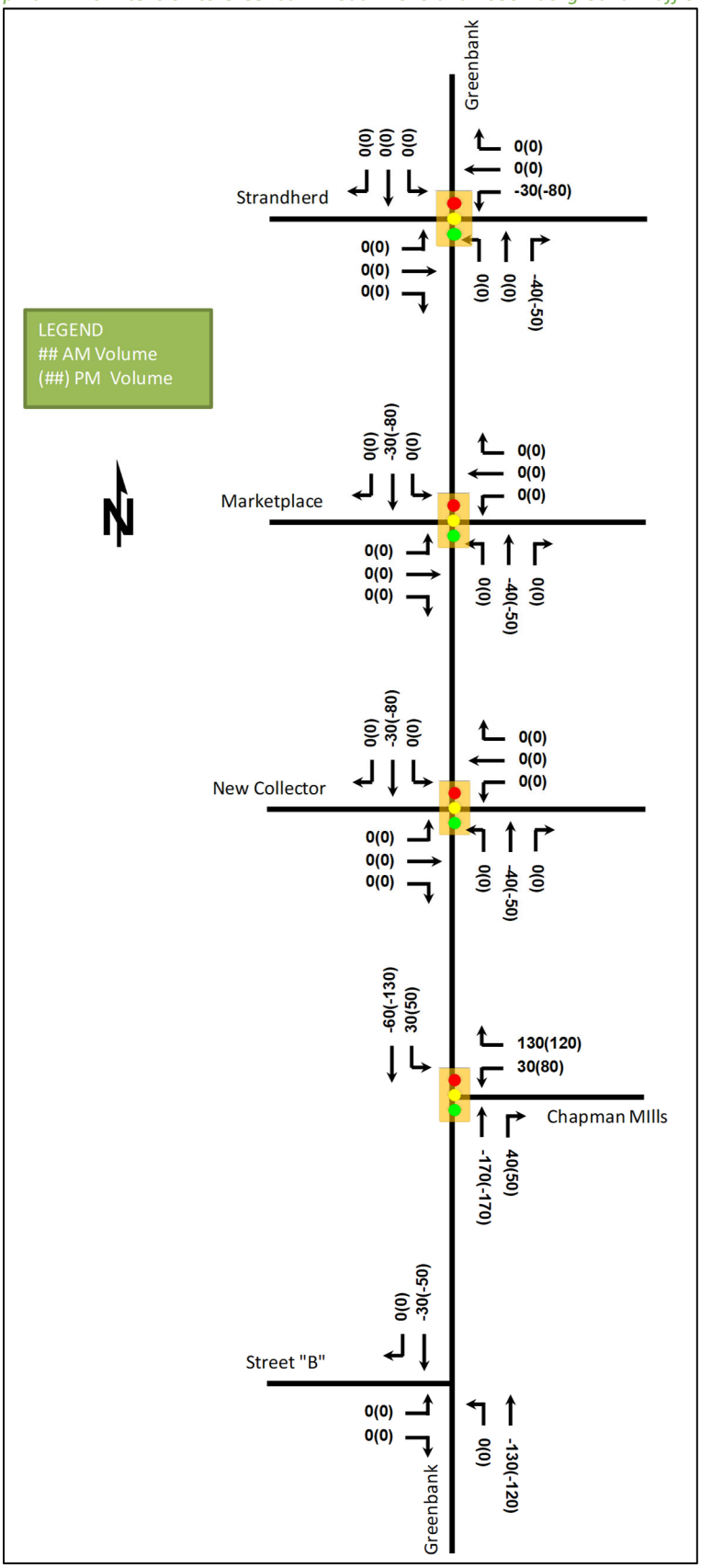
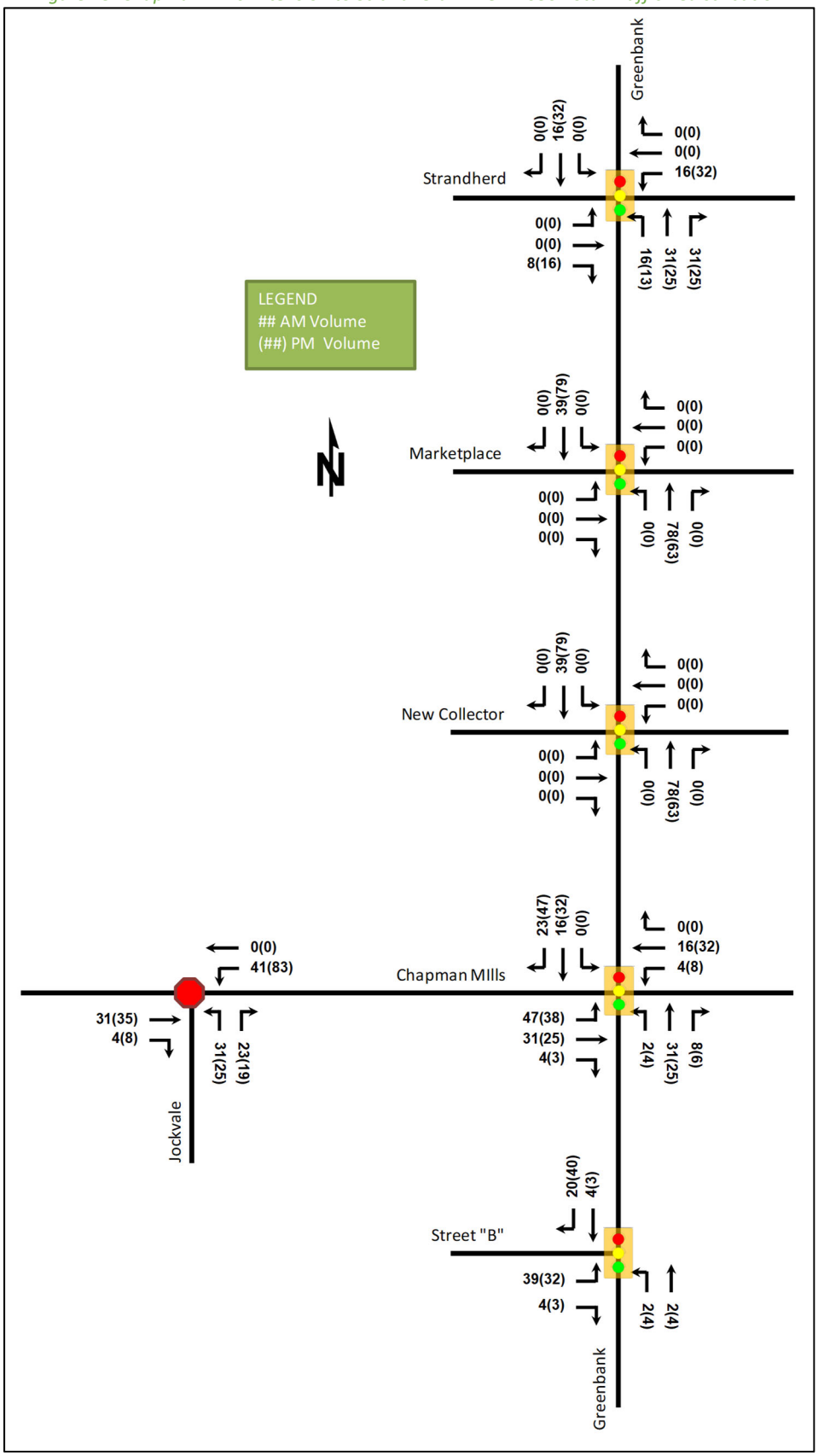


Figure 13: Chapman Mills Extension to Strandherd Drive – 2030 Total Traffic Redistribution



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.

Figure 14 illustrates the 2025 background volumes and Table 12 summarizes the 2025 background intersection operations. Figure 15 illustrates the 2030 background volumes and Table 13 summarizes the 2030 background intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for the lane movements and HCM average delay for the overall intersection, and for unsignalized intersections the level of service is based on HCM average delay

The synchro worksheets for the 2025 and 2030 horizons are provided in Appendix E and Appendix F, respectively.

Figure 14: 2025 Future Background Volumes

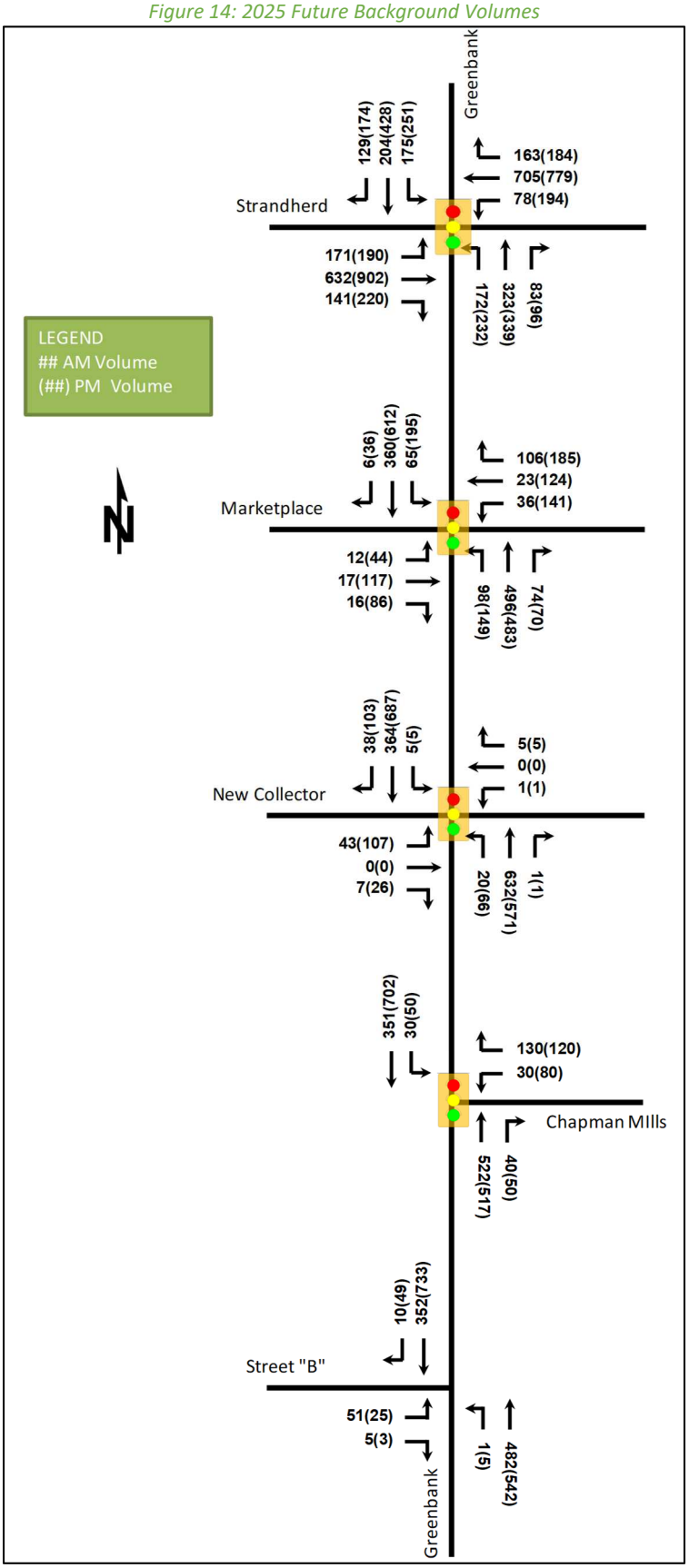


Table 12: 2025 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Greenbank Road & Strandherd Drive ***Signalized***	EBL	B	0.63	31.7	41.5	C	0.80	48.1	#61.4
	EBT	A	0.56	36.0	92.7	E	0.95	61.0	#157.2
	EBR	A	0.24	5.4	13.7	A	0.38	6.3	18.8
	WBL	A	0.27	22.4	20.9	D	0.90	70.3	#77.8
	WBT	C	0.72	43.1	106.3	D	0.81	47.7	119.6
	WBR	A	0.30	6.5	16.4	A	0.33	6.3	17.2
	NBL	A	0.55	73.8	35.4	B	0.62	72.6	m44.8
	NBT/R	A	0.42	25.1	25.2	A	0.47	23.9	31.5
	SBL	A	0.55	57.9	32.7	B	0.65	58.3	44.0
	SBT	A	0.21	33.1	31.5	A	0.45	37.6	64.8
	SBR	A	0.24	4.8	11.2	A	0.32	6.8	17.8
	Overall	**C**	-	**34.4**	-	**D**	-	**44.3**	-
Greenbank Road & Marketplace Avenue ***Signalized***	EBL	A	0.06	34.8	6.6	A	0.24	30.8	16.0
	EBT/R	A	0.17	29.1	12.1	B	0.61	44.6	62.1
	WBL	A	0.18	38.6	14.0	A	0.56	41.5	41.5
	WBT/R	A	0.44	16.9	21.0	D	0.82	53.6	#93.5
	NBL	B	0.61	68.2	#53.9	C	0.78	77.7	#71.4
	NBT/R	A	0.28	13.2	63.9	A	0.38	24.3	68.1
	SBL	A	0.32	63.1	16.5	B	0.61	63.4	m36.1
	SBT/R	A	0.19	13.7	28.9	A	0.46	20.7	m49.7
	Overall	**C**	-	**21.6**	-	**D**	-	**37.3**	-
Greenbank Road & New Collector ***Signalized***	EBL	A	0.22	33.6	13.5	A	0.48	39.5	28.4
	EBT/R	A	0.01	0.0	0.0	A	0.05	0.2	0.0
	WB	A	0.02	0.2	0.0	A	0.02	0.2	0.0
	NBL	A	0.03	2.3	1.6	A	0.42	68.9	26.9
	NBT/R	A	0.23	1.6	11.4	A	0.23	1.8	10.0
	SBL	A	0.01	6.2	1.9	A	0.01	14.2	2.9
	SBT/R	A	0.15	4.1	24.6	A	0.39	13.2	79.0
	Overall	**A**	-	**3.7**	-	**B**	-	**13.0**	-
Greenbank Road & Chapman Mills Drive ***Signalized***	WBL	A	0.12	31.0	10.2	A	0.32	35.0	21.4
	WBR	A	0.39	8.9	12.5	A	0.37	8.7	12.1
	NBT/R	A	0.28	11.6	55.2	A	0.31	13.1	55.4
	SBL	A	0.23	50.3	15.4	A	0.41	42.5	25.0
	SBT	A	0.29	6.4	29.2	A	0.58	18.5	147.2
	Overall	**B**	-	**11.2**	-	**B**	-	**17.5**	-
Greenbank Road & Street "B" ***Unsignalized***	EBL/R	C	0.16	17.3	0.6	D	0.15	27.9	0.5
	NBL	A	0.00	8.0	0.0	A	0.01	9.3	0.0
	NBT	-	-	-	-	-	-	-	-
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	-	**1.1**	-	**A**	-	**0.6**	-

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

The intersection operations for the 2025 future background horizon generally operate satisfactorily during the peak hours. The peak hour factor adjustments for future horizons account for the increase in intersection operations (e.g. lower delays and volume-to-capacity ratios). The eastbound through and westbound left-turn movements at the Greenbank Road and Strandherd Drive intersection are noted to have a volume-to-capacity ratio of 0.90 or higher during the PM peak.

Figure 15: 2030 Future Background Volumes

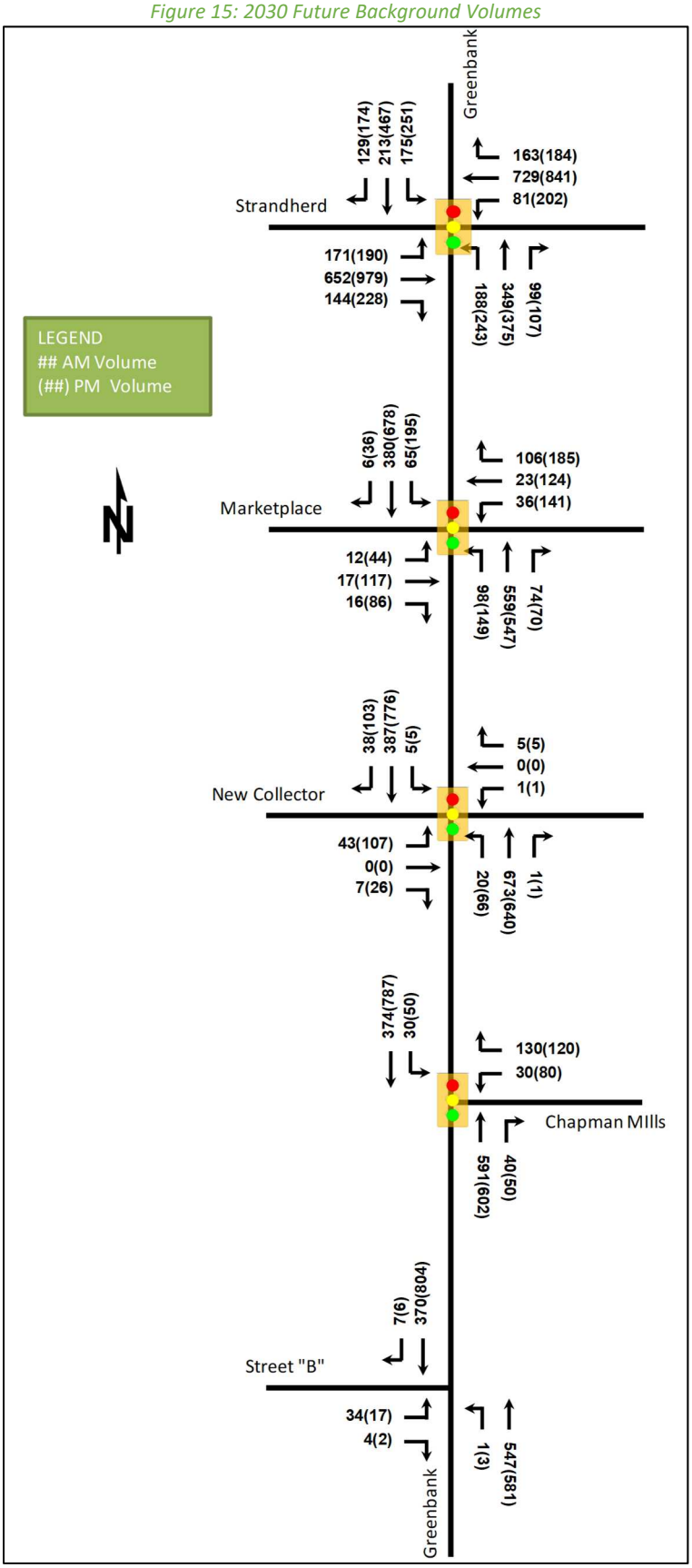


Table 13: 2030 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Greenbank Road & Strandherd Drive *Signalized*	EBL	B	0.65	32.8	41.5	E	0.86	60.7	#72.4
	EBT	A	0.58	36.5	96.3	**F**	**1.03**	**78.5**	**#178.6**
	EBR	A	0.25	5.7	14.5	A	0.39	6.3	19.0
	WBL	A	0.29	22.7	21.6	E	0.94	78.2	#82.9
	WBT	C	0.74	44.0	110.5	D	0.88	52.9	#139.8
	WBR	A	0.30	6.5	16.4	A	0.33	6.3	17.2
	NBL	A	0.57	73.4	38.0	B	0.64	74.2	m46.7
	NBT/R	A	0.47	25.1	26.2	A	0.52	23.7	30.9
	SBL	A	0.55	57.9	32.7	B	0.65	58.3	44.0
	SBT	A	0.22	33.7	33.0	A	0.50	38.6	71.0
	SBR	A	0.24	4.9	11.3	A	0.32	6.9	17.8
	Overall	**C**	-	**35.0**	-	**D**	-	**50.6**	-
Greenbank Road & Marketplace Avenue *Signalized*	EBL	A	0.06	34.8	6.6	A	0.24	30.8	16.0
	EBT/R	A	0.17	29.2	12.1	B	0.61	44.6	62.1
	WBL	A	0.18	38.6	14.0	A	0.56	41.5	41.5
	WBT/R	A	0.44	16.8	21.0	D	0.82	53.6	#93.5
	NBL	B	0.61	68.2	#53.9	C	0.78	77.7	#71.4
	NBT/R	A	0.31	13.6	72.4	A	0.43	25.1	77.2
	SBL	A	0.32	62.4	16.8	B	0.61	63.2	m35.9
	SBT/R	A	0.20	13.8	30.5	A	0.51	20.7	m53.2
	Overall	**C**	-	**21.3**	-	**D**	-	**36.7**	-
Greenbank Road & New Collector *Signalized*	EBL	A	0.28	41.4	17.3	A	0.55	46.1	33.2
	EBT/R	A	0.03	0.3	0.0	A	0.05	0.2	0.0
	WB	A	0.03	0.3	0.0	A	0.02	0.2	0.0
	NBL	A	0.03	3.0	2.6	A	0.40	61.6	26.9
	NBT/R	A	0.24	2.8	24.1	A	0.25	1.4	8.3
	WBL	A	0.01	3.2	1.0	A	0.01	11.8	2.4
	SBT/R	A	0.15	2.5	14.2	A	0.43	12.5	77.1
	Overall	**A**	-	**4.1**	-	**B**	-	**12.1**	-
Greenbank Road & Chapman Mills Drive *Signalized*	WBL	A	0.16	36.4	11.3	A	0.31	35.0	21.4
	WBR	A	0.46	11.4	13.4	A	0.37	8.7	12.1
	NBT/R	A	0.29	9.6	60.1	A	0.32	10.7	59.3
	SBL	A	0.24	46.1	14.6	A	0.37	44.7	22.3
	SBT	A	0.29	6.0	56.7	B	0.63	17.1	123.7
	Overall	**B**	-	**10.3**	-	**B**	-	**15.7**	-
Greenbank Road & Street "B" *Unsignalized*	EBL/R	C	0.12	17.9	0.4	D	012	29.6	0.4
	NBL	A	0.00	8.1	0.0	A	0.00	9.4	0.0
	NBT	-	-	-	-	-	-	-	-
	SBT/R	-	-	-	-	-	-	-	-
	Overall	**A**	-	**0.7**	-	**A**	-	**0.4**	-

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

The intersection operations for the 2030 future background horizon generally operate satisfactorily during the peak hours with the exception of the eastbound through movement during the PM peak at the Greenbank Road and Strandherd Drive intersection. An additional 2 seconds of green time is required to reduce the volume-to-capacity to below 1.00, potentially coming from the westbound left (0.5 seconds) and north/south bound through (1.5 seconds) movements. Any changes will need to be coordinated along the Strandherd Drive and

Greenbank Road corridors. The Greenbank Road and Strandherd Drive intersection westbound left-turn movement is also noted to have a volume-to-capacity ratio higher than 0.90 during the PM peak.

6.3 Other Developments

The background developments explicitly considered in the background conditions (Section 6.2) include:

- 3195 Greenbank Road
- 3201 Greenbank Road
- 3311 Greenbank Road
- 3370 Greenbank Road (Phase 1 for 2025, Phase 2 for 2030)
- 4005 Strandherd Drive (2030)

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 G.

7 Demand Rationalization

No capacity constraints are currently noted for the area and rationalization for adjusted demand is not required for this TIA.

8 Development Design

8.1 Design for Sustainable Modes

The proposed development is a residential subdivision and the auto parking areas will be located adjacent to the stacked townhomes with a total of 320 parking spaces or one per unit. The apartments will include meet bylaw requirements with a combination of surface and underground parking, and bicycle parking. Bicycle parking for the townhomes is assumed to be within the individual units. Figure 16 illustrates the pedestrian and cycling network.

Figure 16: Concept Pedestrian and Cycling Network

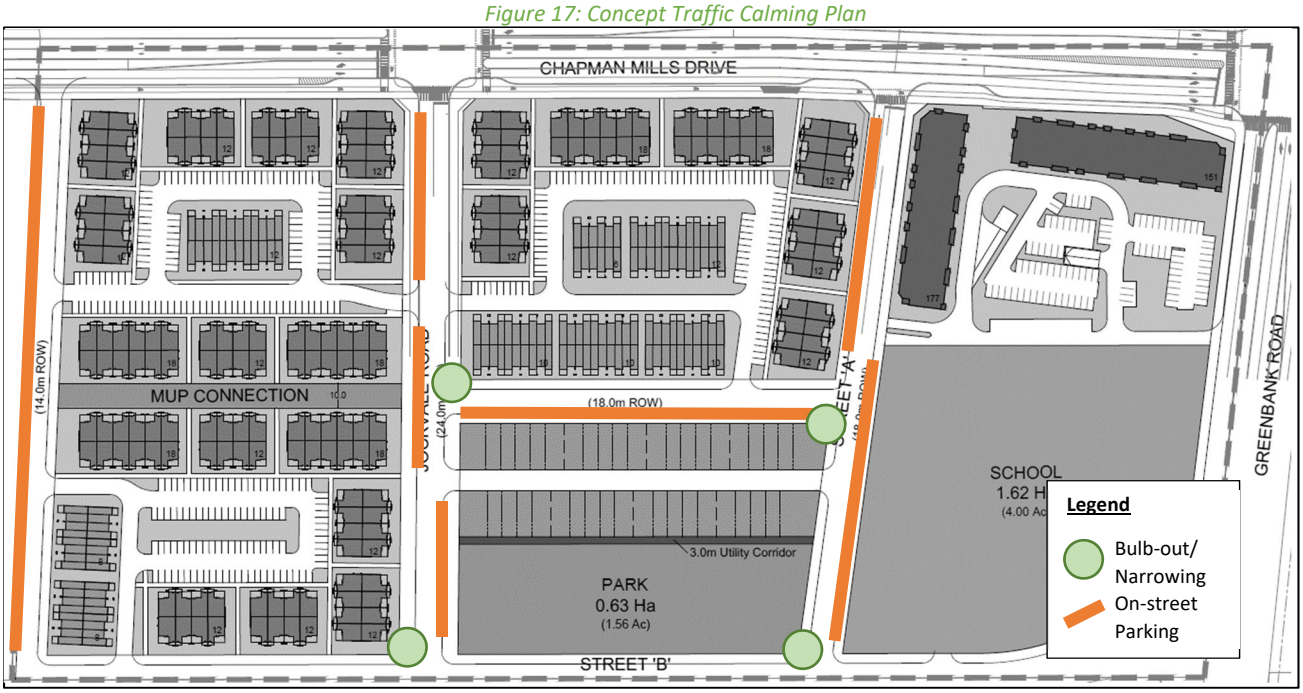
Beyond the active mode network, the existing transit system stop is provided at Barrhaven Centre (future Chapman Mills station) is a maximum of approximately 900 metres walking distance away, and the future St Joseph/Greenbank station will be a maximum of approximately 675 metres walking distance to all the proposed units.

8.2 New Street Networks

The new streets proposed as part of the plan of subdivision include the extension of Jockvale Road, Chapman Mills Drive, and a new collector road along the southern edge of the property. The Jockvale Road is proposed as a 24.0 metre collector road to support pedestrian, cycling, and transit modes. Chapman Mills Drive cross-section will be consistent with the Chapman Mills Drive Environmental Assessment.

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

Figure 17: Concept Traffic Calming Plan



9 Boundary Street Design

Table 14 summarizes the MMLOS analysis for the boundary road of Greenbank Road, existing and future, and the future collector roads of Chapman Mills Drive and Street B. The existing and future conditions have been summarized in separate rows. The future conditions of Greenbank Road are based on the existing four-lane divided cross section to the north. The MMLOS targets are based on the policy area of within 600m of a rapid transit station and 300m of a school. 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
Greenbank Road (existing)	E	A	F	C	D	A	A	E
Greenbank Road (future)	E	A	C	B	A	D	A	D
Chapman Mills Drive (future)	B	A	A	B	A	A	C	N/A
Jockvale Road (future)	B	A	A	B	D	D	C	N/A
Street B (future)	B	A	B	B	D	D	C	N/A

Existing Greenbank Road does not meet the pedestrian and cycling MMLOS targets. The current cross-section is a two-lane rural cross-section, and as such, it is understandable why these targets are not met in this location. With the extension of the urban cross-section of Greenbank Road, the bicycle level of service will increase although it will be below the target, and the pedestrian target will continue to not be met. The City would need to provide separated cycling facilities would be required to reach a level of service A. The travel speed and volumes along Greenbank Road are the primary influence on the pedestrian LOS and will not be met along any arterial.

Chapman Mills Drive, Jockvale Road and future Street B will not meet with pedestrian level of service with the City proposed cross-sections. Traffic volumes and speed are the primary influence on the LOS B level of service for Chapman Mills Drive. In addition to lowering the traffic volumes and speeds to below 30km/h for Chapman Mills Drive, the sidewalks on Chapman Mills Drive, Jockvale Road and Street B would need to be increased to 3 metres to achieve the target LOS A. Therefore, a pedestrian LOS B is deemed satisfactory for these streets.

10 Access Intersections Design

10.1 Location and Design of Access

The residential accesses will connect to the adjacent arterial road network via local roads and adjacent collector roads, such as Chapman Mills Drive, Jockvale Road and Street B. 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. Street B will be free-flow between the Kennedy-Burnett SWM Pond and Greenbank Road, with stop-control on the Jockvale Road and Street A.

10.2 Intersection Control

The Greenbank Road and Chapman Mills Drive intersection will be signalized, as per the Chapman Mills Drive EA Study, and the Greenbank Road and Street B intersection will be signalized, based on operational constraints.

10.3 Access Intersection Design

10.3.1 2025 Future Total Access Intersection Operations

The 2025 future total intersection volumes are illustrated above in Figure 18 and the access intersection operations are summarized below in Table 15. The level of service for signalized intersections is based on the TIA Guidelines for the lane movements and HCM average delay for the overall intersection, and for unsignalized intersections the level of service is based on HCM average delay. The signal timing has been optimized for the horizon. The synchro worksheets have been provided in Appendix I.

Figure 18: 2025 Future Total Volumes

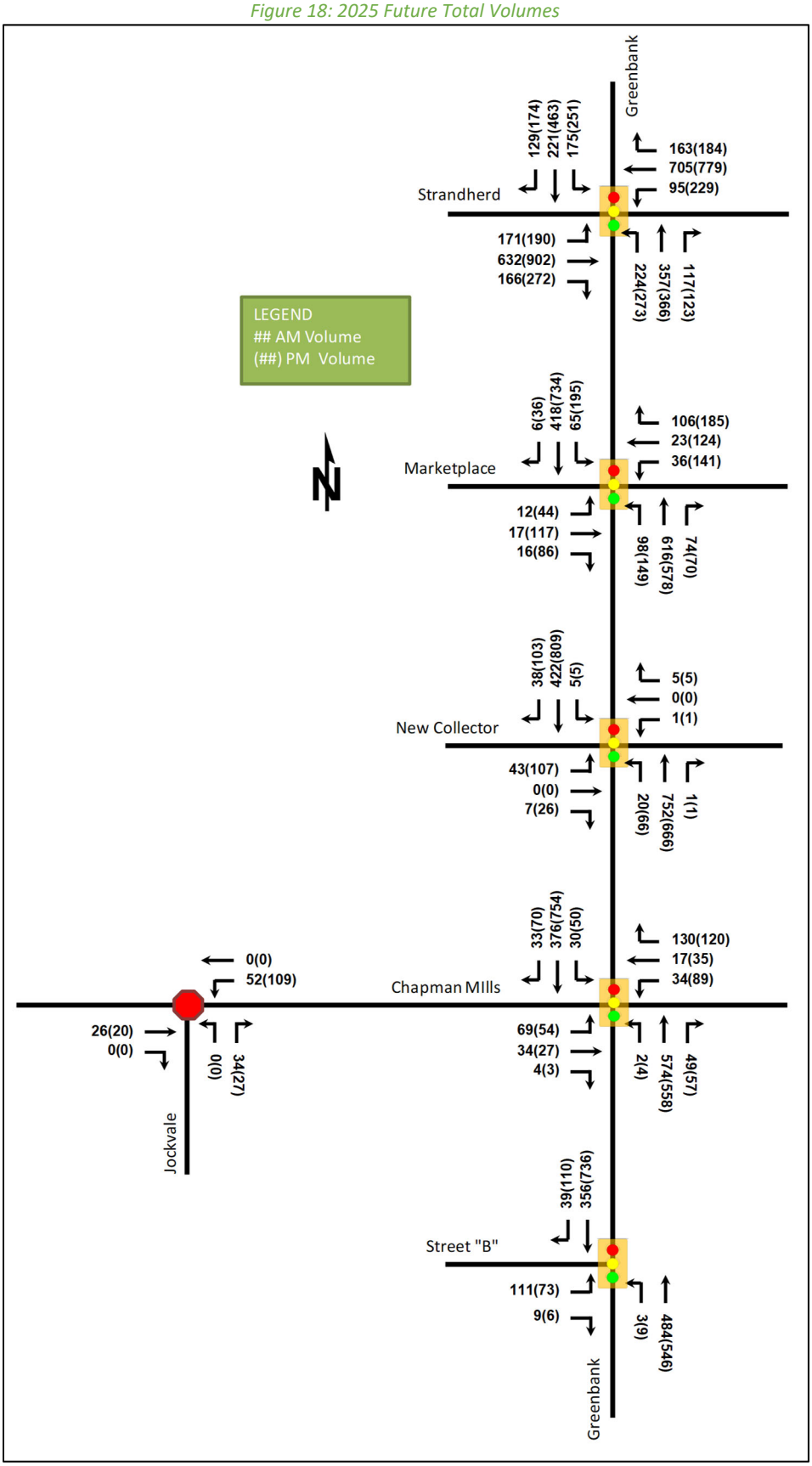


Table 15: 2025 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Greenbank Road & Chapman Mills Drive ***Signalized***	EBL	A	0.38	37.8	19.9	A	0.34	37.1	16.7
	EBT	A	0.12	30.2	11.3	A	0.10	30.0	9.7
	EBR	A	0.01	0.0	0.0	A	0.01	0.0	0.0
	WBL	A	0.17	31.5	11.5	A	0.42	37.9	24.1
	WBT/R	A	0.43	11.0	15.7	A	0.44	13.0	18.7
	NBL	A	0.00	14.5	1.7	A	0.01	13.8	2.6
	NBT/R	A	0.32	12.2	61.2	A	0.32	11.9	57.4
	SBL	A	0.23	49.6	15.5	A	0.36	60.2	22.2
	SBT	A	0.31	6.9	32.9	B	0.62	10.7	66.0
	SBR	A	0.03	1.6	1.9	A	0.07	0.4	0.5
	Overall	**B**	-	**13.4**	-	**B**	-	**14.6**	-
Greenbank Road & Street "B" ***Signalized***	EBL/R	A	0.49	37.7	31.7	A	0.39	40.3	25.1
	NBL	A	0.00	3.7	0.9	A	0.02	3.0	1.5
	NBT	A	0.35	4.9	44.9	A	0.39	4.3	46.2
	SBT/R	A	0.29	4.4	34.1	A	0.61	7.2	98.4
	Overall	**A**	-	**8.6**	-	**A**	-	**7.8**	-
Jockvale Road & Chapman Mills Drive ***Unsignalized***	EBT/R	A	0.03	7.2	0.1	A	0.02	7.2	0.1
	WBL	A	0.06	7.5	0.2	A	0.13	7.8	0.4
	NBR	A	0.03	6.6	0.1	A	0.03	6.7	0.1
	Overall	**A**	-	**7.2**	-	**A**	-	**7.5**	-

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

The access intersection operations for the 2025 future total horizon generally operate satisfactorily during the peak hour. No capacity issues are noted.

10.3.2 2030 Future Total Access Intersection Operations

The 2030 future total intersection volumes are illustrated above in Figure 19 and the access intersection operations are summarized below in Table 16. The level of service for signalized intersections is based on the TIA Guidelines for the lane movements and HCM average delay for the overall intersection. The signal timing has been optimized for the horizon. The synchro worksheets have been provided in Appendix J.

Figure 19: 2030 Future Total Volumes

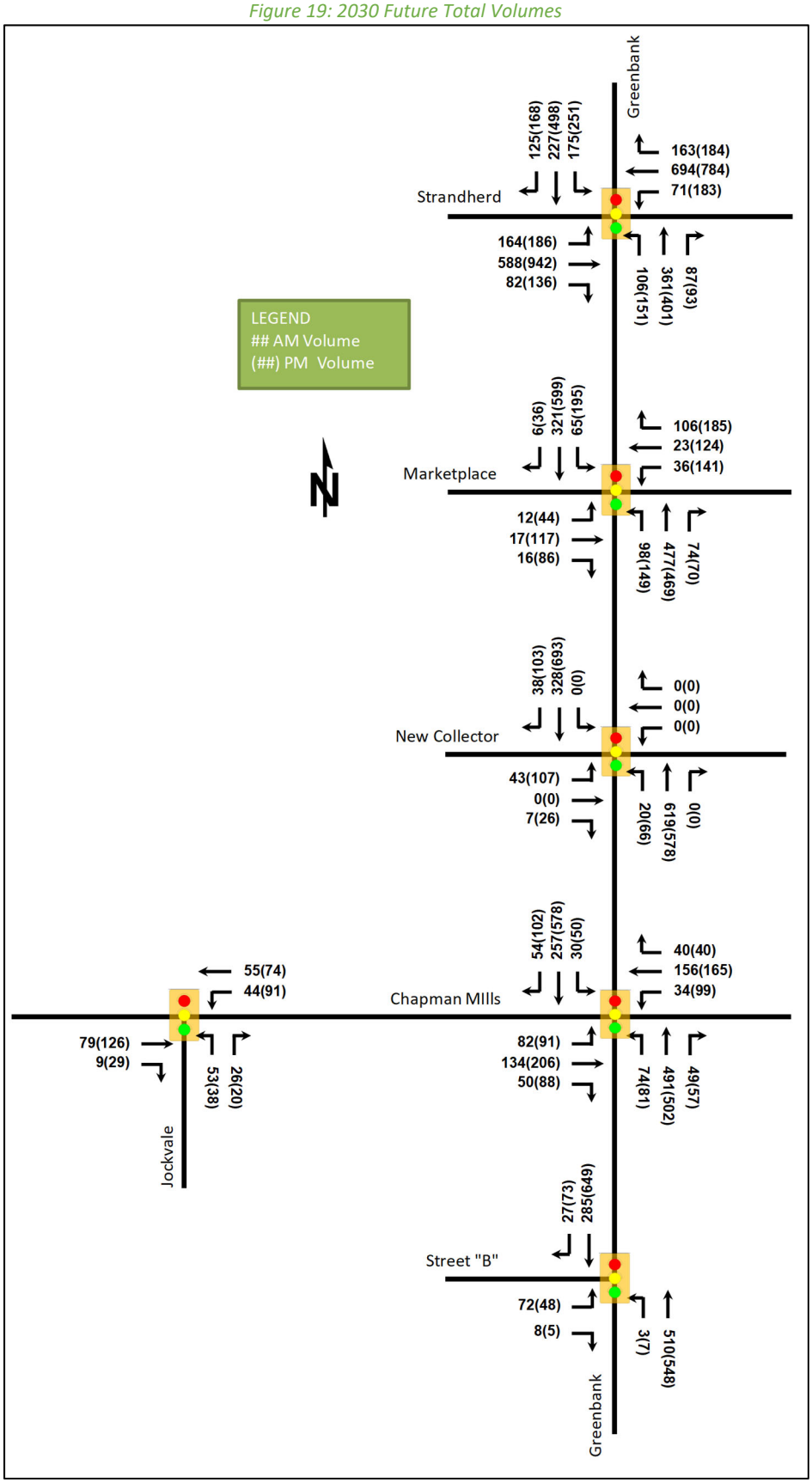


Table 16: 2030 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Greenbank Road & Chapman Mills Drive *Signalized*	EBL	A	0.54	64.5	35.9	B	0.65	73.2	#48.1
	EBT	A	0.37	41.9	42.8	B	0.70	56.9	71.5
	EBR	A	0.12	0.6	0.0	A	0.27	5.6	8.3
	WBL	A	0.35	64.1	19.4	B	0.65	70.6	#49.0
	WBT/R	C	0.71	58.6	64.6	B	0.67	52.2	68.5
	NBL	A	0.51	63.5	33.0	B	0.61	71.2	#42.8
	NBT/R	A	0.30	18.0	66.1	A	0.35	19.9	64.3
	SBL	A	0.30	60.9	17.4	A	0.41	61.6	25.5
	SBT	A	0.36	23.2	89.9	D	0.83	41.3	#237.6
	Overall	**C**	-	**33.1**	-	**D**	-	**41.1**	-
Greenbank Road & Street "B" *Signalized*	EBL/R	A	0.44	40.5	24.1	A	0.34	40.3	19.1
	NBL	A	0.00	3.0	0.8	A	0.01	2.4	1.2
	NBT	A	0.36	4.1	41.9	A	0.36	3.2	41.5
	SBT/R	A	0.22	3.2	22.6	A	0.48	4.1	63.9
	Overall	**A**	-		-	**A**	-	**5.1**	-
Jockvale Road & Chapman Mills Drive *Signalized*	EBT/R	A	0.07	5.4	13.3	A	0.12	5.2	21.3
	WBL	A	0.05	5.9	8.3	A	0.10	6.2	15.5
	WBT	A	0.04	5.7	9.5	A	0.05	5.8	12.3
	NBL	A	0.20	29.7	16.6	A	0.13	26.1	11.3
	NBR	A	0.10	11.2	6.1	A	0.07	10.9	4.8
	Overall	**B**	-	**10.9**	-	**A**	-	**8.0**	-

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

The access intersection operations for the 2030 future total horizon generally operate satisfactorily during the peak hours. No capacity issues are noted.

10.3.3 Access Intersection MMLOS

Table 17 summarizes the MMLOS analysis for the site access intersections of Greenbank Road and Chapman Mills Drive and Chapman Mills Drive and Jockvale Road. The concept Chapman Mills Drive and Jockvale Road intersection is based on the EA configuration. The Chapman Mills Drive intersections analysis is based on the policy area of within 600m of a rapid transit station and 300m of a school. 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
Greenbank Road & Chapman Mills Drive	D	A	E	C	F	A	E	E	C	E
Greenbank Road & Street B	C	A	D	C	F	A	E	E	A	E
Chapman Mills Drive & Jockvale Road (future conceptual)	D	A	B	B	B or worse	A	N/A	N/A	A	E

The MMLOS targets for the pedestrian, bicycle and transit LOS will not be met at the signalized access intersections of Greenbank Road and Chapman Mills Drive, and Greenbank Road and Street B. The pedestrian level of service would require a maximum of two lanes at a crossing to meet a LOS A. The speeds along the arterial roads drive

the LOS E for the intersection and would require travel speeds under 50 km/h to meet a LOS C. The transit LOS will not be met and would require a delay of zero seconds to meet a LOS A target.

The concept intersection for Chapman Mills Drive and Jockvale Road will not meet the pedestrian level of service, similar to physical limitations of the Chapman Mills Drive cross-section. The transit level of service can only achieve the target if there is zero seconds delay.

10.3.4 Recommended Design Elements

The design elements for the site intersections are consistent with the CDP and various EA study recommendations.

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, although not as high as anticipated once the BRT network is extended. Overall, the modal shares are likely to be achieved and supporting TDM measures should be provided.

The subject site is within a design priority area.

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 Southwest Transitway and future BRT corridors, and those assumptions have been carried through the analysis. The study area intersections are anticipated to have residual capacity and the increase in transit ridership is achievable.

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
- Bike parking locations at each building in proximity to the entrances
- Inclusion of a 1-month Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
- Unbundle parking cost from purchase or rental costs

12 Transit

12.1 Route Capacity

Overall, the forecasted new transit trips would result in the need for approximately 3 single buses (55-person capacity) during the AM and PM peak hours for local service.

12.2 Transit Priority

No transit priority is required explicitly for this study. The planned BRT corridors along Chapman Mills and Greenbank Road may not be implemented prior to the 2030 horizon, given the current funding obligations, and were not considered.

13 Network Intersection Design

13.1 Network Intersection Control

No change to the existing signalized control is recommended for the network intersections.

13.2 Network Intersection Design

13.2.1 2025 Future Total Network Intersection Operations

The 2025 future total network intersection operations are summarized below in Table 18. The level of service for signalized intersections is based on the TIA Guidelines for the lane movements and HCM average delay for the overall intersection. The signal timing has been optimized for the horizon. The synchro worksheets have been provided in Appendix I.

Table 18: 2025 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)
Greenbank Road & Strandherd Drive *Signalized*	EBL	B	0.64	32.5	41.5	C	0.80	48.2	#61.5
	EBT	B	0.61	38.6	93.6	E	0.95	61.0	#157.2
	EBR	A	0.29	6.2	16.6	A	0.44	6.2	20.5
	WBL	A	0.34	23.5	24.7	**F**	**1.07**	**110.6**	**#99.9**
	WBT	C	0.72	43.1	106.3	D	0.81	47.7	119.6
	WBR	A	0.30	6.5	16.4	A	0.33	6.4	17.1
	NBL	B	0.61	72.0	44.0	B	0.68	75.4	m51.7
	NBT/R	A	0.49	25.7	29.1	A	0.53	22.6	29.8
	SBL	A	0.55	57.9	32.7	B	0.65	58.3	44.0
	SBT	A	0.24	34.9	34.8	A	0.51	39.3	70.2
	SBR	A	0.25	5.1	11.5	A	0.33	7.0	17.8
	Overall	**D**	-	**35.3**	-	**D**	-	**46.4**	-
Greenbank Road & Marketplace Avenue *Signalized*	EBL	A	0.06	34.8	6.6	A	0.24	30.8	16.0
	EBT/R	A	0.17	29.2	12.1	B	0.61	44.6	62.1
	WBL	A	0.18	38.6	14.0	A	0.56	41.5	41.5
	WBT/R	A	0.44	16.8	21.0	D	0.82	53.6	#93.5
	NBL	B	0.61	68.2	#53.9	C	0.78	77.7	#71.4
	NBT/R	A	0.34	13.9	80.1	A	0.45	25.5	81.5
	SBL	A	0.32	60.8	16.5	B	0.61	61.5	m34.8
	SBT/R	A	0.22	14.7	34.8	A	0.55	22.4	m59.1
	Overall	**C**	-	**21.1**	-	**D**	-	**36.7**	-
Greenbank Road & New Collector *Signalized*	EBL	A	0.22	33.6	13.5	A	0.58	47.8	33.2
	EBT/R	A	0.01	0.0	0.0	A	0.09	0.7	0.0
	WB	A	0.02	0.2	0.0	A	0.02	0.2	0.0
	NBL	A	0.03	4.3	2.5	A	0.34	44.9	26.4
	NBT/R	A	0.28	3.1	20.7	A	0.26	3.4	23.8
	SBL	A	0.01	6.2	1.9	A	0.01	11.2	2.4
	SBT/R	A	0.17	4.2	28.4	A	0.44	12.3	78.3
	Overall	**A**	-	**4.5**	-	**B**	-	**12.1**	-

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

The network intersection operations for the 2025 future total horizon generally operate satisfactorily during the peak hours with the exception of the westbound left-turn at the Greenbank Road and Strandherd Drive intersection during the PM peak. This movement may experience high delays and be at capacity, requiring an

additional 2 seconds in green time to reduce the volume-to-capacity to below 1.00, potentially coming from the eastbound through and north/south bound through (1 second each) movements. Any changes will need to be coordinated along the Greenbank Road and Strandherd Drive corridors.

13.2.2 2030 Future Total Network Intersection Operations

The 2030 future total network intersection operations are summarized below in Table 19. The level of service for signalized intersections is based on the TIA Guidelines for the lane movements and HCM average delay for the overall intersection. The signal timing has been optimized for the horizon. The synchro worksheets have been provided in Appendix J.

Table 19: 2030 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)
Greenbank Road & Strandherd Drive *Signalized*	EBL	A	0.60	30.2	39.9	C	0.79	47.4	#59.9
	EBT	A	0.52	34.9	84.8	E	0.99	68.7	#168.3
	EBR	A	0.14	0.5	0.0	A	0.26	5.4	12.6
	WBL	A	0.24	21.8	19.3	D	0.86	61.9	#71.5
	WBT	C	0.71	42.5	104.3	D	0.82	47.9	120.6
	WBR	A	0.30	6.5	16.4	A	0.33	6.3	17.2
	NBL	A	0.43	76.1	24.4	A	0.52	71.2	m31.3
	NBT/R	A	0.47	27.5	66.2	A	0.54	26.4	44.7
	SBL	A	0.55	57.9	32.7	B	0.65	58.3	44.0
	SBT	A	0.22	31.3	33.4	A	0.48	36.0	72.5
	SBR	A	0.22	4.0	9.8	A	0.29	6.2	16.9
	Overall	**C**	-	**33.7**	-	**D**	-	**45.7**	-
Greenbank Road & Marketplace Avenue *Signalized*	EBL	A	0.08	40.2	7.8	A	0.24	30.8	16.0
	EBT/R	A	0.21	34.2	14.1	B	0.61	44.6	62.1
	WBL	A	0.21	43.8	16.6	A	0.56	41.5	41.5
	WBT/R	A	0.49	20.6	24.6	D	0.82	53.6	#93.5
	NBL	A	0.54	60.5	40.2	C	0.78	77.7	#71.4
	NBT/R	A	0.26	10.8	48.4	A	0.37	24.1	65.9
	SBL	A	0.31	63.7	16.4	B	0.61	67.1	m36.9
	SBT/R	A	0.17	10.6	18.6	A	0.45	18.1	m41.6
	Overall	**C**	-	**20.3**	-	**D**	-	**37.0**	-
Greenbank Road & New Collector *Signalized*	EBL	A	0.22	33.6	13.5	A	0.50	40.4	28.4
	EBT/R	A	0.01	0.0	0.0	A	0.05	0.2	0.0
	WB	A	0.02	0.2	0.0	A	0.02	0.2	0.0
	NBL	A	0.03	5.7	4.7	A	0.41	45.2	23.9
	NBT/R	A	0.23	4.5	40.3	A	0.23	5.6	37.3
	SBL	A	0.01	6.2	1.9	A	0.01	14.0	2.8
	SBT/R	A	0.14	4.0	22.2	A	0.39	13.0	79.3
	Overall	**A**	-	**5.5**	-	**B**	-	**13.2**	-

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

The network intersection operations for the 2030 future total horizon generally operate satisfactorily during the peak hours. The eastbound through at the Strandherd Drive and Greenbank Road intersection is noted to have a volume-to-capacity ratio of 0.99.

13.2.3 Network Intersection MMLOS

Table 20 summarizes the MMLOS analysis for the network intersections of Greenbank Road and Marketplace Avenue, and Greenbank Road and Strandherd Drive. The existing and future conditions for both intersections will be the same and are considered in one row. The analysis is based on the policy area of within 600m of a rapid transit station. 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
Greenbank Road & Strandherd Drive	F	A	F	C	F	A	B	E	C	E
Greenbank Road & New Collector	F	A	F	C	E	A	F	E	A	E
Greenbank Road & Marketplace Avenue	F	A	F	C	F	A	B	E	A	E

The MMLOS targets for the pedestrian, bicycle and transit LOS will not be met at all of the signalized network intersections, and the truck LOS will not be met at the Greenbank Road and New Collector intersection. The pedestrian level of service would require a maximum of four lanes at a crossing to meet a LOS C and two lanes at a crossing to meet a LOS A. The mixed traffic approaches for cyclists and speeds along the arterial roads drive the LOS F and E for the intersections and would require travel speeds under 50 km/h to meet a bicycle LOS C. The transit LOS will not be met due to the intersection delays. The truck LOS is does not meet the targets at the Greenbank Road and New Collector Road intersection due to the single receiving lane of the New Collector.

13.2.4 Recommended Design Elements

No study area intersection design elements are proposed as part of this study beyond the approved intersection modifications and proposed intersections within the Chapman Mills Drive EA Study.

14 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 250 apartment units and 429 stacked townhome units
- Accesses will be provided along the internal road network, connecting to Chapman Mills Drive and Street B, and a right-in/right-out on Greenbank Road
- The development is proposed to be completed as a single phase by 2025
- The Trip Generation, Location, and Safety triggers were met for the TIA Screening

Existing Conditions

- Greenbank Road and Strandherd Drive are arterial roads, and Jockvale Road and Marketplace Avenue are collector roads in the study area
- Future roadways include Chapman Mills Drive and Street B as collector roads
- Sidewalks/MUPS are generally provided on both sides of the study area roadways, and on-street bike lanes on both sides of the roadway on Greenbank Road and on Strandherd Drive, east of Greenbank Road
- The high volumes roadways have produced a high number of collisions at the study are intersections, primarily at the Greenbank Road and Strandherd Drive intersection

- The collisions are predominantly rear end and turning movement collisions indicating that they are lower speed and a result of congestion
- The northbound left-turn at the Greenbank Road and Marketplace Avenue intersection may experience high delays during the PM peak hour

Development Generated Travel Demand

- The proposed development is forecasted produce 585 two-way people trips during the AM peak hour and 708 two-way people trips during the PM peak hour
- Of the forecasted people trips, 234 two-way trips will be vehicle trips during the AM peak hour and 283 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

Background Conditions

- The background developments of 3195 Greenbank, 3201 Greenbank Road, 3311 Greenbank Road, 3370 Greenbank Road (Phase 1 for 2026, ultimate with the Chapman Mills Drive reduction for 2031), and 4005 Strandherd Drive (during 2030) were included in the background conditions, along with a total background growth of 10% along the mainline volumes
- By the 2030 horizon, the Chapman Mills Drive Extension to the west of the Kennedy-Burnett stormwater pond as been assumed to be constructed and an 25% diversion from Greenbank Road was assumed to use Chapman Mills Drive.
- Generally, the study area intersections will operate acceptably during the background horizons
- By 2030, the eastbound through movement at the Greenbank Road and Strandherd Drive intersection may have a volume-to-capacity ratio over 1.00 and would require an additional 2 seconds of green time to lower the ratio below 1.00

Development Design

- The bike and auto parking areas are to be located near the main entrances for the stacked town home and apartment units
- Pedestrian connections will be made along Jockvale Road and to Chapman Mills Drive to the north, Street B to the south, Greenbank Road to the east, and the Kennedy-Burnett stormwater pond to the west
- The new streets proposed as part of the plan of subdivision include the extension of Jockvale Road, Chapman Mills Drive along the north edge of the property and Street B along the southern edge of the property
- The Chapman Mills Drive cross-section is consistent with the associated EA study, Jockvale Road will be a 24.0 metre collector road and the remaining local roads will be 18.0 metres
- Traffic calming elements are recommended at the future local road intersections with Jockvale Road, Street A and Street B, including bulb-outs to narrow each approach to the intersection and reduce pedestrian crossing distances

Boundary Street Design

- The boundary streets will not meet pedestrian MMLOS targets, due to auto volumes and/or posted speed limits (e.g. 60km/h)

- Existing and future Greenbank Road will not meet bicycle MMLOS targets and require the addition of cycle tracks in the future City design
- Due to the issues limiting the ability to meet the MMLOS targets, no improvements are recommended for the boundary streets to meet the pedestrian MMLOS targets

Access Intersections Design

- Townhome and apartment accesses are proposed as private approach, the access will require a depressed curb and sidewalk through the access
- The new intersections along Chapman Mills Drive are consistent with the EA study recommendations and no changes to the Greenbank Road and Chapman Mills Drive intersection are recommended
- The intersections along Street B are assumed to be minor stop-controlled, with Street B operating as a free flow corridor, and the intersection of Greenbank Road and Street B will be signalized for operational constraints
- No specific recommendations or design elements are required outside of typical plan of subdivision design
- Generally, the access intersections are expected to operate acceptably during the 2025 and 2030 horizons
- The MMLOS targets for pedestrians, bicycles and transit cannot be met at the signalized access intersections due to the nature of arterial roadways or restrictions on limiting transit delay
- The MMLOS targets for pedestrian and transit will no be met at the concept intersection for Chapman Mills Drive and Jockvale Road due to the crossing distance and restrictions of limiting transit delay

TDM

- Supportive TDM measures to be included within the proposed development should include:
  - Enhanced connectivity of pedestrians and cyclists to the adjacent network and transit
  - Bike parking locations at each building in proximity to the entrances
  - Inclusion of a 1-month Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
  - Unbundle parking cost from purchase or rental costs

Transit

- No transit service is currently provided on the boundary road network, although ultimately BRT corridors will border the north and east of the site
- To meet forecasted transit use, three single buses, 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 any BRT related measures would be subject to the detailed design of those corridors

Network Intersection Design

- Generally, the network intersections will operate acceptably during the background horizons
- During the 2025 horizon, the westbound left-turn at the Greenbank Road and Strandherd Drive intersection may have a volume-to-capacity ratio above 1.00 during the PM peak, requiring an additional 2 seconds in green time to reduce the ratio to below 1.00
- The MMLOS targets for pedestrians, bicycles and transit cannot be met due to the nature of arterial roadways at all signalized network intersections and truck movements may be limited along New Collector for 3195 Jockvale Road development

15 Next Steps

Following the circulation and review of this Strategy Report, any outstanding comments will be addressed, within the context of the draft plan of subdivision submission. Once remaining TIA Steps are completed and sign-off has been received from City Transportation Project Manager, a signed and stamped final report will be provided to City staff.

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

CGH TRANSPORTATION INC.

13 Markham Avenue
Nepean ON K2G 3Z1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 03-Mar-19
Project Number: 2019-09
Project Reference: Caivan Barrhaven Towncentre

1.1 Description of Proposed Development	
Municipal Address	3288 Greenbank Road
Description of Location	CON 3RF PT LOT 14
Land Use Classification	Residential
Development Size	311 apartments, 602 townhomes
Accesses	2 RIRO & 1 Signal on Chapman Mills, shared (Claridge) local connection to Greenbank
Phase of Development	Single Phase
Buildout Year	2028
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	913	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?	Yes
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)?	Yes
Is the proposed driveway within auxiliary lanes of an intersection?	No
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	No
Does the development include a drive-thru facility?	No
Safety Trigger	Yes

TIA Plan Reports

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

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

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

CERTIFICATION

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

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

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

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

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

Name: _____Andrew Harte_____
(Please Print)

Professional Title: _____Professional Engineer_____

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

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

Appendix B

Turning Movement Counts

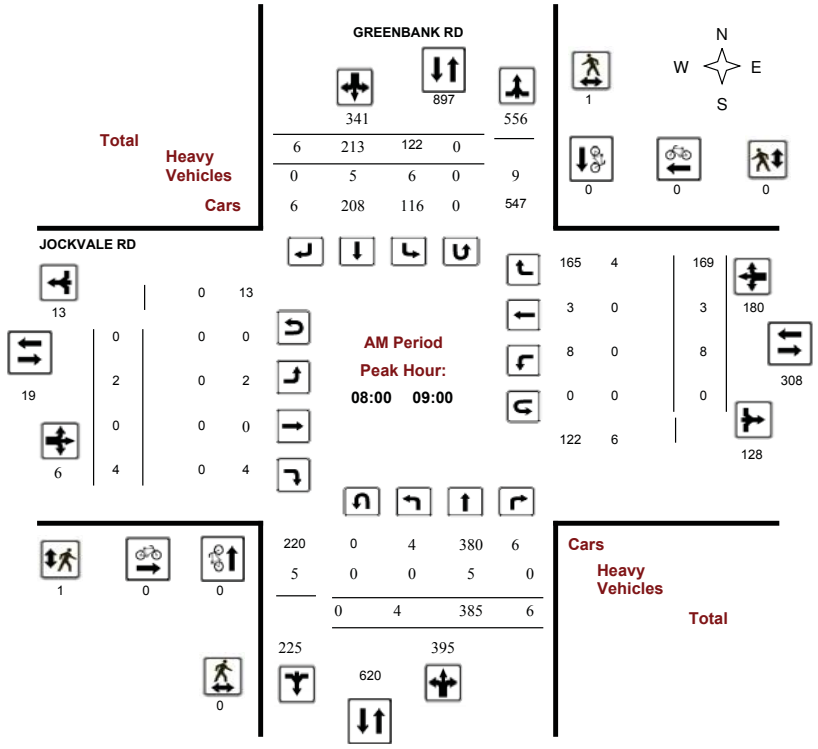
Transportation Services - Traffic Services

Turning Movement Count - 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

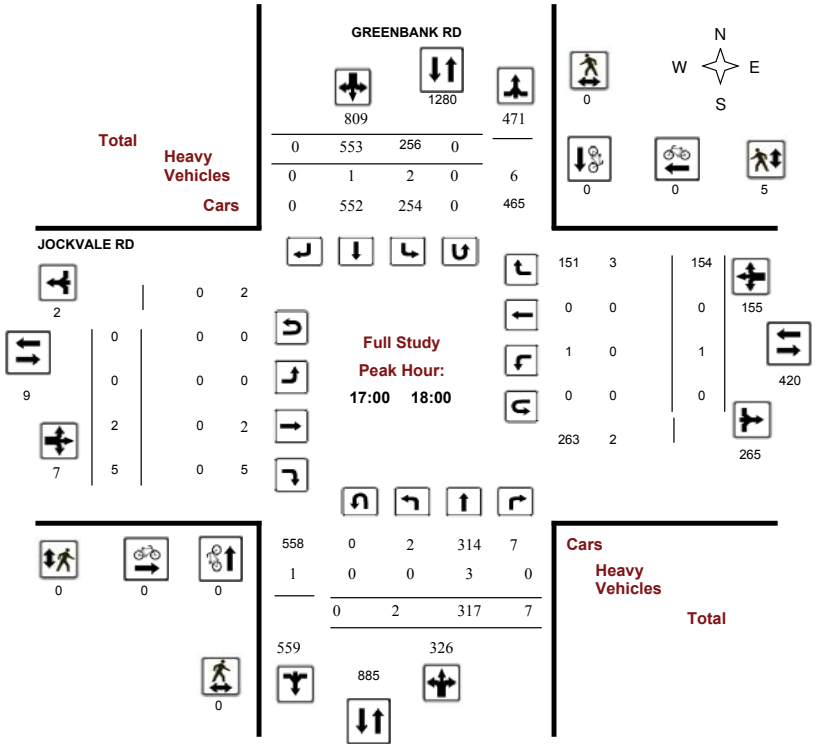
Transportation Services - Traffic Services

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

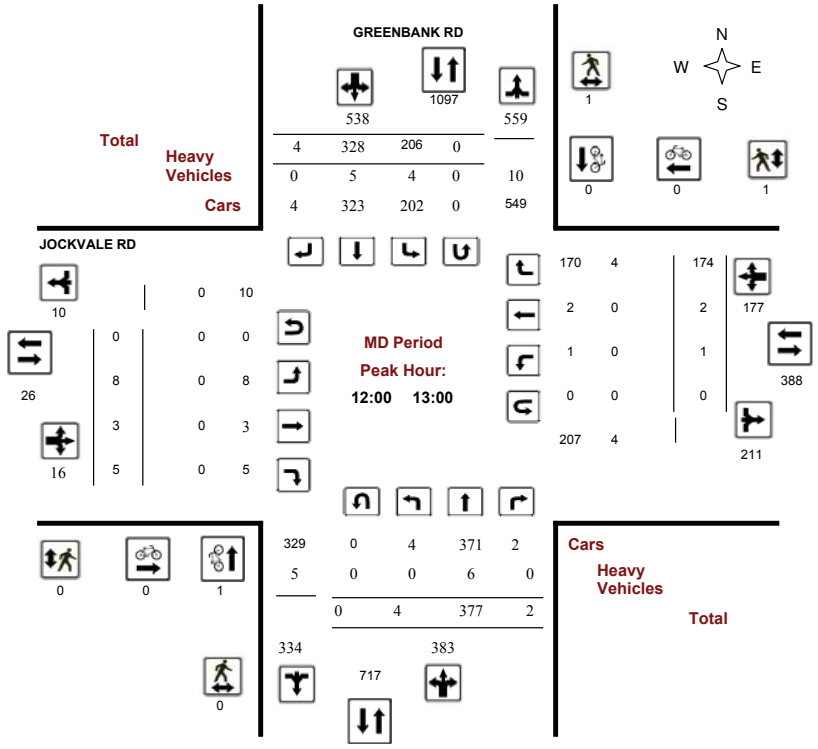
Transportation Services - Traffic Services

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

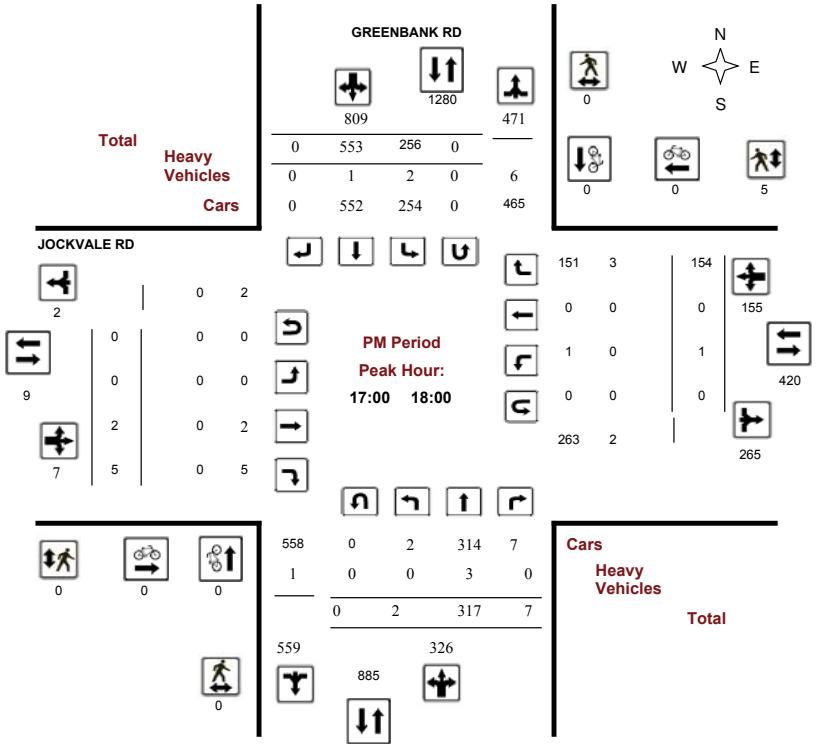
Transportation Services - Traffic Services

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

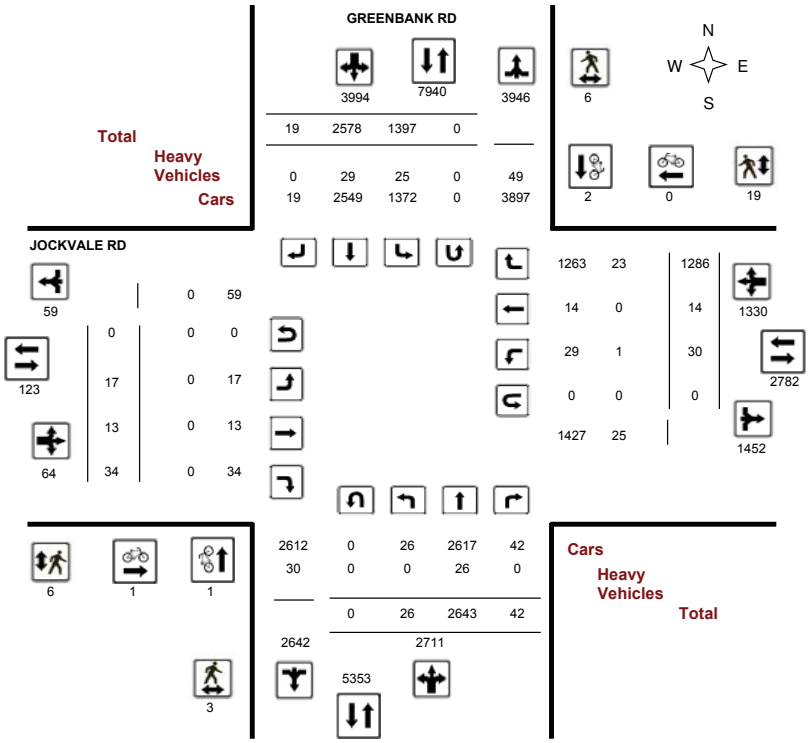
Turning Movement Count - Full Study Diagram

GREENBANK RD @ JOCKVALE RD

Survey Date: Tuesday, August 16, 2016

WO#: 36178

Device: Miovision



Comments

Transportation Services - Traffic Services

Work Order 36178

Turning Movement Count - Full Study Summary Report

GREENBANK RD @ JOCKVALE RD

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.

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:

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.

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.

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:

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:

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

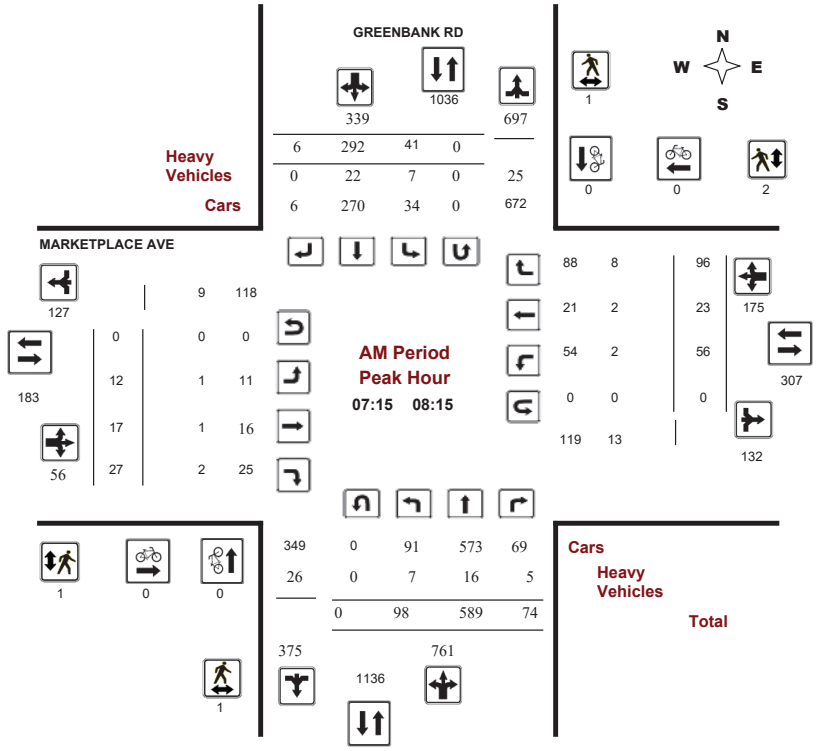
Transportation Services - Traffic Services

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

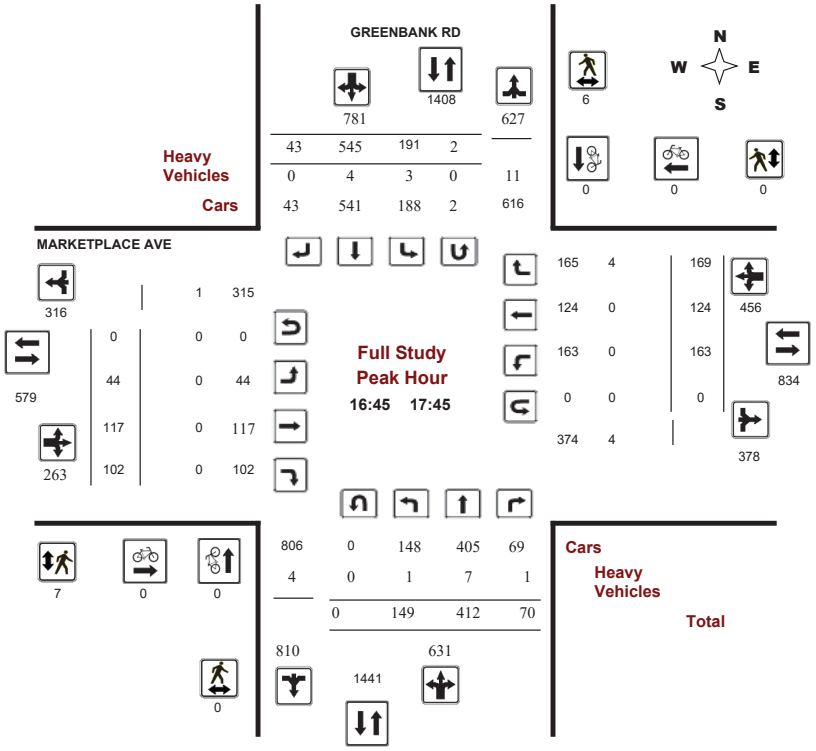
Transportation Services - Traffic Services

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

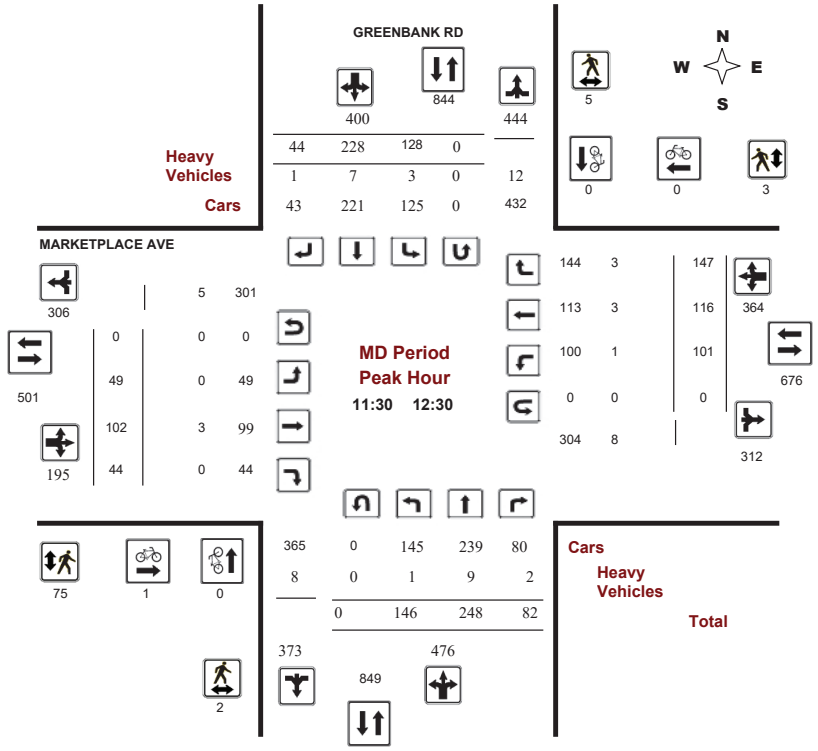
Transportation Services - Traffic Services

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

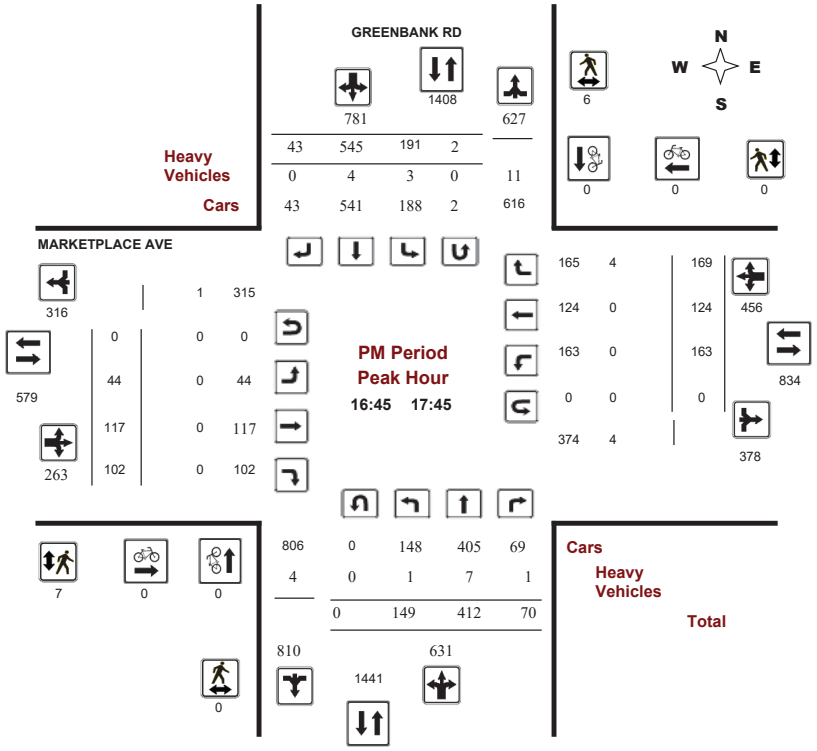
Transportation Services - Traffic Services

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



Comments

Transportation Services - Traffic Services

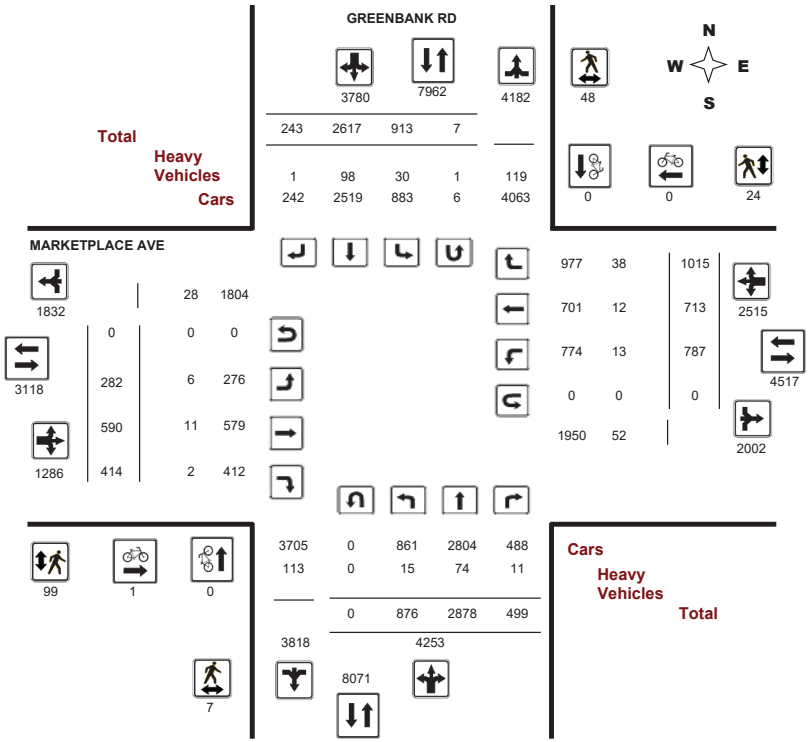
Turning Movement Count - Full Study Diagram

GREENBANK RD @ MARKETPLACE AVE

Survey Date: Wednesday, February 10, 2016

WO#: 35721

Device: Miovision



Comments

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

		GREENBANK RD			MARKETPLACE AVE			
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**	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	GREENBANK RD Southbound LT	ST	RT	S TOT	STR TOT	MARKETPLACE AVE Eastbound LT	ST	RT	E TOT	MARKETPLACE AVE 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

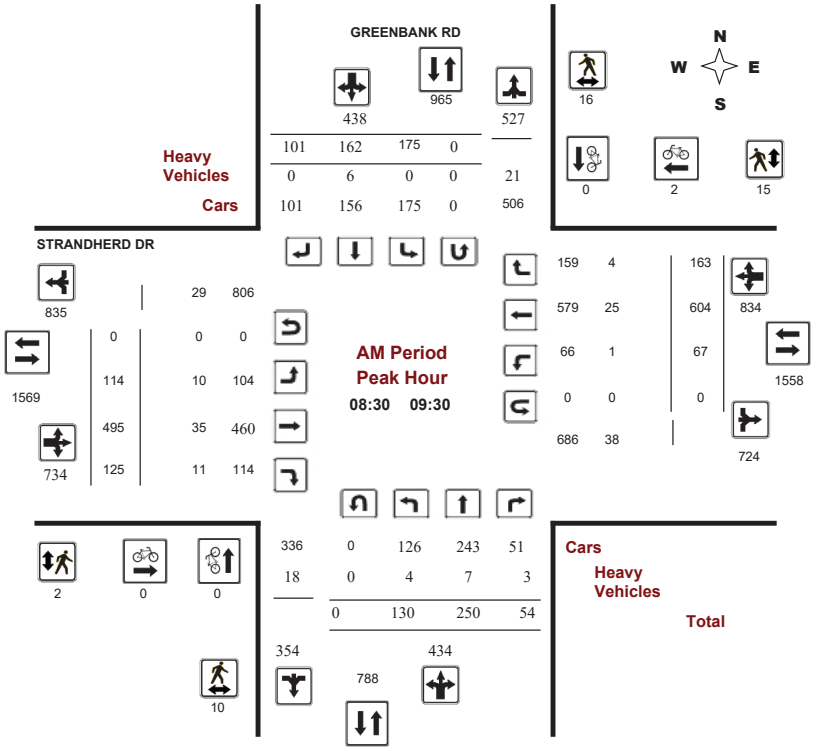
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016 **WO No:** 36175

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



Comments

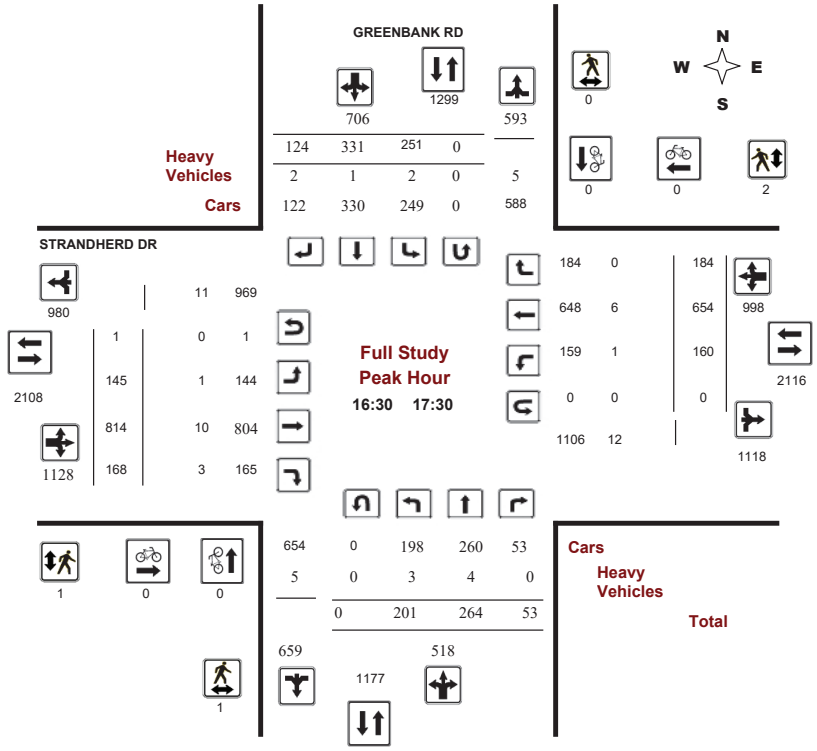
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016 **WO No:** 36175

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



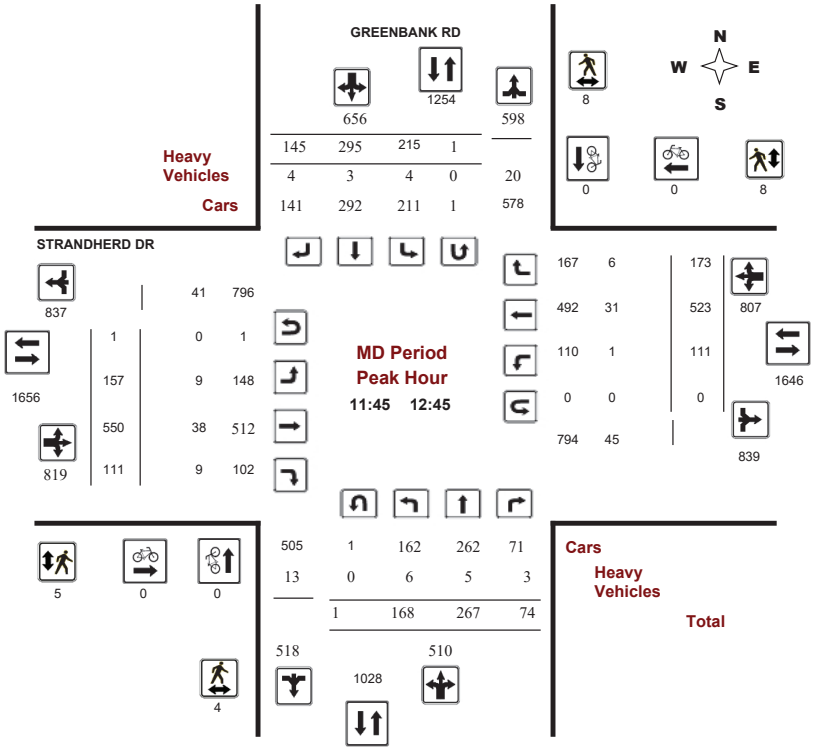
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016 **WO No:** 36175

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



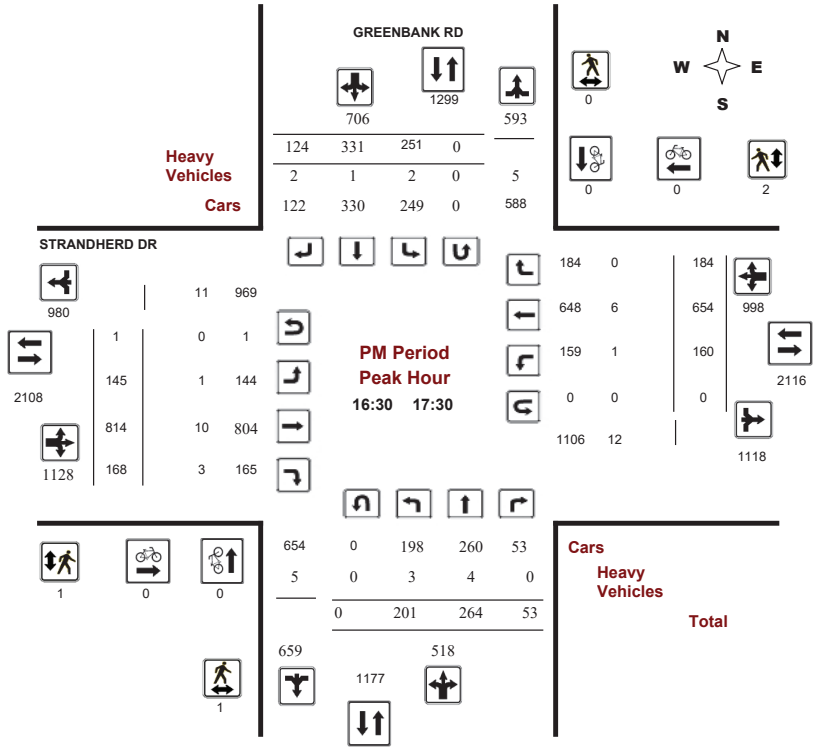
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016 **WO No:** 36175

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



Comments

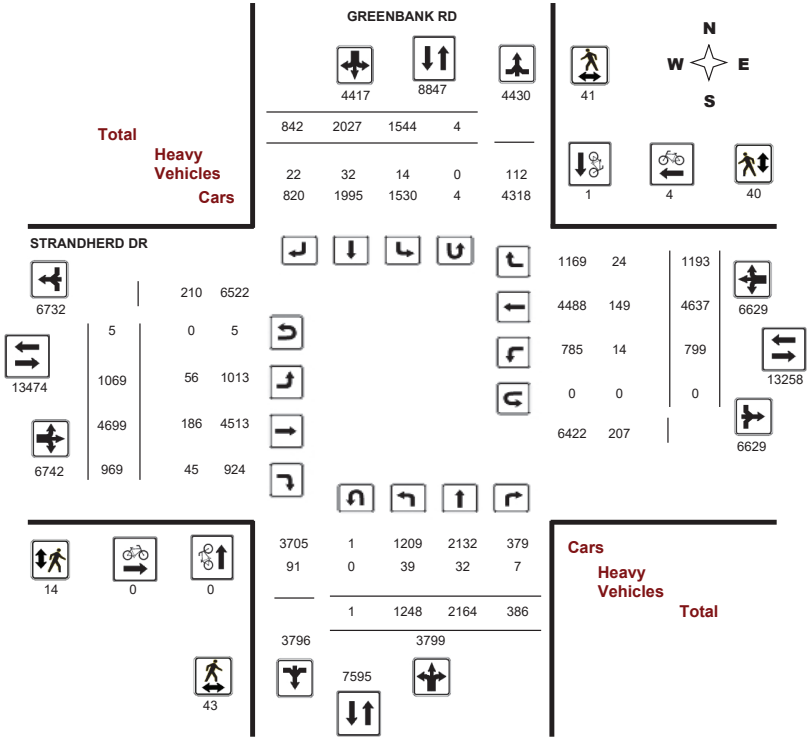
Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016 **WO#:** 36175

Device: Miovision



Comments

Transportation Services - Traffic Services

Work Order 36175

Turning Movement Count - Full Study Summary Report

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016

Total Observed U-Turns

Northbound: 1 Southbound: 4

Eastbound: 5 Westbound: 0

AADT Factor .90

Full Study

	GREENBANK RD									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	108	379	19	**506**	95	120	69	**284**	**790**	112	471	77	**660**	36	526	120	**682**	**1342**	**2132**
08:00 09:00	129	257	49	**435**	149	139	95	**383**	**818**	109	472	116	**697**	47	684	188	**919**	**1616**	**2434**
09:00 10:00	146	247	38	**431**	181	207	106	**494**	**925**	110	518	99	**727**	77	512	125	**714**	**1441**	**2366**
11:30 12:30	181	262	69	**512**	213	287	135	**635**	**1147**	155	581	116	**852**	101	518	169	**788**	**1640**	**2787**
12:30 13:30	153	287	58	**498**	198	250	135	**583**	**1081**	170	551	115	**836**	108	521	172	**801**	**1637**	**2718**
15:00 16:00	151	222	45	**418**	240	322	97	**659**	**1077**	123	605	123	**851**	126	590	116	**832**	**1683**	**2760**
16:00 17:00	190	259	56	**505**	228	322	96	**646**	**1151**	147	708	164	**1019**	142	658	161	**961**	**1980**	**3131**
17:00 18:00	190	251	52	**493**	240	380	109	**729**	**1222**	143	793	159	**1095**	162	628	142	**932**	**2027**	**3249**
Sub Total	1248	2164	386	**3798**	1544	2027	842	**4413**	**8211**	1069	4699	969	**6737**	799	4637	1193	**6629**	**13366**	**21577**
U Turns				**1**				**4**	**5**				**5**				**0**	**5**	**10**
Total	1248	2164	386	**3799**	1544	2027	842	**4417**	**8216**	1069	4699	969	**6742**	799	4637	1193	**6629**	**13371**	**21587**
EQ 12Hr	1735	3008	537	**5281**	2146	2818	1170	**6140**	**11421**	1486	6532	1347	**9371**	1111	6445	1658	**9214**	**18585**	**30006**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	1561	2707	483	**4753**	1932	2536	1053	**5526**	**10279**	1337	5878	1212	**8434**	1000	5801	1492	**8293**	**16727**	**27006**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													**.90**						
AVG 24Hr	2045	3546	633	**6226**	2530	3322	1380	**7239**	**13465**	1752	7701	1588	**11049**	1309	7599	1955	**10864**	**21913**	**35378**
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. 36175

Turning Movement Count - 15 Minute Summary Report

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016

Total Observed U-Turns

Northbound: 1 Southbound: 4

Eastbound: 5 Westbound: 0

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

Note: U-Turns are included in Totals.

Comment:

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 36175

GREENBANK RD @ STRANDHERD DR

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

	GREENBANK RD			STRANDHERD DR			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	0	1	**1**	0	0	**0**	**1**
08:00 09:00	0	0	**0**	0	2	**2**	**2**
09:00 10:00	0	0	**0**	0	1	**1**	**1**
11:30 12:30	0	0	**0**	0	1	**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	1	**1**	0	4	**4**	**5**

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. 36175

Turning Movement Count - Heavy Vehicle Report

GREENBANK RD @ STRANDHERD DR

Survey Date: Tuesday, August 16, 2016

	GREENBANK RD								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	5	1	0	**6**	0	3	7	**10**	**16**	8	22	7	**37**	3	16	2	**21**	**58**	**74**
08:00 09:00	6	10	3	**19**	0	3	1	**4**	**23**	12	25	7	**44**	0	26	7	**33**	**77**	**100**
09:00 10:00	6	3	0	**9**	2	11	4	**17**	**26**	12	39	7	**58**	6	25	4	**35**	**93**	**119**
11:30 12:30	7	2	2	**11**	3	2	3	**8**	**19**	8	34	8	**50**	1	34	9	**44**	**94**	**113**
12:30 13:30	4	8	1	**13**	5	7	4	**16**	**29**	9	34	7	**50**	2	19	1	**22**	**72**	**101**
15:00 16:00	4	0	0	**4**	2	1	1	**4**	**8**	1	16	3	**20**	1	14	0	**15**	**35**	**43**
16:00 17:00	3	3	0	**6**	0	2	2	**4**	**10**	4	10	3	**17**	0	9	1	**10**	**27**	**37**
17:00 18:00	4	5	1	**10**	2	3	0	**5**	**15**	2	6	3	**11**	1	6	0	**7**	**18**	**33**
Sub Total	39	32	7	**78**	14	32	22	**68**	**146**	56	186	45	**287**	14	149	24	**187**	**474**	**620**
U-Turns (Heavy Vehicles)				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	39	32	7	**0**	14	32	22	**68**	**146**	56	186	45	**287**	14	149	24	**187**	**474**	**620**

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

Transportation Services - Traffic Services

Work Order 36175

Turning Movement Count - Pedestrian Volume Report

GREENBANK RD @ STRANDHERD DR

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

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	1	1	0	0	0	1
07:15 07:30	2	0	2	0	2	2	4
07:30 07:45	2	2	4	0	1	1	5
07:45 08:00	1	0	1	0	1	1	2
07:00 08:00	5	3	8	0	4	4	12
08:00 08:15	0	2	2	0	0	0	2
08:15 08:30	0	1	1	0	0	0	1
08:30 08:45	0	4	4	2	0	2	6
08:45 09:00	3	5	8	0	0	0	8
08:00 09:00	3	12	15	2	0	2	17
09:00 09:15	6	2	8	0	7	7	15
09:15 09:30	1	5	6	0	8	8	14
09:30 09:45	4	2	6	0	3	3	9
09:45 10:00	3	0	3	2	1	3	6
09:00 10:00	14	9	23	2	19	21	44
11:30 11:45	3	1	4	0	3	3	7
11:45 12:00	2	1	3	1	1	2	5
12:00 12:15	0	2	2	2	1	3	5
12:15 12:30	0	3	3	1	4	5	8
11:30 12:30	5	7	12	4	9	13	25
12:30 12:45	2	2	4	1	2	3	7
12:45 13:00	3	2	5	0	0	0	5
13:00 13:15	1	1	2	1	1	2	4
13:15 13:30	4	2	6	1	0	1	7
12:30 13:30	10	7	17	3	3	6	23
15:00 15:15	0	0	0	0	0	0	0
15:15 15:30	0	1	1	0	0	0	1
15:30 15:45	1	0	1	0	0	0	1
15:45 16:00	0	1	1	0	0	0	1
15:00 16:00	1	2	3	0	0	0	3
16:00 16:15	2	0	2	0	0	0	2
16:15 16:30	0	1	1	1	1	2	3
16:30 16:45	0	0	0	0	1	1	1
16:45 17:00	0	0	0	0	1	1	1
16:00 17:00	2	1	3	1	3	4	7
17:00 17:15	1	0	1	0	0	0	1
17:15 17:30	0	0	0	1	0	1	1
17:30 17:45	0	0	0	0	2	2	2
17:45 18:00	2	0	2	1	0	1	3
17:00 18:00	3	0	3	2	2	4	7
Total	43	41	84	14	40	54	138

Comment:

Transportation Services - Traffic Services

Work Order 36175

Turning Movement Count - 15 Min U-Turn Total Report

GREENBANK RD @ STRANDHERD DR

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	1	0	0	1
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	1	0	1
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	1	0	1
11:30	11:45	0	0	1	0	1
11:45	12:00	1	0	1	0	2
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	1	0	0	1
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	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	1	0	1
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		1	4	5	0	10

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	9	3	169	4	426	6	126	223	6
Future Volume (vph)	2	0	4	9	3	169	4	426	6	126	223	6
Satd. Flow (prot)	0	1563	0	0	1681	1483	0	1742	0	1658	1737	0
Flt Permitted		0.884			0.772			0.998		0.453		
Satd. Flow (perm)	0	1403	0	0	1347	1463	0	1738	0	791	1737	0
Satd. Flow (RTOR)		102				188		1			3	
Lane Group Flow (vph)	0	6	0	0	13	188	0	484	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)	27.0	27.0		27.0	27.0	20.0	73.0	73.0		20.0	93.0	
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)		12.0			12.0	13.0		89.9		104.3	108.6	
Actuated g/C Ratio		0.10			0.10	0.11		0.75		0.87	0.90	
v/c Ratio		0.03			0.10	0.57		0.37		0.19	0.16	
Control Delay		0.2			48.5	12.0		8.6		3.2	1.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		0.2			48.5	12.0		8.6		3.2	1.9	
LOS		A			D	B		A		A	A	
Approach Delay		0.2			14.3			8.6			2.4	
Approach LOS		A			B			A			A	
Queue Length 50th (m)		0.0			3.1	0.0		21.3		2.4	0.0	
Queue Length 95th (m)		0.0			8.8	17.0		95.5		6.9	11.0	
Internal Link Dist (m)		194.4			396.8			294.1			283.1	
Turn Bay Length (m)												
Base Capacity (vph)		325			231	388		1302		781	1572	
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			0.06	0.48		0.37		0.18	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: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 7.3	Intersection LOS: A
Intersection Capacity Utilization 72.6%	ICU Level of Service C
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 1: Greenbank & Jockvale

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	74	43	305	6
Future Volume (vph)	12	17	16	34	23	96	98	358	74	43	305	6
Satd. Flow (prot)	1658	1607	0	1658	1518	0	1658	3221	0	3216	3304	0
Flt Permitted	0.645			0.678			0.950			0.950		
Satd. Flow (perm)	1124	1607	0	1182	1518	0	1655	3221	0	3208	3304	0
Satd. Flow (RTOR)		18			107			25			2	
Lane Group Flow (vph)	13	37	0	38	133	0	109	480	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)	12.0	35.0		12.0	35.0		15.0	58.0		15.0	58.0	
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	0.24		0.25	0.19	
Control Delay	35.1	29.2		38.7	17.2		65.6	11.7		62.2	14.6	
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		65.6	11.7		62.2	14.6	
LOS	D	C		D	B		E	B		E	B	
Approach Delay		30.7			22.0			21.7			20.4	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	2.7	4.5		8.0	5.4		26.8	23.7		6.2	16.9	
Queue Length 95th (m)	6.9	13.0		14.7	21.9		#64.2	41.1		13.1	28.6	
Internal Link Dist (m)		102.8			148.8			283.1			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	185	395		203	442		178	2029		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	0.24		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: 120
Control Type: Actuated-Coordinated

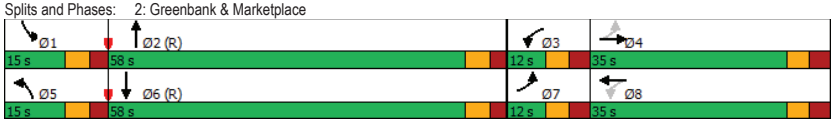
Maximum v/c Ratio: 0.61

Intersection Signal Delay: 21.7	Intersection LOS: C
Intersection Capacity Utilization 51.5%	ICU Level of Service A
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

Splits and Phases: 2: Greenbank & Marketplace



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	114	495	125	67	604	163	130	250	54	175	162	101
Future Volume (vph)	114	495	125	67	604	163	130	250	54	175	162	101
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3209	0	3216	3316	1483
Flt Permitted	0.234			0.380			0.950			0.950		
Satd. Flow (perm)	406	3316	1446	660	3316	1432	3206	3209	0	3154	3316	1462
Satd. Flow (RTOR)			149			181		20				149
Lane Group Flow (vph)	127	550	139	74	671	181	144	338	0	194	180	112
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (%)	15.8%	34.2%	34.2%	15.8%	34.2%	34.2%	20.0%	30.0%		20.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	49.8	40.8	40.8	44.9	36.4	36.4	10.7	34.7		12.5	36.5	36.5
Actuated g/C Ratio	0.42	0.34	0.34	0.37	0.30	0.30	0.09	0.29		0.10	0.30	0.30
v/c Ratio	0.46	0.49	0.24	0.23	0.67	0.32	0.50	0.36		0.58	0.18	0.20
Control Delay	25.8	34.4	5.2	21.7	40.8	6.3	70.6	30.6		57.9	31.9	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	25.8	34.4	5.2	21.7	40.8	6.3	70.6	30.6		57.9	31.9	3.0
LOS	C	C	A	C	D	A	E	C		E	C	A
Approach Delay		28.1			32.6			42.6			35.6	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	18.5	58.3	0.0	10.4	76.8	0.0	19.4	30.2		24.0	17.2	0.0
Queue Length 95th (m)	31.7	79.2	13.2	20.1	100.4	17.2	30.6	34.4		35.3	27.8	6.8
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	300	1127	589	370	1004	559	474	941		474	1008	548
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.42	0.49	0.24	0.20	0.67	0.32	0.30	0.36		0.41	0.18	0.20

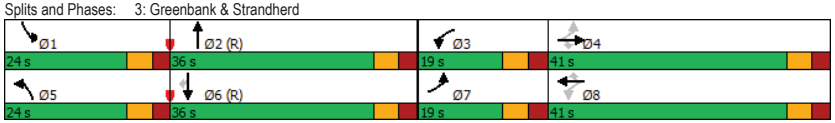
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 94 (78%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 33.5	Intersection LOS: C
Intersection Capacity Utilization 80.2%	ICU Level of Service D
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 3: Greenbank & Strandherd



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	236	7	214	470	0
Future Volume (vph)	0	2	4	1	0	154	2	236	7	214	470	0
Satd. Flow (prot)	0	1588	0	0	1658	1483	0	1737	0	1658	1745	0
Flt Permitted								0.998		0.569		
Satd. Flow (perm)	0	1588	0	0	1745	1483	0	1733	0	987	1745	0
Satd. Flow (RTOR)		4				171		2				
Lane Group Flow (vph)	0	6	0	0	1	171	0	272	0	238	522	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)	27.0	27.0		27.0	27.0	30.0	63.0	63.0		30.0	93.0	
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	11.2		94.6		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		0.20		0.25	0.31	
Control Delay		37.0			51.0	14.7		4.6		1.7	1.6	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		37.0			51.0	14.7		4.6		1.7	1.6	
LOS		D			D	B		A		A	A	
Approach Delay		37.0			14.9			4.6			1.6	
Approach LOS		D			B			A			A	
Queue Length 50th (m)		0.5			0.2	0.0		10.5		0.0	2.8	
Queue Length 95th (m)		4.9			2.1	18.1		38.8		13.4	36.2	
Internal Link Dist (m)		194.4			396.8			294.1			283.1	
Turn Bay Length (m)												
Base Capacity (vph)		275			299	457		1366		1029	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		0.20		0.23	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: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 4.3	Intersection LOS: A
Intersection Capacity Utilization 74.1%	ICU Level of Service D
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 1: Greenbank & Jockvale

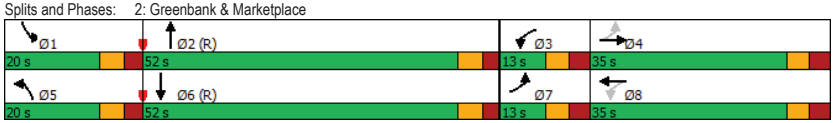
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	117	86	137	124	169	149	347	70	162	461	36
Future Volume (vph)	44	117	86	137	124	169	149	347	70	162	461	36
Satd. Flow (prot)	1658	1633	0	1658	1575	0	1658	3233	0	3216	3271	0
Flt Permitted	0.275			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)	13.0	35.0		13.0	35.0		20.0	52.0		20.0	52.0	
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		85.5	21.7		63.5	21.2	
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		85.5	21.7		63.5	21.2	
LOS	C	D		D	E		F	C		E	C	
Approach Delay		43.7			52.4			38.5			31.6	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	8.3	43.7		27.4	65.3		38.0	39.1		23.5	32.9	
Queue Length 95th (m)	17.3	69.8		44.5	#109.1		#83.8	45.1		m34.3	m44.3	
Internal Link Dist (m)		102.8			148.8			283.1			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
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: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84
Intersection Signal Delay: 39.9 Intersection LOS: D
Intersection Capacity Utilization 74.0% ICU Level of Service D
Analysis Period (min) 15
Description: As per timing plans provided 26-Nov-2018
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Greenbank & Marketplace



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	814	168	160	654	184	201	264	53	251	331	124
Future Volume (vph)	145	814	168	160	654	184	201	264	53	251	331	124
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3225	0	3216	3316	1483
Flt Permitted	0.203			0.114			0.950			0.950		
Satd. Flow (perm)	354	3316	1464	199	3316	1483	3212	3225	0	3208	3316	1464
Satd. Flow (RTOR)			187			204		19				149
Lane Group Flow (vph)	161	904	187	178	727	204	223	352	0	279	368	138
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (%)	15.0%	34.2%	34.2%	15.0%	34.2%	34.2%	20.0%	30.8%		20.0%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	45.3	34.7	34.7	46.3	35.2	35.2	13.6	33.0		15.2	34.6	34.6
Actuated g/C Ratio	0.38	0.29	0.29	0.39	0.29	0.29	0.11	0.28		0.13	0.29	0.29
v/c Ratio	0.64	0.94	0.34	0.84	0.75	0.35	0.61	0.39		0.69	0.38	0.26
Control Delay	34.3	60.4	6.3	59.4	44.3	6.2	69.4	25.8		58.9	36.3	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	34.3	60.4	6.3	59.4	44.3	6.2	69.4	25.8		58.9	36.3	5.9
LOS	C	E	A	E	D	A	E	C		E	D	A
Approach Delay		49.0			39.7			42.7			39.0	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	24.4	115.6	0.0	28.4	86.5	0.0	30.5	21.5		34.4	38.4	0.0
Queue Length 95th (m)	40.0	#157.7	17.3	#68.2	110.2	18.2	m42.5	m28.2		48.4	55.5	13.8
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	259	958	556	215	971	578	474	900		474	956	528
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.62	0.94	0.34	0.83	0.75	0.35	0.47	0.39		0.59	0.38	0.26

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

Maximum v/c Ratio: 0.94

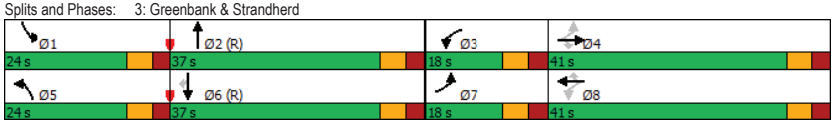
Intersection Signal Delay: 43.1	Intersection LOS: D
Intersection Capacity Utilization 86.4%	ICU Level of Service E
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

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

Splits and Phases: 3: Greenbank & Strandherd



Appendix D

Collision Data

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition
2017-06-16	2017	20:54	GREENBANK RD @ JOCKVALE RD	01 - Clear	05 - Dusk	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-06-06	2017	19:50	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2017-05-04	2017	10:10	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2017-09-19	2017	17:05	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-11-03	2017	16:35	GREENBANK RD @ JOCKVALE RD	02 - Rain	05 - Dusk	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2017-12-07	2017	17:04	GREENBANK RD @ JOCKVALE RD	01 - Clear	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2017-02-15	2017	18:31	GREENBANK RD @ JOCKVALE RD	03 - Snow	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	05 - Packed snow
2017-01-21	2017	11:44	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	06 - Ice
2016-05-28	2016	13:29	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2016-03-05	2016	9:00	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2016-08-11	2016	12:54	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2016-11-18	2016	17:42	GREENBANK RD @ JOCKVALE RD	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-01-16	2015	10:00	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	05 - Packed snow
2015-07-10	2015	13:20	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-03-17	2015	23:57	GREENBANK RD @ JOCKVALE RD	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2015-04-16	2015	20:44	GREENBANK RD @ JOCKVALE RD	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2015-07-26	2015	13:00	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-02-21	2015	15:00	GREENBANK RD @ JOCKVALE RD	03 - Snow	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	03 - Loose snow
2015-08-01	2015	13:34	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-06-11	2015	18:52	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-12-21	2015	9:31	GREENBANK RD @ JOCKVALE RD	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-01-11	2014	18:30	GREENBANK RD @ JOCKVALE RD	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	07 - SMV other	02 - Wet
2014-02-01	2014	15:10	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	06 - Ice
2014-02-11	2014	8:25	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2014-04-03	2014	13:14	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2014-07-12	2014	14:19	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2014-07-08	2014	13:54	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2013-01-25	2013	8:16	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	03 - Loose snow
2013-02-25	2013	10:15	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2013-05-20	2013	19:50	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2013-07-04	2013	14:29	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	02 - Angle	01 - Dry
2013-07-17	2013	20:55	GREENBANK RD @ JOCKVALE RD	01 - Clear	05 - Dusk	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2013-11-25	2013	13:00	GREENBANK RD @ JOCKVALE RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-08-01	2017	9:00	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2017-12-12	2017	15:09	GREENBANK RD @ MARKETPLACE AVE	03 - Snow	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	03 - Loose snow
2017-01-06	2017	11:39	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2016-05-05	2016	18:31	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	07 - SMV other	01 - Dry
2016-03-18	2016	18:43	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2016-08-23	2016	12:36	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2016-06-28	2016	23:01	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2016-12-23	2016	14:09	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	02 - Wet
2015-03-02	2015	15:28	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2015-01-07	2015	15:51	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2015-05-18	2015	13:39	GREENBANK RD @ MARKETPLACE AVE	02 - Rain	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	02 - Angle	02 - Wet
2015-10-17	2015	16:15	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2015-10-10	2015	9:38	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2015-12-28	2015	19:13	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2014-02-21	2014	6:14	GREENBANK RD @ MARKETPLACE AVE	02 - Rain	03 - Dawn	01 - Traffic signal		03 - P.D. only	05 - Turning movement	02 - Wet
2014-03-04	2014	14:07	GREENBANK RD @ MARKETPLACE AVE	03 - Snow	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	02 - Wet
2014-03-28	2014	9:00	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	02 - Wet
2013-03-29	2013	12:20	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2013-06-02	2013	16:45	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2013-07-07	2013	14:21	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2013-10-26	2013	16:17	GREENBANK RD @ MARKETPLACE AVE	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2013-11-01	2013	9:30	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2013-12-08	2013	10:21	GREENBANK RD @ MARKETPLACE AVE	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	02 - Angle	01 - Dry
2017-06-23	2017	8:09	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2017-06-09	2017	17:50	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-05-17	2017	21:42	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2017-05-13	2017	16:26	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-07-20	2017	12:02	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2017-08-05	2017	15:10	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2017-07-12	2017	9:25	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-08-10	2017	11:39	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-08-25	2017	16:47	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-07-11	2017	5:07	GREENBANK RD @ STRANDHERD DR	01 - Clear	03 - Dawn	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-07-24	2017	22:10	GREENBANK RD @ STRANDHERD DR	02 - Rain	07 - Dark	01 - Traffic signal		03 - P.D. only	05 - Turning movement	02 - Wet
2017-09-12	2017	16:29	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-09-12	2017	8:17	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-10-28	2017	11:20	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-10-08	2017	10:30	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet

2017-11-09	2017	21:44	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2017-11-18	2017	15:56	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2017-11-03	2017	15:29	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2017-11-18	2017	18:44	GREENBANK RD @ STRANDHERD DR	02 - Rain	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	02 - Wet
2017-12-08	2017	17:58	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2017-11-30	2017	7:20	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2017-12-09	2017	16:15	GREENBANK RD @ STRANDHERD DR	01 - Clear	05 - Dusk	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2017-02-14	2017	23:00	GREENBANK RD @ STRANDHERD DR	03 - Snow	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	03 - Loose snow
2017-01-04	2017	19:05	GREENBANK RD @ STRANDHERD DR	03 - Snow	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	03 - Loose snow
2017-02-15	2017	18:57	GREENBANK RD @ STRANDHERD DR	03 - Snow	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	04 - Slush
2017-03-02	2017	12:08	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2017-03-24	2017	9:00	GREENBANK RD @ STRANDHERD DR	03 - Snow	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	03 - Loose snow
2017-04-08	2017	11:26	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	01 - Dry
2017-02-21	2017	12:50	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2017-03-24	2017	12:07	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2017-02-22	2017	18:44	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2017-03-12	2017	15:12	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2017-12-22	2017	12:35	GREENBANK RD @ STRANDHERD DR	03 - Snow	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	03 - Loose snow
2016-04-12	2016	9:58	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	01 - Dry
2016-02-17	2016	20:45	GREENBANK RD @ STRANDHERD DR	03 - Snow	07 - Dark	01 - Traffic signal	03 - P.D. only	99 - Other	05 - Packed snow
2016-08-22	2016	10:28	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2016-01-26	2016	0:38	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2016-10-25	2016	18:42	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2016-09-11	2016	10:15	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2016-08-10	2016	18:09	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2016-07-25	2016	17:39	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2016-06-04	2016	13:10	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2016-06-20	2016	19:40	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2016-05-31	2016	13:15	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2016-09-22	2016	21:17	GREENBANK RD @ STRANDHERD DR	02 - Rain	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2016-07-21	2016	13:18	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2016-08-25	2016	19:20	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2016-12-30	2016	16:05	GREENBANK RD @ STRANDHERD DR	01 - Clear	05 - Dusk	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	02 - Wet
2016-12-21	2016	18:36	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2016-12-03	2016	18:12	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	99 - Other	01 - Dry
2015-05-07	2015	9:20	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2015-09-01	2015	20:05	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	01 - Dry
2015-12-06	2015	10:30	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2015-10-20	2015	19:58	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2015-02-08	2015	10:20	GREENBANK RD @ STRANDHERD DR	03 - Snow	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	03 - Loose snow
2015-05-12	2015	14:00	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2015-05-14	2015	10:46	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2015-09-19	2015	9:45	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2015-05-05	2015	14:53	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2015-04-29	2015	13:06	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	02 - Angle	01 - Dry
2015-07-16	2015	21:00	GREENBANK RD @ STRANDHERD DR	01 - Clear	05 - Dusk	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2015-02-14	2015	11:00	GREENBANK RD @ STRANDHERD DR	03 - Snow	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	03 - Loose snow
2015-03-01	2015	17:17	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	07 - SMV other	01 - Dry
2015-03-18	2015	22:11	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2015-03-21	2015	15:19	GREENBANK RD @ STRANDHERD DR	03 - Snow	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2015-06-05	2015	18:39	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2015-06-06	2015	16:29	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2015-11-16	2015	16:29	GREENBANK RD @ STRANDHERD DR	01 - Clear	05 - Dusk	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2015-12-30	2015	14:00	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2014-01-11	2014	8:22	GREENBANK RD @ STRANDHERD DR	04 - Freezing Rain	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	06 - Ice
2014-01-23	2014	17:49	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	06 - Ice
2014-03-12	2014	19:20	GREENBANK RD @ STRANDHERD DR	05 - Drifting Snow	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	03 - Loose snow
2014-05-09	2014	21:00	GREENBANK RD @ STRANDHERD DR	02 - Rain	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	02 - Wet
2014-06-23	2014	13:50	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	01 - Dry
2014-11-03	2014	8:22	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2014-09-05	2014	11:43	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	07 - SMV other	01 - Dry
2014-12-21	2014	0:13	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	02 - Non-fatal injury	02 - Angle	01 - Dry
2014-01-24	2014	18:15	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-01-31	2014	18:41	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-02-11	2014	12:35	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	02 - Wet
2014-02-09	2014	10:01	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-02-18	2014	7:29	GREENBANK RD @ STRANDHERD DR	03 - Snow	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	03 - Loose snow
2014-05-03	2014	9:53	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2014-04-27	2014	15:15	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-06-11	2014	17:27	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2014-07-23	2014	10:47	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	02 - Angle	01 - Dry
2014-07-28	2014	14:30	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry

2014-07-14	2014	7:45	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-07-18	2014	13:58	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-11-25	2014	18:29	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-11-08	2014	21:51	GREENBANK RD @ STRANDHERD DR	02 - Rain	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2014-09-30	2014	10:20	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2014-11-06	2014	9:12	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2014-10-29	2014	16:10	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-10-04	2014	1:30	GREENBANK RD @ STRANDHERD DR	02 - Rain	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2014-09-20	2014	16:40	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-10-30	2014	16:16	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2014-12-09	2014	7:48	GREENBANK RD @ STRANDHERD DR	01 - Clear	03 - Dawn	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2014-09-13	2014	13:55	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2014-09-26	2014	19:50	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2014-11-01	2014	16:13	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2013-01-17	2013	16:50	GREENBANK RD @ STRANDHERD DR	01 - Clear	05 - Dusk	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2013-01-24	2013	13:52	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	03 - Loose snow
2013-01-28	2013	11:02	GREENBANK RD @ STRANDHERD DR	03 - Snow	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	02 - Angle	04 - Slush
2013-02-03	2013	20:28	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2013-02-28	2013	19:19	GREENBANK RD @ STRANDHERD DR	03 - Snow	07 - Dark	01 - Traffic signal	03 - P.D. only	05 - Turning movement	02 - Wet
2013-03-21	2013	10:20	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-04-24	2013	16:30	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2013-04-28	2013	15:00	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2013-04-30	2013	15:36	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	01 - Dry
2013-05-21	2013	5:49	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2013-05-29	2013	16:50	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-06-01	2013	14:04	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-06-04	2013	11:02	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	01 - Dry
2013-06-21	2013	17:00	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-06-24	2013	14:37	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-08-12	2013	11:47	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2013-09-11	2013	9:26	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	02 - Angle	01 - Dry
2013-09-12	2013	9:17	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	01 - Dry
2013-09-11	2013	8:20	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-09-20	2013	10:56	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	05 - Turning movement	01 - Dry
2013-11-10	2013	16:08	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal	02 - Non-fatal injury	03 - Rear end	02 - Wet
2013-11-17	2013	11:30	GREENBANK RD @ STRANDHERD DR	02 - Rain	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	02 - Wet
2013-12-03	2013	12:15	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-12-03	2013	20:15	GREENBANK RD @ STRANDHERD DR	01 - Clear	07 - Dark	01 - Traffic signal	03 - P.D. only	03 - Rear end	01 - Dry
2013-12-06	2013	8:35	GREENBANK RD @ STRANDHERD DR	01 - Clear	01 - Daylight	01 - Traffic signal	03 - P.D. only	04 - Sideswipe	01 - Dry
2013-12-26	2013	13:38	GREENBANK RD @ STRANDHERD DR	00 - Unknown	01 - Daylight	01 - Traffic signal	03 - P.D. only	05 - Turning movement	00 - Unknown
2017-06-17	2017	2:58	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	02 - Wet
2017-11-11	2017	12:15	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	02 - Angle	01 - Dry
2017-11-27	2017	8:02	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	05 - Drifting Snow	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	06 - Ice
2017-11-27	2017	8:01	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	02 - Wet
2017-01-15	2017	1:14	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	02 - Wet
2017-04-23	2017	0:43	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	01 - Dry
2017-03-22	2017	11:12	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2016-01-29	2016	10:18	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	01 - Approaching	03 - Loose snow
2016-04-30	2016	11:26	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	6 - SMV unattended vehicl	01 - Dry
2016-06-22	2016	22:43	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	02 - Rain	07 - Dark	10 - No control	03 - P.D. only	01 - Approaching	02 - Wet
2016-04-06	2016	20:26	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	03 - Snow	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	05 - Packed snow
2016-04-28	2016	21:36	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2016-02-19	2016	18:23	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	02 - Rain	07 - Dark	10 - No control	03 - P.D. only	01 - Approaching	03 - Loose snow
2015-01-20	2015	15:12	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	03 - Rear end	01 - Dry
2015-05-07	2015	7:51	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	03 - Rear end	01 - Dry
2015-01-30	2015	7:25	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	03 - Snow	03 - Dawn	10 - No control	02 - Non-fatal injury	07 - SMV other	05 - Packed snow
2015-04-09	2015	0:50	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	02 - Rain	07 - Dark	10 - No control	02 - Non-fatal injury	07 - SMV other	02 - Wet
2015-09-15	2015	18:27	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2015-05-07	2015	21:33	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	01 - Dry
2015-01-17	2015	8:55	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	01 - Approaching	02 - Wet
2015-12-10	2015	1:00	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	02 - Rain	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	02 - Wet
2014-02-12	2014	10:37	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2014-09-26	2014	14:20	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	07 - SMV other	01 - Dry
2014-12-12	2014	8:10	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	03 - Snow	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	03 - Loose snow
2014-08-26	2014	16:15	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	07 - SMV other	01 - Dry
2013-01-28	2013	12:18	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	03 - Snow	01 - Daylight	10 - No control	03 - P.D. only	07 - SMV other	05 - Packed snow
2013-01-31	2013	21:45	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	07 - Dark	10 - No control	03 - P.D. only	07 - SMV other	01 - Dry
2013-02-27	2013	12:34	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	03 - Snow	01 - Daylight	10 - No control	03 - P.D. only	01 - Approaching	03 - Loose snow
2013-05-31	2013	17:55	GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	01 - Dry
2016-06-14	2016	20:53	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	01 - Clear	05 - Dusk	10 - No control	03 - P.D. only	04 - Sideswipe	01 - Dry
2015-08-15	2015	12:00	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	04 - Sideswipe	01 - Dry
2015-07-29	2015	11:01	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	05 - Turning movement	01 - Dry

2015-08-15	2015	11:40	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	02 - Angle	01 - Dry
2015-10-25	2015	17:44	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	04 - Sideswipe	01 - Dry
2014-01-07	2014	15:45	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	06 - Strong wind	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	06 - Ice
2014-01-03	2014	8:58	GREENBANK RD btwn MARKETPLACE AVE & JOCKVALE RD	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	01 - Approaching	06 - Ice
2017-05-13	2017	19:15	GREENBANK RD btwn STRANDHERD DR & MARKETPLACE AVE	01 - Clear	01 - Daylight	10 - No control	03 - P.D. only	04 - Sideswipe	01 - Dry
2017-01-19	2017	17:50	GREENBANK RD btwn STRANDHERD DR & MARKETPLACE AVE	01 - Clear	07 - Dark	10 - No control	02 - Non-fatal injury	04 - Sideswipe	02 - Wet
2016-03-24	2016	15:44	GREENBANK RD btwn STRANDHERD DR & MARKETPLACE AVE	04 - Freezing Rain	01 - Daylight	10 - No control	03 - P.D. only	03 - Rear end	06 - Ice
2013-01-07	2013	7:53	GREENBANK RD btwn STRANDHERD DR & MARKETPLACE AVE	01 - Clear	03 - Dawn	10 - No control	03 - P.D. only	07 - SMV other	04 - Slush
2013-10-30	2013	11:30	GREENBANK RD btwn STRANDHERD DR & MARKETPLACE AVE	01 - Clear	01 - Daylight	10 - No control	02 - Non-fatal injury	03 - Rear end	01 - Dry

Appendix E

Synchro Intersection Worksheets – 2025 Background Conditions

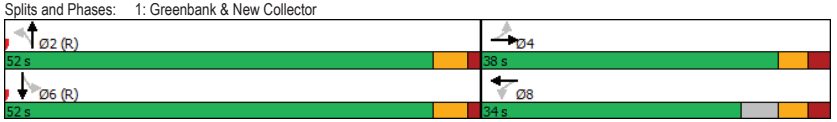
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	0	7	1	0	5	20	632	1	5	364	38
Future Volume (vph)	43	0	7	1	0	5	20	632	1	5	364	38
Satd. Flow (prot)	1658	1457	0	0	1513	0	1658	3316	0	1658	3260	0
Flt Permitted	0.754				0.959		0.515			0.412		
Satd. Flow (perm)	1310	1457	0	0	1461	0	894	3316	0	717	3260	0
Satd. Flow (RTOR)		430			29						18	
Lane Group Flow (vph)	43	7	0	0	6	0	20	633	0	5	402	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	33.8	33.8		34.0	34.0		30.4	30.4		30.4	30.4	
Total Split (s)	38.0	38.0		34.0	34.0		52.0	52.0		52.0	52.0	
Total Split (%)	42.2%	42.2%		37.8%	37.8%		57.8%	57.8%		57.8%	57.8%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.7	1.7		1.7	1.7	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8			5.8		5.4	5.4		5.4	5.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	13.6	13.6			13.6		73.7	73.7		73.7	73.7	
Actuated g/C Ratio	0.15	0.15			0.15		0.82	0.82		0.82	0.82	
v/c Ratio	0.22	0.01			0.02		0.03	0.23		0.01	0.15	
Control Delay	33.6	0.0			0.2		2.3	1.6		6.2	4.1	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	33.6	0.0			0.2		2.3	1.6		6.2	4.1	
LOS	C	A			A		A	A		A	A	
Approach Delay		28.9			0.2			1.6			4.1	
Approach LOS		C			A			A			A	
Queue Length 50th (m)	7.3	0.0			0.0		0.2	2.5		0.2	7.7	
Queue Length 95th (m)	13.5	0.0			0.0		1.6	11.4		1.9	24.6	
Internal Link Dist (m)		520.6			70.5			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	468	797			541		732	2714		587	2672	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.09	0.01			0.01		0.03	0.23		0.01	0.15	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.23

Intersection Signal Delay: 3.7	Intersection LOS: A
Intersection Capacity Utilization 41.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	17	16	36	23	106	98	496	74	65	360	6
Future Volume (vph)	12	17	16	36	23	106	98	496	74	65	360	6
Satd. Flow (prot)	1658	1618	0	1658	1506	0	1658	3253	0	3216	3307	0
Flt Permitted	0.659			0.680			0.950			0.950		
Satd. Flow (perm)	1143	1618	0	1187	1506	0	1641	3253	0	3216	3307	0
Satd. Flow (RTOR)		16			106			17			2	
Lane Group Flow (vph)	12	33	0	36	129	0	98	570	0	65	366	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)	12.0	35.0		12.0	35.0		15.0	58.0		15.0	58.0	
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	13.6		18.4	16.0		11.7	74.9		7.7	68.5	
Actuated g/C Ratio	0.14	0.11		0.15	0.13		0.10	0.62		0.06	0.57	
v/c Ratio	0.06	0.17		0.18	0.44		0.61	0.28		0.32	0.19	
Control Delay	34.8	29.1		38.6	16.9		68.2	13.2		63.1	13.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.8	29.1		38.6	16.9		68.2	13.2		63.1	13.7	
LOS	C	C		D	B		E	B		E	B	
Approach Delay		30.6			21.6			21.2			21.2	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	2.5	4.0		7.5	4.8		23.2	33.4		8.4	17.0	
Queue Length 95th (m)	6.6	12.1		14.0	21.0		#53.9	63.9		16.5	28.9	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	186	396		203	438		161	2036		236	1888	
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	0.06	0.08		0.18	0.29		0.61	0.28		0.28	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: 120
Control Type: Actuated-Coordinated

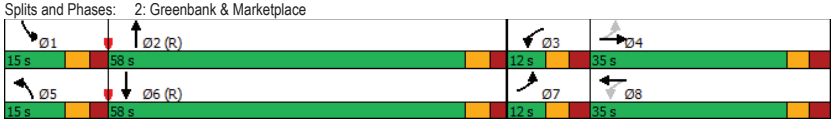
Maximum v/c Ratio: 0.61

Intersection Signal Delay: 21.6	Intersection LOS: C
Intersection Capacity Utilization 53.8%	ICU Level of Service A
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

Splits and Phases: 2: Greenbank & Marketplace



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	632	141	78	705	163	172	323	83	175	204	129
Future Volume (vph)	171	632	141	78	705	163	172	323	83	175	204	129
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3193	0	3216	3316	1483
Flt Permitted	0.204			0.327			0.950			0.950		
Satd. Flow (perm)	354	3316	1446	568	3316	1432	3206	3193	0	3159	3316	1462
Satd. Flow (RTOR)			149			163		25				149
Lane Group Flow (vph)	171	632	141	78	705	163	172	406	0	175	204	129
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (%)	15.8%	34.2%	34.2%	15.8%	34.2%	34.2%	20.0%	30.0%		20.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	50.3	40.7	40.7	44.1	35.4	35.4	11.7	35.4		11.8	35.5	35.5
Actuated g/C Ratio	0.42	0.34	0.34	0.37	0.30	0.30	0.10	0.30		0.10	0.30	0.30
v/c Ratio	0.63	0.56	0.24	0.27	0.72	0.30	0.55	0.42		0.55	0.21	0.24
Control Delay	31.7	36.0	5.4	22.4	43.1	6.5	73.8	25.1		57.9	33.1	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	31.7	36.0	5.4	22.4	43.1	6.5	73.8	25.1		57.9	33.1	4.8
LOS	C	D	A	C	D	A	E	C		E	C	A
Approach Delay		30.7			35.1			39.6			34.5	
Approach LOS		C			D			D			C	
Queue Length 50th (m)	25.7	69.2	0.0	11.0	83.2	0.0	22.9	40.8		21.7	19.9	0.0
Queue Length 95th (m)	41.5	92.7	13.7	20.9	106.3	16.4	35.4	25.2		32.7	31.5	11.2
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	283	1123	588	338	979	537	474	958		474	980	537
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.60	0.56	0.24	0.23	0.72	0.30	0.36	0.42		0.37	0.21	0.24

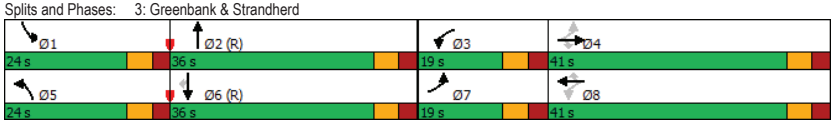
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 94 (78%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 34.4	Intersection LOS: C
Intersection Capacity Utilization 83.5%	ICU Level of Service E
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 3: Greenbank & Strandherd



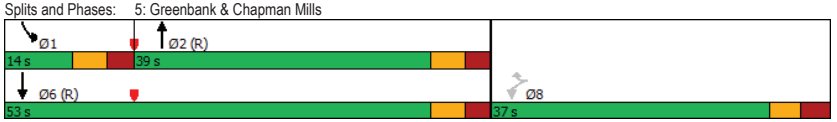
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	30	130	522	40	30	351
Future Volume (vph)	30	130	522	40	30	351
Satd. Flow (prot)	1658	1483	3272	0	1658	1745
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1645	1457	3272	0	1652	1745
Satd. Flow (RTOR)		130	10			
Lane Group Flow (vph)	30	130	562	0	30	351
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0
Minimum Split (s)	34.7	34.7	34.6		11.6	34.6
Total Split (s)	37.0	37.0	39.0		14.0	53.0
Total Split (%)	41.1%	41.1%	43.3%		15.6%	58.9%
Yellow Time (s)	3.3	3.3	3.7		3.7	3.7
All-Red Time (s)	3.4	3.4	2.9		2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.7	6.7	6.6		6.6	6.6
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	C-Max		None	C-Max
Act Effct Green (s)	13.6	13.6	54.3		7.2	63.1
Actuated g/C Ratio	0.15	0.15	0.60		0.08	0.70
v/c Ratio	0.12	0.39	0.28		0.23	0.29
Control Delay	31.0	8.9	11.6		50.3	6.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	31.0	8.9	11.6		50.3	6.4
LOS	C	A	B		D	A
Approach Delay	13.0		11.6			9.8
Approach LOS	B		B			A
Queue Length 50th (m)	5.0	0.0	24.0		5.7	17.0
Queue Length 95th (m)	10.2	12.5	55.2		15.4	29.2
Internal Link Dist (m)	403.7		204.2			161.2
Turn Bay Length (m)	38.0				38.0	
Base Capacity (vph)	553	576	1977		145	1223
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.05	0.23	0.28		0.21	0.29

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 11.2	Intersection LOS: B
Intersection Capacity Utilization 48.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Greenbank & Chapman Mills



Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	51	5	1	482	352	10
Future Vol, veh/h	51	5	1	482	352	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	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	51	5	1	482	352	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	841	357	362	0	-	0
Stage 1	357	-	-	-	-	-
Stage 2	484	-	-	-	-	-
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	335	687	1197	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	335	687	1197	-	-	-
Mov Cap-2 Maneuver	335	-	-	-	-	-
Stage 1	707	-	-	-	-	-
Stage 2	620	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.2	0	0
HCM LOS	C		

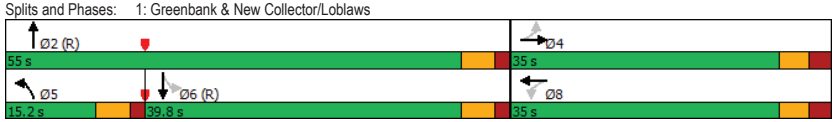
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1197	-	351	-	-
HCM Lane V/C Ratio	0.001	-	0.16	-	-
HCM Control Delay (s)	8	-	17.2	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	0	26	1	0	5	66	571	1	5	687	103
Future Volume (vph)	107	0	26	1	0	5	66	571	1	5	687	103
Satd. Flow (prot)	1658	1457	0	0	1512	0	1658	3316	0	1658	3236	0
Flt Permitted	0.754				0.966		0.950			0.437		
Satd. Flow (perm)	1310	1457	0	0	1472	0	1653	3316	0	760	3236	0
Satd. Flow (RTOR)		317			95						21	
Lane Group Flow (vph)	107	26	0	0	6	0	66	572	0	5	790	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0		10.0	10.0	
Minimum Split (s)	33.8	33.8		33.8	33.8		10.8	31.2		30.8	30.8	
Total Split (s)	35.0	35.0		35.0	35.0		15.2	55.0		39.8	39.8	
Total Split (%)	38.9%	38.9%		38.9%	38.9%		16.9%	61.1%		44.2%	44.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.7	1.7		1.7	1.7	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8			5.8		5.4	5.4		5.4	5.4	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	15.2	15.2			15.2		8.6	67.8		56.0	56.0	
Actuated g/C Ratio	0.17	0.17			0.17		0.10	0.75		0.62	0.62	
v/c Ratio	0.48	0.05			0.02		0.42	0.23		0.01	0.39	
Control Delay	39.5	0.2			0.2		68.9	1.8		14.2	13.2	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	39.5	0.2			0.2		68.9	1.8		14.2	13.2	
LOS	D	A			A		E	A		B	B	
Approach Delay		31.8			0.2			8.8			13.3	
Approach LOS		C			A			A			B	
Queue Length 50th (m)	18.5	0.0			0.0		12.8	2.6		0.4	38.2	
Queue Length 95th (m)	28.4	0.0			0.0		26.9	10.0		2.9	79.0	
Internal Link Dist (m)		520.6			78.7			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	425	686			541		186	2499		472	2020	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.25	0.04			0.01		0.35	0.23		0.01	0.39	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 15 (17%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 57.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector/Loblaws



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	117	86	141	124	185	149	483	70	195	612	36
Future Volume (vph)	44	117	86	141	124	185	149	483	70	195	612	36
Satd. Flow (prot)	1658	1633	0	1658	1569	0	1658	3253	0	3216	3282	0
Flt Permitted	0.294			0.458			0.950			0.950		
Satd. Flow (perm)	511	1633	0	799	1569	0	1647	3253	0	3216	3282	0
Satd. Flow (RTOR)		29			59			15			6	
Lane Group Flow (vph)	44	203	0	141	309	0	149	553	0	195	648	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)	13.0	35.0		13.0	35.0		20.0	52.0		20.0	52.0	
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)	29.4	22.9		30.9	25.5		13.9	53.1		12.0	51.2	
Actuated g/C Ratio	0.24	0.19		0.26	0.21		0.12	0.44		0.10	0.43	
v/c Ratio	0.24	0.61		0.56	0.82		0.78	0.38		0.61	0.46	
Control Delay	30.8	44.6		41.5	53.6		77.7	24.3		63.4	20.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.8	44.6		41.5	53.6		77.7	24.3		63.4	20.7	
LOS	C	D		D	D		E	C		E	C	
Approach Delay		42.2			49.8			35.6			30.6	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	7.6	38.8		25.9	60.3		35.3	48.3		25.5	38.4	
Queue Length 95th (m)	16.0	62.1		41.5	#93.5		#71.4	68.1		m36.1	m49.7	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	189	409		252	417		200	1447		367	1402	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.50		0.56	0.74		0.74	0.38		0.53	0.46	

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: 120
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
2: Greenbank & Marketplace

08-30-2019

Maximum v/c Ratio: 0.82

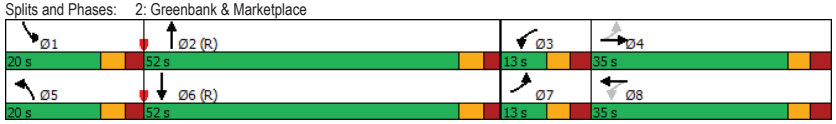
Intersection Signal Delay: 37.3	Intersection LOS: D
Intersection Capacity Utilization 74.9%	ICU Level of Service D
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

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

Splits and Phases: 2: Greenbank & Marketplace



Lanes, Volumes, Timings
3: Greenbank & Strandherd

08-30-2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	902	220	194	779	184	232	339	96	251	428	174
Future Volume (vph)	190	902	220	194	779	184	232	339	96	251	428	174
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3196	0	3216	3316	1483
Flt Permitted	0.166			0.115			0.950			0.950		
Satd. Flow (perm)	290	3316	1464	201	3316	1483	3213	3196	0	3209	3316	1464
Satd. Flow (RTOR)			220			184		29				174
Lane Group Flow (vph)	190	902	220	194	779	184	232	435	0	251	428	174
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (%)	15.0%	34.2%	34.2%	15.0%	34.2%	34.2%	20.0%	30.8%		20.0%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	45.6	34.5	34.5	46.0	34.7	34.7	13.9	33.8		14.4	34.3	34.3
Actuated g/C Ratio	0.38	0.29	0.29	0.38	0.29	0.29	0.12	0.28		0.12	0.29	0.29
v/c Ratio	0.80	0.95	0.38	0.90	0.81	0.33	0.62	0.47		0.65	0.45	0.32
Control Delay	48.1	61.0	6.3	70.3	47.7	6.3	72.6	23.9		58.3	37.6	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	48.1	61.0	6.3	70.3	47.7	6.3	72.6	23.9		58.3	37.6	6.8
LOS	D	E	A	E	D	A	E	C		E	D	A
Approach Delay		50.0			44.9			40.9			37.4	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	29.4	115.2	0.0	32.5	94.7	0.0	31.8	22.5		31.0	45.8	0.0
Queue Length 95th (m)	#61.4	#157.2	18.8	#77.8	119.6	17.2	m44.8	31.5		44.0	64.8	17.8
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	240	953	577	215	958	559	474	920		474	948	542
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.79	0.95	0.38	0.90	0.81	0.33	0.49	0.47		0.53	0.45	0.32

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

Maximum v/c Ratio: 0.95

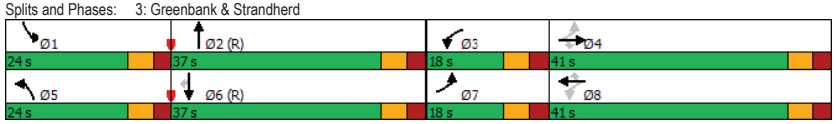
Intersection Signal Delay: 44.3	Intersection LOS: D
Intersection Capacity Utilization 91.0%	ICU Level of Service E
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

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

Splits and Phases: 3: Greenbank & Strandherd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	80	120	517	50	60	702
Future Volume (vph)	80	120	517	50	60	702
Satd. Flow (prot)	1658	1483	3264	0	1658	1745
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1645	1456	3264	0	1652	1745
Satd. Flow (RTOR)		120	13			
Lane Group Flow (vph)	80	120	567	0	60	702
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0
Minimum Split (s)	34.7	34.7	34.6		11.6	34.6
Total Split (s)	34.7	34.7	39.6		15.7	55.3
Total Split (%)	38.6%	38.6%	44.0%		17.4%	61.4%
Yellow Time (s)	3.3	3.3	3.7		3.7	3.7
All-Red Time (s)	3.4	3.4	2.9		2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.7	6.7	6.6		6.6	6.6
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	C-Max		None	C-Max
Act Effct Green (s)	13.9	13.9	50.6		8.1	62.8
Actuated g/C Ratio	0.15	0.15	0.56		0.09	0.70
v/c Ratio	0.32	0.37	0.31		0.41	0.58
Control Delay	35.0	8.7	13.1		42.5	18.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	35.0	8.7	13.1		42.5	18.5
LOS	D	A	B		D	B
Approach Delay	19.2		13.1			20.4
Approach LOS	B		B			C
Queue Length 50th (m)	13.8	0.0	25.3		11.0	43.2
Queue Length 95th (m)	21.4	12.1	55.4		25.0	147.2
Internal Link Dist (m)	403.7		204.2			161.2
Turn Bay Length (m)	38.0				38.0	
Base Capacity (vph)	511	535	1839		170	1218
Starvation Cap Reductn	0	0	0		0	16
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.16	0.22	0.31		0.35	0.58

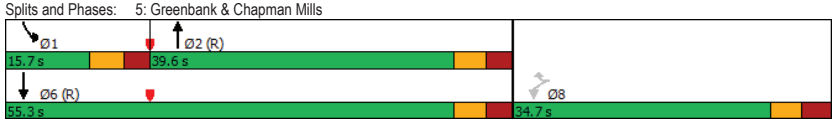
Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 17.5	Intersection LOS: B
Intersection Capacity Utilization 60.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 5: Greenbank & Chapman Mills



Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	3	5	542	733	49
Future Vol, veh/h	25	3	5	542	733	49
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	25	3	5	542	733	49

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1310	758	782	0	-	0
Stage 1	758	-	-	-	-	-
Stage 2	552	-	-	-	-	-
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	175	407	836	-	-	-
Stage 1	463	-	-	-	-	-
Stage 2	577	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	174	407	836	-	-	-
Mov Cap-2 Maneuver	174	-	-	-	-	-
Stage 1	460	-	-	-	-	-
Stage 2	577	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.9	0.1	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	836	-	185	-	-
HCM Lane V/C Ratio	0.006	-	0.151	-	-
HCM Control Delay (s)	9.3	-	27.9	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

Appendix F

Synchro Intersection Worksheets – 2030 Background Conditions

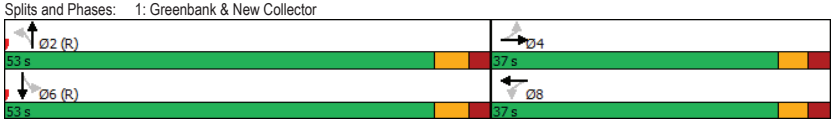
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	0	7	1	0	5	20	673	1	5	387	38
Future Volume (vph)	43	0	7	1	0	5	20	673	1	5	387	38
Satd. Flow (prot)	1658	1457	0	0	1512	0	1658	3316	0	1658	3264	0
Flt Permitted	0.754				0.940		0.504			0.395		
Satd. Flow (perm)	1310	1457	0	0	1432	0	875	3316	0	687	3264	0
Satd. Flow (RTOR)		407			39						17	
Lane Group Flow (vph)	43	7	0	0	6	0	20	674	0	5	425	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		5.0	5.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	33.8	33.8		33.8	33.8		31.2	31.2		31.2	31.2	
Total Split (s)	37.0	37.0		37.0	37.0		53.0	53.0		53.0	53.0	
Total Split (%)	41.1%	41.1%		41.1%	41.1%		58.9%	58.9%		58.9%	58.9%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8			5.8		6.2	6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	10.4	10.4			8.6		76.4	76.4		76.4	76.4	
Actuated g/C Ratio	0.12	0.12			0.10		0.85	0.85		0.85	0.85	
v/c Ratio	0.28	0.01			0.03		0.03	0.24		0.01	0.15	
Control Delay	41.4	0.0			0.3		3.0	2.8		3.2	2.5	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	41.4	0.0			0.3		3.0	2.8		3.2	2.5	
LOS	D	A			A		A	A		A	A	
Approach Delay		35.6			0.3			2.8			2.5	
Approach LOS		D			A			A			A	
Queue Length 50th (m)	7.3	0.0			0.0		0.7	15.8		0.2	8.7	
Queue Length 95th (m)	17.3	0.0			0.0		2.6	24.1		1.0	14.2	
Internal Link Dist (m)		520.6			62.5			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	454	771			521		743	2815		583	2773	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.09	0.01			0.01		0.03	0.24		0.01	0.15	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.28

Intersection Signal Delay: 4.1	Intersection LOS: A
Intersection Capacity Utilization 42.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector



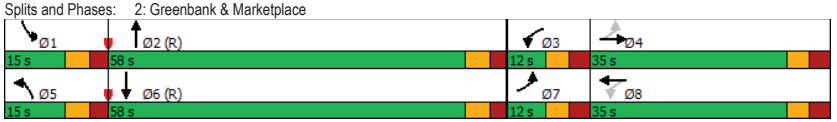
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	17	16	36	23	106	98	559	74	65	380	6
Future Volume (vph)	12	17	16	36	23	106	98	559	74	65	380	6
Satd. Flow (prot)	1658	1607	0	1658	1514	0	1658	3250	0	3216	3308	0
Flt Permitted	0.659			0.680			0.950			0.950		
Satd. Flow (perm)	1149	1607	0	1185	1514	0	1656	3250	0	3210	3308	0
Satd. Flow (RTOR)		16			106			15			2	
Lane Group Flow (vph)	12	33	0	36	129	0	98	633	0	65	386	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)	12.0	35.0		12.0	35.0		15.0	58.0		15.0	58.0	
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	13.6		18.4	16.0		11.7	74.9		7.7	68.5	
Actuated g/C Ratio	0.14	0.11		0.15	0.13		0.10	0.62		0.06	0.57	
v/c Ratio	0.06	0.17		0.18	0.44		0.61	0.31		0.32	0.20	
Control Delay	34.8	29.2		38.6	16.8		68.2	13.6		62.4	13.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.8	29.2		38.6	16.8		68.2	13.6		62.4	13.8	
LOS	C	C		D	B		E	B		E	B	
Approach Delay		30.7			21.5			20.9			20.8	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	2.5	4.0		7.5	4.8		23.2	38.3		8.5	17.9	
Queue Length 95th (m)	6.6	12.1		14.0	21.0		#53.9	72.4		16.8	30.5	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	187	393		203	440		161	2034		236	1888	
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	0.06	0.08		0.18	0.29		0.61	0.31		0.28	0.20	

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: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61
Intersection Signal Delay: 21.3 Intersection LOS: C
Intersection Capacity Utilization 53.3% ICU Level of Service A
Analysis Period (min) 15
Description: As per timing plans provided 26-Nov-2018
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Greenbank & Marketplace



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	652	144	81	729	163	188	349	99	175	213	129
Future Volume (vph)	171	652	144	81	729	163	188	349	99	175	213	129
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3185	0	3216	3316	1483
Flt Permitted	0.191			0.311			0.950			0.950		
Satd. Flow (perm)	332	3316	1446	541	3316	1432	3206	3185	0	3163	3316	1462
Satd. Flow (RTOR)			149			163		29				149
Lane Group Flow (vph)	171	652	144	81	729	163	188	448	0	175	213	129
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (%)	15.8%	34.2%	34.2%	15.8%	34.2%	34.2%	20.0%	30.0%		20.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	50.1	40.5	40.5	44.3	35.4	35.4	12.3	35.4		11.8	34.9	34.9
Actuated g/C Ratio	0.42	0.34	0.34	0.37	0.30	0.30	0.10	0.30		0.10	0.29	0.29
v/c Ratio	0.65	0.58	0.25	0.29	0.74	0.30	0.57	0.47		0.55	0.22	0.24
Control Delay	32.8	36.5	5.7	22.7	44.0	6.5	73.4	25.1		57.9	33.7	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	32.8	36.5	5.7	22.7	44.0	6.5	73.4	25.1		57.9	33.7	4.9
LOS	C	D	A	C	D	A	E	C		E	C	A
Approach Delay		31.3			35.9			39.4			34.7	
Approach LOS		C			D			D			C	
Queue Length 50th (m)	25.7	72.1	0.0	11.5	86.8	0.0	24.5	45.4		21.7	21.0	0.0
Queue Length 95th (m)	41.5	96.3	14.5	21.6	110.5	16.4	38.0	26.2		32.7	33.0	11.3
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	276	1120	587	330	979	537	474	959		474	964	530
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.62	0.58	0.25	0.25	0.74	0.30	0.40	0.47		0.37	0.22	0.24

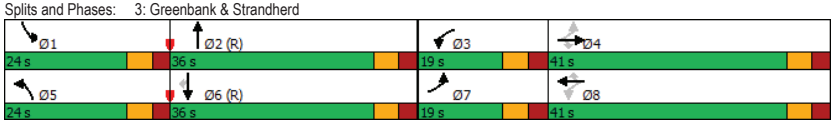
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 94 (78%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 35.0	Intersection LOS: C
Intersection Capacity Utilization 83.9%	ICU Level of Service E
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 3: Greenbank & Strandherd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	30	130	591	40	30	374
Future Volume (vph)	30	130	591	40	30	374
Satd. Flow (prot)	1658	1483	3276	0	1658	1745
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1644	1456	3276	0	1652	1745
Satd. Flow (RTOR)		130	9			
Lane Group Flow (vph)	30	130	631	0	30	374
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	3		2		1	6
Permitted Phases		3				
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	10.0		5.0	10.0
Minimum Split (s)	34.7	34.7	34.6		11.6	34.6
Total Split (s)	34.7	34.7	47.0		15.0	62.0
Total Split (%)	35.9%	35.9%	48.6%		15.5%	64.1%
Yellow Time (s)	3.3	3.3	3.7		3.7	3.7
All-Red Time (s)	3.4	3.4	2.9		1.0	2.9
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.7	6.7	6.6		4.7	6.6
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	C-Max		None	C-Max
Act Effct Green (s)	11.0	11.0	64.6		7.3	72.4
Actuated g/C Ratio	0.11	0.11	0.67		0.08	0.75
v/c Ratio	0.16	0.46	0.29		0.24	0.29
Control Delay	36.4	11.4	9.6		46.1	6.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	36.4	11.4	9.6		46.1	6.0
LOS	D	B	A		D	A
Approach Delay	16.1		9.6			9.0
Approach LOS	B		A			A
Queue Length 50th (m)	5.7	0.0	23.6		5.7	15.3
Queue Length 95th (m)	11.3	13.4	60.1		14.6	56.7
Internal Link Dist (m)	403.7		204.2			161.2
Turn Bay Length (m)	38.0				38.0	
Base Capacity (vph)	480	513	2191		176	1306
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.06	0.25	0.29		0.17	0.29

Intersection Summary
Cycle Length: 96.7
Actuated Cycle Length: 96.7
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 10.3	Intersection LOS: B
Intersection Capacity Utilization 45.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Greenbank & Chapman Mills

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	34	4	1	547	370	7
Future Vol, veh/h	34	4	1	547	370	7
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	34	4	1	547	370	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	923	374	377	0	-	0
Stage 1	374	-	-	-	-	-
Stage 2	549	-	-	-	-	-
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	299	672	1181	-	-	-
Stage 1	696	-	-	-	-	-
Stage 2	579	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	299	672	1181	-	-	-
Mov Cap-2 Maneuver	299	-	-	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	579	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.9	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1181	-	318	-	-
HCM Lane V/C Ratio	0.001	-	0.119	-	-
HCM Control Delay (s)	8.1	-	17.9	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	0	26	1	0	5	66	640	1	5	776	103
Future Volume (vph)	107	0	26	1	0	5	66	640	1	5	776	103
Satd. Flow (prot)	1658	1456	0	0	1512	0	1658	3316	0	1658	3244	0
Flt Permitted	0.754				0.972		0.950			0.408		
Satd. Flow (perm)	1310	1456	0	0	1481	0	1653	3316	0	709	3244	0
Satd. Flow (RTOR)		304			104						18	
Lane Group Flow (vph)	107	26	0	0	6	0	66	641	0	5	879	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		5.0	5.0		5.0	10.0		10.0	10.0	
Minimum Split (s)	33.8	33.8		32.5	32.5		10.8	30.8		30.8	30.8	
Total Split (s)	34.0	34.0		32.5	32.5		16.0	56.0		40.0	40.0	
Total Split (%)	37.8%	37.8%		36.1%	36.1%		17.8%	62.2%		44.4%	44.4%	
Yellow Time (s)	3.3	3.3		3.5	3.5		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.5	2.5		1.0	1.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8			4.5		5.8	5.8		5.8	5.8	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	13.3	13.3			13.4		8.9	69.4		57.0	57.0	
Actuated g/C Ratio	0.15	0.15			0.15		0.10	0.77		0.63	0.63	
v/c Ratio	0.55	0.05			0.02		0.40	0.25		0.01	0.43	
Control Delay	46.1	0.2			0.2		61.6	1.4		11.8	12.5	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	46.1	0.2			0.2		61.6	1.4		11.8	12.5	
LOS	D	A			A		E	A		B	B	
Approach Delay		37.1			0.2			7.0			12.5	
Approach LOS		D			A			A			B	
Queue Length 50th (m)	18.5	0.0			0.0		12.9	2.5		0.4	45.3	
Queue Length 95th (m)	33.2	0.0			0.0		26.9	8.3		2.4	77.1	
Internal Link Dist (m)		520.6			74.0			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	410	664			555		196	2558		448	2060	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.26	0.04			0.01		0.34	0.25		0.01	0.43	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 16 (18%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

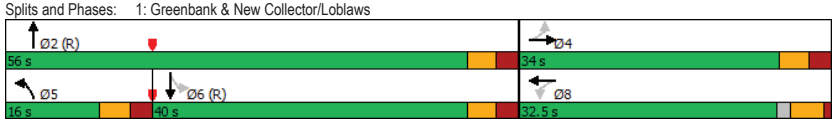
Lanes, Volumes, Timings
1: Greenbank & New Collector/Loblaws

09-03-2019

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 12.1	Intersection LOS: B
Intersection Capacity Utilization 59.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector/Loblaws



Lanes, Volumes, Timings
2: Greenbank & Marketplace

09-03-2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	117	86	141	124	185	149	547	70	195	678	36
Future Volume (vph)	44	117	86	141	124	185	149	547	70	195	678	36
Satd. Flow (prot)	1658	1633	0	1658	1569	0	1658	3259	0	3216	3283	0
Flt Permitted	0.294			0.458			0.950			0.950		
Satd. Flow (perm)	511	1633	0	799	1569	0	1648	3259	0	3216	3283	0
Satd. Flow (RTOR)		29			59			13			5	
Lane Group Flow (vph)	44	203	0	141	309	0	149	617	0	195	714	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)	13.0	35.0		13.0	35.0		20.0	52.0		20.0	52.0	
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)	29.4	22.9		30.9	25.5		13.9	53.1		12.0	51.2	
Actuated g/C Ratio	0.24	0.19		0.26	0.21		0.12	0.44		0.10	0.43	
v/c Ratio	0.24	0.61		0.56	0.82		0.78	0.43		0.61	0.51	
Control Delay	30.8	44.6		41.5	53.6		77.7	25.1		63.2	20.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.8	44.6		41.5	53.6		77.7	25.1		63.2	20.7	
LOS	C	D		D	D		E	C		E	C	
Approach Delay		42.2			49.8			35.3			29.9	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	7.6	38.8		25.9	60.3		35.3	55.5		25.6	42.0	
Queue Length 95th (m)	16.0	62.1		41.5	#93.5		#71.4	77.2		m35.9	m53.2	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	189	409		252	417		200	1448		367	1402	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.50		0.56	0.74		0.74	0.43		0.53	0.51	

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: 120
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
2: Greenbank & Marketplace

09-03-2019

Maximum v/c Ratio: 0.82

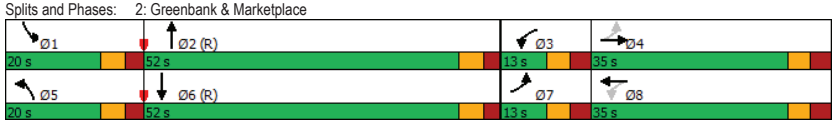
Intersection Signal Delay: 36.7	Intersection LOS: D
Intersection Capacity Utilization 75.1%	ICU Level of Service D
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

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

Splits and Phases: 2: Greenbank & Marketplace



Lanes, Volumes, Timings
3: Greenbank & Strandherd

09-03-2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	979	228	202	841	184	243	375	107	251	467	174
Future Volume (vph)	190	979	228	202	841	184	243	375	107	251	467	174
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3196	0	3216	3316	1483
Flt Permitted	0.128			0.116			0.950			0.950		
Satd. Flow (perm)	223	3316	1464	202	3316	1483	3213	3196	0	3209	3316	1464
Satd. Flow (RTOR)			228			184		29				174
Lane Group Flow (vph)	190	979	228	202	841	184	243	482	0	251	467	174
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (%)	15.0%	34.2%	34.2%	15.0%	34.2%	34.2%	20.0%	30.8%		20.0%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	45.8	34.5	34.5	45.8	34.5	34.5	14.2	33.8		14.4	34.0	34.0
Actuated g/C Ratio	0.38	0.29	0.29	0.38	0.29	0.29	0.12	0.28		0.12	0.28	0.28
v/c Ratio	0.86	1.03	0.39	0.94	0.88	0.33	0.64	0.52		0.65	0.50	0.32
Control Delay	60.7	78.5	6.3	78.2	52.9	6.3	74.2	23.7		58.3	38.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	60.7	78.5	6.3	78.2	52.9	6.3	74.2	23.7		58.3	38.6	6.9
LOS	E	E	A	E	D	A	E	C		E	D	A
Approach Delay		64.3			50.1			40.6			38.0	
Approach LOS		E			D			D			D	
Queue Length 50th (m)	29.7	~136.3	0.0	34.9	104.7	0.0	33.2	23.5		31.0	50.9	0.0
Queue Length 95th (m)	#72.4	#178.6	19.0	#82.9	#139.8	17.2	m46.7	30.9		44.0	71.0	17.8
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	221	953	583	215	953	557	474	920		474	939	539
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.86	1.03	0.39	0.94	0.88	0.33	0.51	0.52		0.53	0.50	0.32

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 7 (6%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 50.6	Intersection LOS: D
Intersection Capacity Utilization 93.7%	ICU Level of Service F
Analysis Period (min) 15	

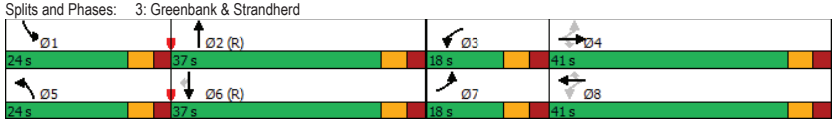
Description: As per timing plans provided 26-Nov-2018

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

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

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

Splits and Phases: 3: Greenbank & Strandherd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	80	120	602	50	50	787
Future Volume (vph)	80	120	602	50	50	787
Satd. Flow (prot)	1658	1483	3268	0	1658	1745
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1645	1456	3268	0	1652	1745
Satd. Flow (RTOR)		120	12			
Lane Group Flow (vph)	80	120	652	0	50	787
Turn Type	Prot	Perm	NA		Prot	NA
Protected Phases	3		2		1	6
Permitted Phases		3				
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0
Minimum Split (s)	33.8	33.8	33.8		10.8	33.8
Total Split (s)	33.8	33.8	43.2		13.0	56.2
Total Split (%)	37.6%	37.6%	48.0%		14.4%	62.4%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	2.5		2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8		5.8	5.8
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	C-Max		None	C-Max
Act Effct Green (s)	13.9	13.9	56.1		7.4	64.5
Actuated g/C Ratio	0.15	0.15	0.62		0.08	0.72
v/c Ratio	0.31	0.37	0.32		0.37	0.63
Control Delay	35.0	8.7	10.7		44.7	17.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	35.0	8.7	10.7		44.7	17.1
LOS	C	A	B		D	B
Approach Delay	19.2		10.7			18.8
Approach LOS	B		B			B
Queue Length 50th (m)	13.8	0.0	27.4		9.4	46.7
Queue Length 95th (m)	21.4	12.1	59.3		22.3	123.7
Internal Link Dist (m)	403.7		204.2			161.2
Turn Bay Length (m)	38.0				38.0	
Base Capacity (vph)	515	535	2043		143	1251
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.16	0.22	0.32		0.35	0.63

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
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: 0.63

Intersection Signal Delay: 15.7	Intersection LOS: B
Intersection Capacity Utilization 64.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: Greenbank & Chapman Mills

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	17	2	3	581	804	6
Future Vol, veh/h	17	2	3	581	804	6
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	17	2	3	581	804	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1394	807	810	0	-	0
Stage 1	807	-	-	-	-	-
Stage 2	587	-	-	-	-	-
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	156	381	816	-	-	-
Stage 1	439	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	155	381	816	-	-	-
Mov Cap-2 Maneuver	155	-	-	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	556	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	29.6	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	816	-	165	-	-
HCM Lane V/C Ratio	0.004	-	0.115	-	-
HCM Control Delay (s)	9.4	-	29.6	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Appendix G

Background Development Volumes

Figure 9: Site Generated Traffic Volumes

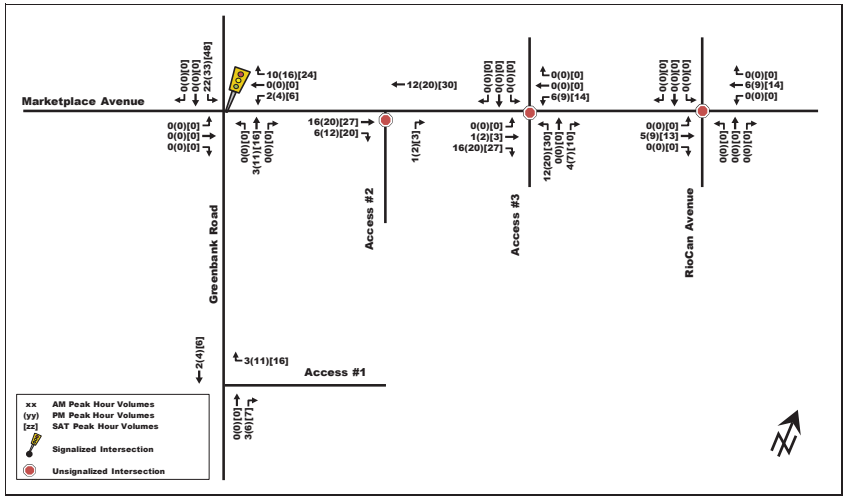
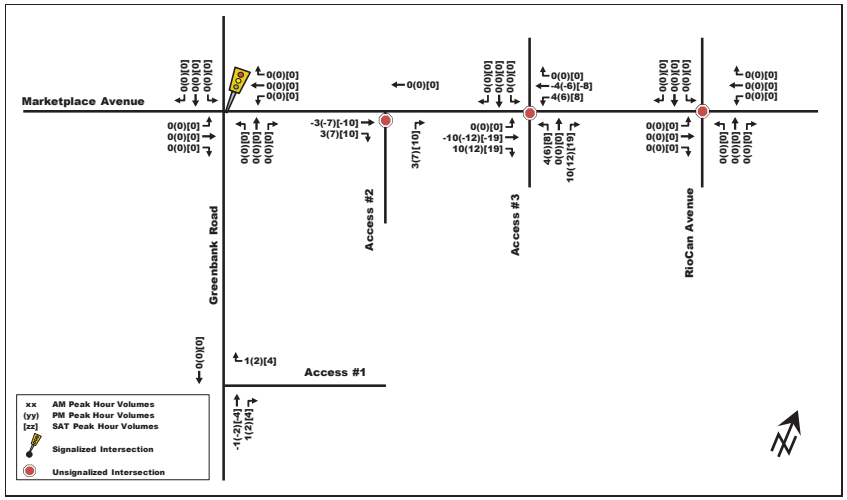
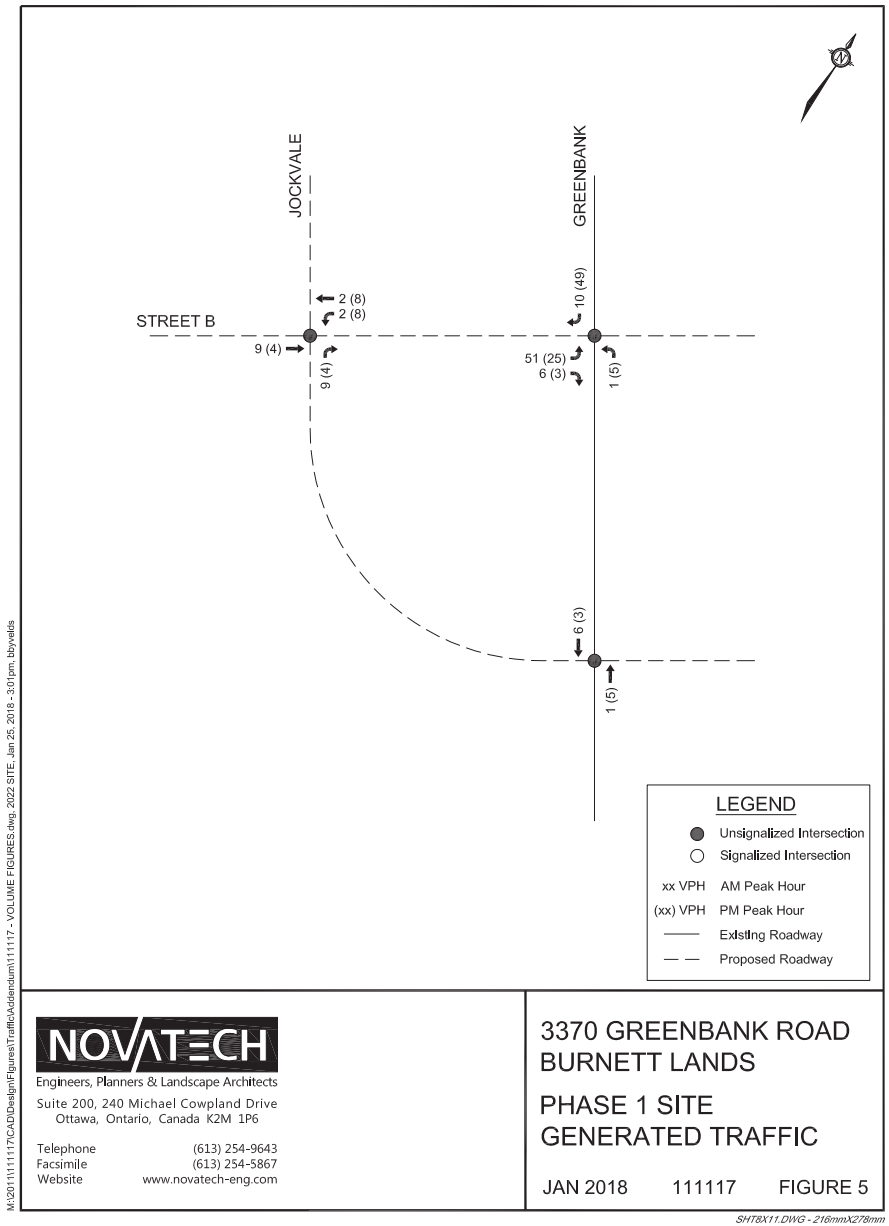


Figure 10: Pass-by Traffic Volumes





M:\2011\111117\CAD\Design\Figures\Traffic\Addendum\111117 - VOLUME FIGURES.dwg, 2022 SITE, Jan 25, 2018 - 3:01pm, bbyvelds

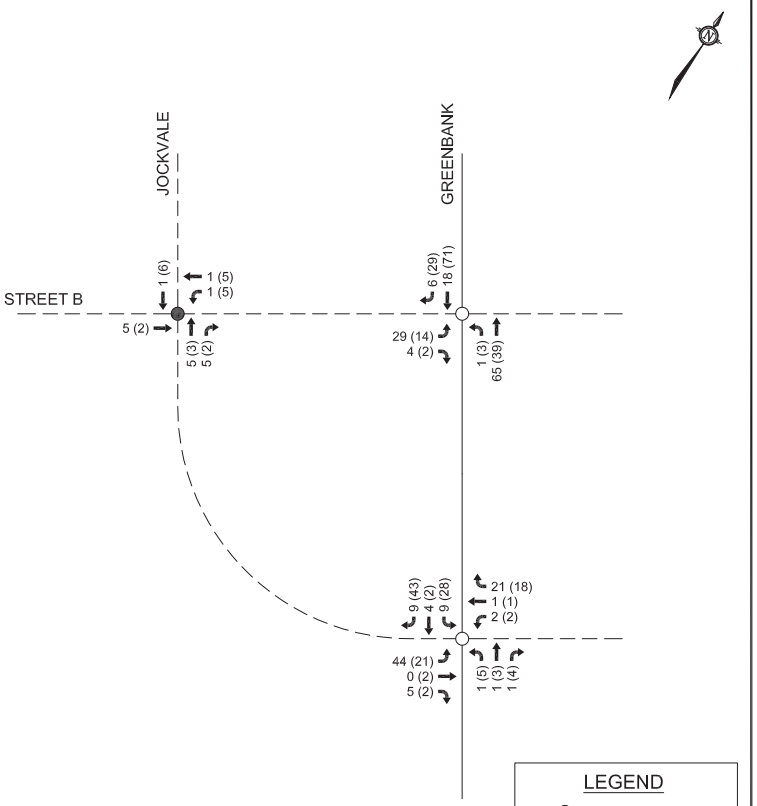
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

3370 GREENBANK ROAD
BURNETT LANDS

PHASE 1 SITE
GENERATED TRAFFIC

JAN 2018 111117 FIGURE 5

SHT8X11.DWG - 216mmX278mm



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

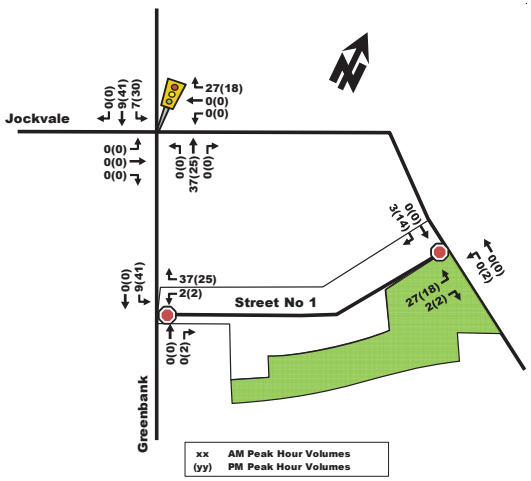
ULTIMATE SITE
GENERATED TRAFFIC

JAN 2018 111117 FIGURE 7

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

SHT8X11.DWG - 216mmX278mm

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.

Figure 10: New Site Generation Auto Volumes

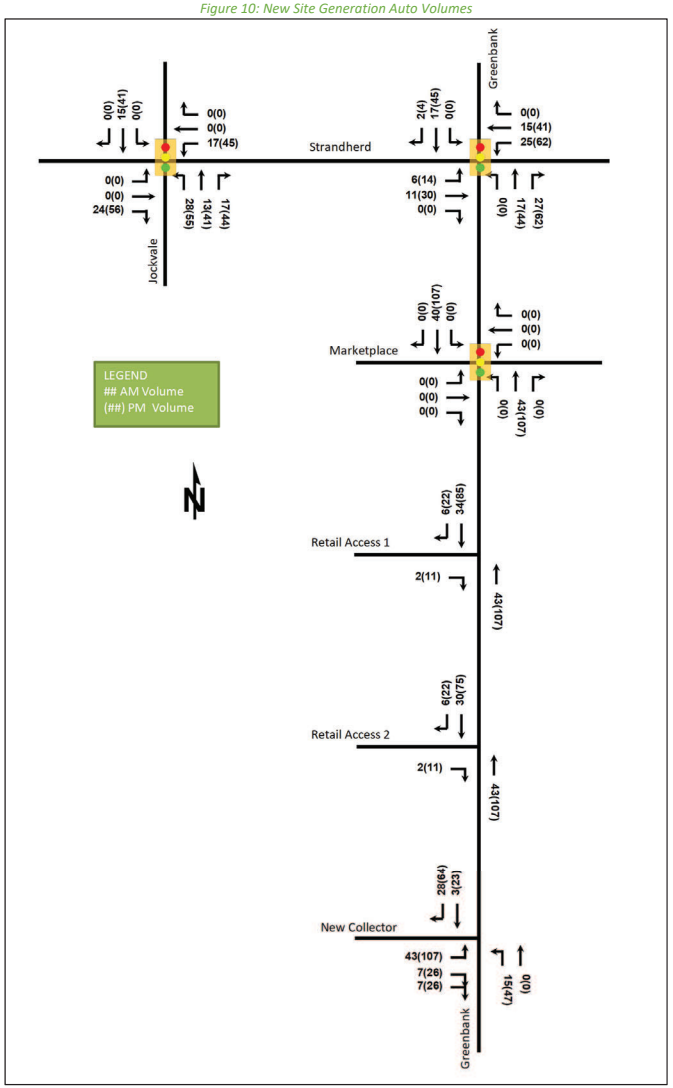
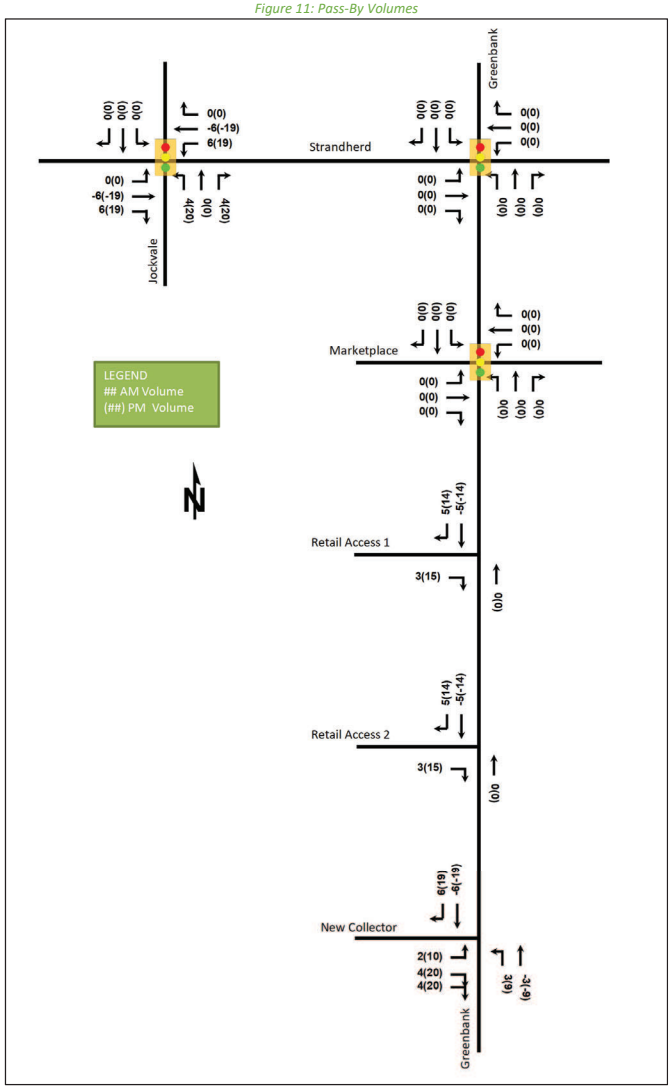
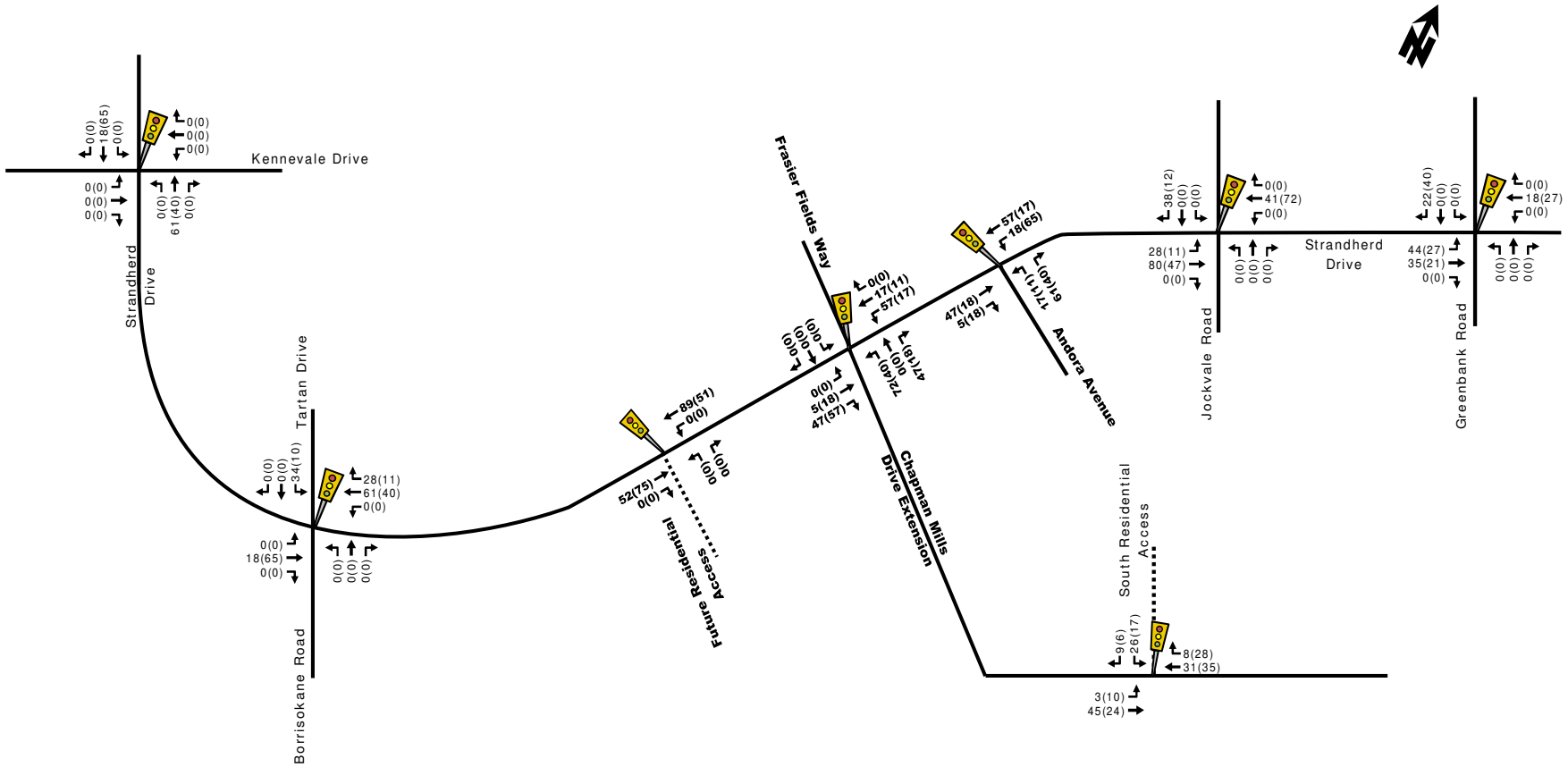


Figure 11: Pass-By Volumes





Legend

- Signalized Intersection
- Lane Configuration
- c Channelized
- Existing Roadway
- Future Roadway

xx AM Peak Hour Volumes
(yy) PM Peak Hour Volumes

PARSONS

Figure 13: Site Generated Traffic Volumes

Appendix H

MMLOS Analysis

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation**	**Project**	**3194 Jockvale Road**
Scenario		**Date**	**Sept. 2019**
Comments			

	INTERSECTIONS	Greenbank Road & Marketplace Avenue				Greenbank Road & Strandherd Drive				Greenbank Road & Chapman Mills			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	6	5	4	4	7	6	6	4	5	5	3	4
	Median	Median > 2.4 m	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	Median > 2.4 m	Median > 2.4 m	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected	Protected	Protected	Protected	Protected
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No	No	No	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	Smart Channel	No Channel	Smart Channel	Smart Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	10-15m	10-15m	10-15m	10-15m	10-15m	15-25m	15-25m	>25m	5-10m	5-10m	5-10m	5-10m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**25**	**40**	**61**	**61**	**16**	**23**	**37**	**66**	**46**	**46**	**82**	**62**
	Ped. Exposure to Traffic LoS	**F**	**E**	**C**	**C**	**F**	**F**	**E**	**C**	**D**	**D**	**B**	**C**
	Cycle Length	120	120	120	120	120	120	120	120	90	90	90	90
	Effective Walk Time	28	28	25	25	27	27	29	29	34	29	40	42
	Average Pedestrian Delay	**35**	**35**	**38**	**38**	**36**	**36**	**35**	**35**	**17**	**21**	**14**	**13**
	Pedestrian Delay LoS	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**B**	**C**	**B**	**B**
	Level of Service	**F**	**E**	**D**	**D**	**F**	**F**	**E**	**D**	**D**	**D**	**B**	**C**
		F				**F**				**D**			
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
	Right Turn Lane Configuration	Not Applicable	Not Applicable	≤ 50 m	≤ 50 m	> 50 m Introduced right turn lane	Not Applicable	Bike lane shifts to the left of right turn	≤ 50 m Introduced right turn lane	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Right Turning Speed	Not Applicable	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	>25 to 30 km/h	>25 to 30 km/h	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Cyclist relative to RT motorists	**Not Applicable**	**Not Applicable**	**D**	**D**	**D**	**Not Applicable**	**F**	**C**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**
	Separated or Mixed Traffic	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	No lane crossed	No lane crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	1 lane crossed	1 lane crossed	1 lane crossed	1 lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
	Left Turning Cyclist	**F**	**F**	**B**	**B**	**F**	**F**	**F**	**F**	**E**	**C**	**C**	**C**
	Level of Service	**F**	**F**	**D**	**D**	**F**	**F**	**F**	**F**	**E**	**C**	**C**	**C**
		F				**F**				**E**			
Transit	Average Signal Delay	≤ 30 sec	≤ 30 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	≤ 40 sec	≤ 40 sec	> 40 sec	> 40 sec	≤ 30 sec	> 40 sec
	Level of Service	**D**	**D**	**F**	**F**	**F**	**F**	**E**	**E**	**F**	**F**	**D**	**F**
		F				**F**				**F**			
Truck	Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	> 15 m	10 - 15 m	> 15 m	> 15 m	< 10 m	< 10 m	< 10 m	< 10 m
	Number of Receiving Lanes on Departure from Intersection	≥ 2	≥ 2	≥ 2	≥ 2	≥ 2	≥ 2	≥ 2	≥ 2	1	1	≥ 2	≥ 2
	Level of Service	**B**	**B**	**B**	**B**	**A**	**B**	**A**	**A**	**F**	**F**	**D**	**D**
		B				**B**				**F**			
Auto	Volume to Capacity Ratio	0.61 - 0.70				0.71 - 0.80				0.71 - 0.80			
	Level of Service	**B**				**C**				**C**			

Unlocked Rows for Replicating

Greenbank Road & New Collector			
NORTH	SOUTH	EAST	WEST
6	5		5
Median > 2.4 m	Median > 2.4 m		No Median - 2.4 m
Permissive	Permissive		Protected
Permissive or yield control	Permissive or yield control		Permissive or yield control
RTOR allowed	RTOR allowed		RTOR allowed
No	No		No
No Channel	No Channel		No Channel
10-15m	10-15m		10-15m
Std transverse markings	Std transverse markings		Std transverse markings
25	**40**		**45**
F	**E**	-	**D**
90	90		90
34	34		40
17	**17**		**14**
B	**B**	-	**B**
F	**E**	**-**	**D**
F			
NORTH	SOUTH	EAST	WEST
Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	
Not Applicable	Not Applicable	≤ 50 m	
Not Applicable	Not Applicable	≤ 25 km/h	
Not Applicable	**Not Applicable**	**D**	**-**
Separated	**Separated**	**Mixed Traffic**	**-**
≥ 2 lanes crossed		No lane crossed	
≥ 60 km/h		> 40 to ≤ 50 km/h	
F	**-**	**B**	**-**
F	**-**	**D**	**-**
F			
≤ 10 sec	≤ 20 sec	≤ 40 sec	
B	**C**	**E**	**-**
E			
< 10 m		< 10 m	
1		≥ 2	
F	**-**	**D**	**-**
F			
0.0 - 0.60			
A			

Chapman Mills Drive & Jockvale Road			
NORTH	SOUTH	EAST	WEST
	0 - 2	5	5
	No Median - 2.4 m	Median > 2.4 m	Median > 2.4 m
	Permissive	Protected	Protected
	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR allowed	RTOR allowed	RTOR allowed
	No	No	No
	No Channel	No Channel	No Channel
	10-15m	10-15m	10-15m
	Std transverse markings	Std transverse markings	Std transverse markings
	85	**48**	**48**
-	**B**	**D**	**D**
	90	90	90
	40	35	35
	14	**17**	**17**
-	**B**	**B**	**B**
-	**B**	**D**	**D**
-			
NORTH	SOUTH	EAST	WEST
	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
	Not Applicable	Not Applicable	Not Applicable
	Not Applicable	Not Applicable	Not Applicable
-	**Not Applicable**	**Not Applicable**	**Not Applicable**
-	**Separated**	**Separated**	**Separated**
	No lane crossed	2-stage, LT box	2-stage, LT box
	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h
-	**B**	**A**	**A**
-	**B**	**A**	**A**
B			
-	**-**	**-**	**-**
-			
	10 - 15 m	10 - 15 m	10 - 15 m
	1	1	1
-	**E**	**E**	**E**
E			
0.0 - 0.60			
A			

Greenbank Road & Street B			
NORTH	SOUTH	EAST	WEST
0 - 2	3		0 - 2
No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m
Permissive	Permissive		Permissive
No right turn	Permissive or yield control		Permissive or yield control
RTOR prohibited	RTOR allowed		RTOR allowed
No	No		No
No Channel	No Channel		No Channel
10-15m	10-15m		10-15m
Std transverse markings	Std transverse markings		Std transverse markings
93	**70**		**85**
A	**C**	-	**B**
90	90		90
20	20		56
27	**27**		**6**
C	**C**	-	**A**
C	**C**	**-**	**B**
C			
NORTH	SOUTH	EAST	WEST
Mixed Traffic		Mixed Traffic	
≤ 50 m		≤ 50 m	
≤ 25 km/h		≤ 25 km/h	
D	**-**	**D**	**-**
Mixed Traffic	**-**	**Mixed Traffic**	**-**
No lane crossed		No lane crossed	
> 50 to < 60 km/h		> 40 to ≤ 50 km/h	
C	**-**	**B**	**-**
D	**-**	**D**	**-**
D			
≤ 10 sec	≤ 10 sec	> 40 sec	
B	**B**	**F**	**-**
F			
10 - 15 m	10 - 15 m	10 - 15 m	
1	1	1	
E	**E**	**E**	**-**
E			
0.0 - 0.60			
A			

Multi-Modal Level of Service - Segments Form

Consultant	**CGH Transportation**	**Project**	**3288 Greenbank Road**
Scenario		**Date**	**Sept. 2019**
Comments			

SEGMENTS		Segment	GB Existing	GB Future	CM Future	St B Future	JV Future
			1	2	3	4	5
Pedestrian	Sidewalk Width Boulevard Width	E	1.8 m 0.5 - 2 m	≥ 2 m 0.5 - 2 m	≥ 2 m > 2 m	≥ 2 m 0.5 - 2 m	≥ 2 m > 2 m
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	> 3000	≤ 3000	≤ 3000
	Operating Speed On-Street Parking		> 60 km/h no	> 60 km/h no	> 30 to 50 km/h yes	> 30 to 50 km/h yes	> 30 to 50 km/h yes
	Exposure to Traffic PLoS		**E**	**E**	**B**	**A**	**A**
	Effective Sidewalk Width		1.5 m	2.0 m	2.5 m	2.0 m	2.0 m
	Pedestrian Volume		250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr
	Crowding PLoS		**B**	**B**	**B**	**B**	**B**
	Level of Service		**E**	**E**	**B**	**B**	**B**
Bicycle	Type of Cycling Facility	F	Mixed Traffic	Curbside Bike Lane	Physically Separated	Mixed Traffic	Physically Separated
	Number of Travel Lanes		2-3 lanes total	2 ea. dir. (w median)		≤ 2 (no centreline)	
	Operating Speed		≥ 60 km/h	>50 to 70 km/h		>40 to <50 km/h	
	# of Lanes & Operating Speed LoS		**F**	**C**	**-**	**B**	**-**
	Bike Lane (+ Parking Lane) Width			≥ 1.8 m			
	Bike Lane Width LoS		**-**	**A**	**-**	**-**	**-**
	Bike Lane Blockages			Rare			
	Blockage LoS		**-**	**A**	**-**	**-**	**-**
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	≥ 1.8 m refuge		< 1.8 m refuge	
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes		≤ 3 lanes	
	Sidestreet Operating Speed		>40 to 50 km/h	>40 to 50 km/h		>40 to 50 km/h	
	Unsignalized Crossing - Lowest LoS		**B**	**B**	**A**	**A**	**A**
	Level of Service		**F**	**C**	**A**	**B**	**A**
Transit	Facility Type	D	Mixed Traffic	Segregated ROW	Segregated ROW	Mixed Traffic	Mixed Traffic
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8			Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8
	Level of Service		**D**	**A**	**A**	**D**	**D**
Truck	Truck Lane Width	C	≤ 3.5 m	≤ 3.5 m	≤ 3.5 m	≤ 3.5 m	≤ 3.5 m
	Travel Lanes per Direction		> 1	> 1	1	1	1
	Level of Service		**A**	**A**	**C**	**C**	**C**
Auto	**Level of Service**	**Not Applicable**					

Appendix I

Synchro Intersection Worksheets – 2025 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	0	7	1	0	5	20	752	1	5	422	38
Future Volume (vph)	43	0	7	1	0	5	20	752	1	5	422	38
Satd. Flow (prot)	1658	1457	0	0	1509	0	1658	3316	0	1658	3268	0
Flt Permitted	0.754				0.959		0.487			0.363		
Satd. Flow (perm)	1306	1457	0	0	1458	0	846	3316	0	632	3268	0
Satd. Flow (RTOR)		396			29						17	
Lane Group Flow (vph)	43	7	0	0	6	0	20	753	0	5	460	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	33.8	33.8		24.0	24.0		31.2	31.2		31.2	31.2	
Total Split (s)	35.0	35.0		24.0	24.0		55.0	55.0		55.0	55.0	
Total Split (%)	38.9%	38.9%		26.7%	26.7%		61.1%	61.1%		61.1%	61.1%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.7	1.7		1.7	1.7	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8			5.8		5.4	5.4		5.4	5.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	13.6	13.6			13.6		73.7	73.7		73.7	73.7	
Actuated g/C Ratio	0.15	0.15			0.15		0.82	0.82		0.82	0.82	
v/c Ratio	0.22	0.01			0.02		0.03	0.28		0.01	0.17	
Control Delay	33.6	0.0			0.2		4.3	3.1		6.2	4.2	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	33.6	0.0			0.2		4.3	3.1		6.2	4.2	
LOS	C	A			A		A	A		A	A	
Approach Delay		28.9			0.2			3.2			4.2	
Approach LOS		C			A			A			A	
Queue Length 50th (m)	7.3	0.0			0.0		0.5	11.2		0.2	9.1	
Queue Length 95th (m)	13.5	0.0			0.0		2.5	20.7		1.9	28.4	
Internal Link Dist (m)		520.6			60.8			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	423	740			492		692	2714		517	2678	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.10	0.01			0.01		0.03	0.28		0.01	0.17	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.28

Intersection Signal Delay: 4.5	Intersection LOS: A
Intersection Capacity Utilization 42.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector

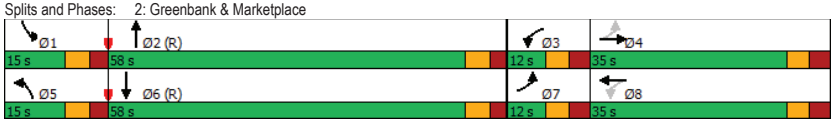
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	17	16	36	23	106	98	616	74	65	418	6
Future Volume (vph)	12	17	16	36	23	106	98	616	74	65	418	6
Satd. Flow (prot)	1658	1607	0	1658	1514	0	1658	3257	0	3216	3308	0
Flt Permitted	0.659			0.680			0.950			0.950		
Satd. Flow (perm)	1149	1607	0	1185	1514	0	1656	3257	0	3210	3308	0
Satd. Flow (RTOR)		16			106			14			1	
Lane Group Flow (vph)	12	33	0	36	129	0	98	690	0	65	424	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)	12.0	35.0		12.0	35.0		15.0	58.0		15.0	58.0	
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	13.6		18.4	16.0		11.7	74.9		7.7	68.5	
Actuated g/C Ratio	0.14	0.11		0.15	0.13		0.10	0.62		0.06	0.57	
v/c Ratio	0.06	0.17		0.18	0.44		0.61	0.34		0.32	0.22	
Control Delay	34.8	29.2		38.6	16.8		68.2	13.9		60.8	14.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.8	29.2		38.6	16.8		68.2	13.9		60.8	14.7	
LOS	C	C		D	B		E	B		E	B	
Approach Delay		30.7			21.5			20.7			20.8	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	2.5	4.0		7.5	4.8		23.2	42.8		8.5	21.0	
Queue Length 95th (m)	6.6	12.1		14.0	21.0		#53.9	80.1		16.5	34.8	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	187	393		203	440		161	2038		236	1888	
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	0.06	0.08		0.18	0.29		0.61	0.34		0.28	0.22	

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: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61
Intersection Signal Delay: 21.1 Intersection LOS: C
Intersection Capacity Utilization 53.3% ICU Level of Service A
Analysis Period (min) 15
Description: As per timing plans provided 26-Nov-2018
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Greenbank & Marketplace



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	632	166	95	705	163	224	357	117	175	221	129
Future Volume (vph)	171	632	166	95	705	163	224	357	117	175	221	129
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3169	0	3216	3316	1483
Flt Permitted	0.204			0.293			0.950			0.950		
Satd. Flow (perm)	354	3316	1446	509	3316	1432	3206	3169	0	3165	3316	1462
Satd. Flow (RTOR)			166			163		35				149
Lane Group Flow (vph)	171	632	166	95	705	163	224	474	0	175	221	129
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (%)	15.8%	34.2%	34.2%	15.8%	34.2%	34.2%	20.0%	30.0%		20.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	48.7	37.4	37.4	44.9	35.4	35.4	13.6	35.4		11.8	33.6	33.6
Actuated g/C Ratio	0.41	0.31	0.31	0.37	0.30	0.30	0.11	0.30		0.10	0.28	0.28
v/c Ratio	0.64	0.61	0.29	0.34	0.72	0.30	0.61	0.49		0.55	0.24	0.25
Control Delay	32.5	38.6	6.2	23.5	43.1	6.5	72.0	25.7		57.9	34.9	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	32.5	38.6	6.2	23.5	43.1	6.5	72.0	25.7		57.9	34.9	5.1
LOS	C	D	A	C	D	A	E	C		E	C	A
Approach Delay		32.0			34.9			40.5			35.3	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	25.7	69.9	0.0	13.6	83.2	0.0	28.1	48.0		21.7	22.2	0.0
Queue Length 95th (m)	41.5	93.6	16.6	24.7	106.3	16.4	44.0	29.1		32.7	34.8	11.5
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	281	1032	564	321	979	537	474	958		474	927	516
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.61	0.61	0.29	0.30	0.72	0.30	0.47	0.49		0.37	0.24	0.25

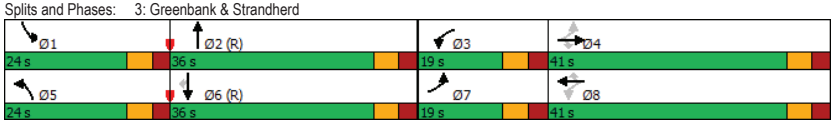
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 94 (78%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 35.3	Intersection LOS: D
Intersection Capacity Utilization 85.0%	ICU Level of Service E
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 3: Greenbank & Strandherd



Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	26	0	52	0	0	34
Future Vol, veh/h	26	0	52	0	0	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	0	52	0	0	34
Number of Lanes	1	0	1	0	0	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.2	7.5	6.6
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	0%	0%	100%
Vol Thru, %	0%	100%	0%
Vol Right, %	100%	0%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	34	26	52
LT Vol	0	0	52
Through Vol	0	26	0
RT Vol	34	0	0
Lane Flow Rate	34	26	52
Geometry Grp	1	1	1
Degree of Util (X)	0.033	0.029	0.061
Departure Headway (Hd)	3.467	4.032	4.213
Convergence, Y/N	Yes	Yes	Yes
Cap	1027	889	853
Service Time	1.508	2.051	2.224
HCM Lane V/C Ratio	0.033	0.029	0.061
HCM Control Delay	6.6	7.2	7.5
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.1	0.2

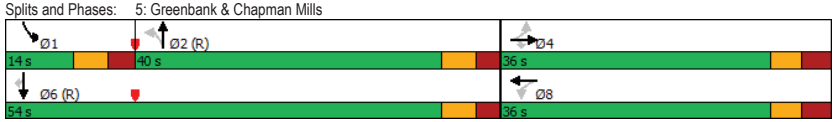
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	34	4	34	17	130	2	574	49	30	376	33
Future Volume (vph)	69	34	4	34	17	130	2	574	49	30	376	33
Satd. Flow (prot)	1658	1745	1483	1658	1483	0	1658	3268	0	1658	1745	1483
Flt Permitted	0.662			0.735			0.538			0.950		
Satd. Flow (perm)	1146	1745	1427	1263	1483	0	934	3268	0	1652	1745	1440
Satd. Flow (RTOR)			124		130			11				45
Lane Group Flow (vph)	69	34	4	34	147	0	2	623	0	30	376	33
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Prot	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8			2					6
Detector Phase	4	4	4	8	8		2	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		5.0	10.0	10.0
Minimum Split (s)	34.7	34.7	34.7	34.7	34.7		34.6	34.6		11.6	34.6	34.6
Total Split (s)	36.0	36.0	36.0	36.0	36.0		40.0	40.0		14.0	54.0	54.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%		44.4%	44.4%		15.6%	60.0%	60.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	3.4	3.4	3.4	3.4	3.4		2.9	2.9		2.9	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.7	6.7	6.7	6.7	6.7		6.6	6.6		6.6	6.6	6.6
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None	None	None	None		C-Max	C-Max		None	C-Max	C-Max
Act Effct Green (s)	14.3	14.3	14.3	14.3	14.3		53.7	53.7		7.1	62.4	62.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.60	0.60		0.08	0.69	0.69
v/c Ratio	0.38	0.12	0.01	0.17	0.43		0.00	0.32		0.23	0.31	0.03
Control Delay	37.6	30.2	0.0	31.5	11.0		14.5	12.2		49.6	6.9	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	37.6	30.2	0.0	31.5	11.0		14.5	12.2		49.6	6.9	1.6
LOS	D	C	A	C	B		B	B		D	A	A
Approach Delay		33.9			14.8			12.2			9.5	
Approach LOS		C			B			B			A	
Queue Length 50th (m)	12.0	5.7	0.0	5.7	2.8		0.2	27.8		5.4	19.3	0.0
Queue Length 95th (m)	19.9	11.3	0.0	11.5	15.7		1.7	61.2		15.5	32.9	1.9
Internal Link Dist (m)		243.9			403.7			204.2			161.2	
Turn Bay Length (m)	38.0		60.0	38.0			38.0			38.0		
Base Capacity (vph)	373	568	548	411	570		557	1953		143	1209	1011
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.18	0.06	0.01	0.08	0.26		0.00	0.32		0.21	0.31	0.03

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 13.4	Intersection LOS: B
Intersection Capacity Utilization 65.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: Greenbank & Chapman Mills



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	111	9	3	484	356	39
Future Volume (vph)	111	9	3	484	356	39
Satd. Flow (prot)	1652	0	1658	1745	1722	0
Flt Permitted	0.956		0.525			
Satd. Flow (perm)	1652	0	916	1745	1722	0
Satd. Flow (RTOR)	5				11	
Lane Group Flow (vph)	120	0	3	484	395	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	26.8		33.1	33.1	24.2	
Total Split (s)	31.0		59.0	59.0	59.0	
Total Split (%)	34.4%		65.6%	65.6%	65.6%	
Yellow Time (s)	3.3		3.7	3.7	3.7	
All-Red Time (s)	1.9		1.4	1.4	1.4	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.2		5.1	5.1	5.1	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		Max	Max	Max	
Act Effct Green (s)	11.8		63.6	63.6	63.6	
Actuated g/C Ratio	0.15		0.78	0.78	0.78	
v/c Ratio	0.49		0.00	0.35	0.29	
Control Delay	37.7		3.7	4.9	4.4	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	37.7		3.7	4.9	4.4	
LOS	D		A	A	A	
Approach Delay	37.7			4.9	4.4	
Approach LOS	D			A	A	
Queue Length 50th (m)	18.3		0.1	23.0	16.9	
Queue Length 95th (m)	31.7		0.9	44.9	34.1	
Internal Link Dist (m)	444.3			187.4	204.2	
Turn Bay Length (m)			38.0			
Base Capacity (vph)	530		717	1366	1350	
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	0.23		0.00	0.35	0.29	

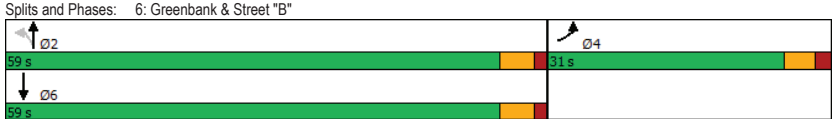
Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 81.3
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.49

Lanes, Volumes, Timings
6: Greenbank & Street "B"

09-17-2019

Intersection Signal Delay: 8.6	Intersection LOS: A
Intersection Capacity Utilization 43.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 6: Greenbank & Street "B"



Lanes, Volumes, Timings
1: Greenbank & New Collector/Loblaws

09-17-2019

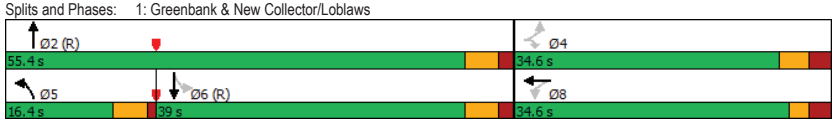
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	0	26	1	0	5	66	666	1	5	809	103
Future Volume (vph)	107	0	26	1	0	5	66	666	1	5	809	103
Satd. Flow (prot)	1658	0	1483	0	1509	0	1658	3316	0	1658	3248	0
Flt Permitted	0.754				0.992		0.950			0.398		
Satd. Flow (perm)	1306	0	1456	0	1507	0	1654	3316	0	692	3248	0
Satd. Flow (RTOR)			86		86						17	
Lane Group Flow (vph)	107	0	26	0	6	0	66	667	0	5	912	0
Turn Type	Perm		Perm	Perm	NA		Prot	NA		Perm	NA	
Protected Phases					8		5	2			6	
Permitted Phases	4		4	8						6		
Detector Phase	4		4	8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0		5.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	34.5		34.5	22.7	22.7		16.3	31.2		31.2	31.2	
Total Split (s)	34.6		34.6	34.6	34.6		16.4	55.4		39.0	39.0	
Total Split (%)	38.4%		38.4%	38.4%	38.4%		18.2%	61.6%		43.3%	43.3%	
Yellow Time (s)	3.3		3.3	2.2	2.2		3.7	3.7		3.7	3.7	
All-Red Time (s)	2.5		2.5	2.5	2.5		1.0	1.7		1.7	1.7	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8		5.8		4.7		4.7	5.4		5.4	5.4	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None		None	None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	12.7		12.7		14.2		10.5	69.7		57.4	57.4	
Actuated g/C Ratio	0.14		0.14		0.16		0.12	0.77		0.64	0.64	
v/c Ratio	0.58		0.09		0.02		0.34	0.26		0.01	0.44	
Control Delay	47.8		0.7		0.2		44.9	3.4		11.2	12.3	
Queue Delay	0.0		0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay	47.8		0.7		0.2		44.9	3.4		11.2	12.3	
LOS	D		A		A		D	A		B	B	
Approach Delay		38.6			0.2			7.2			12.3	
Approach LOS		D			A			A			B	
Queue Length 50th (m)	18.5		0.0		0.0		12.0	14.3		0.4	47.3	
Queue Length 95th (m)	33.2		0.0		0.0		26.4	23.8		2.4	78.3	
Internal Link Dist (m)		520.6			76.1			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	417		524		558		218	2568		441	2078	
Starvation Cap Reductn	0		0		0		0	0		0	0	
Spillback Cap Reductn	0		0		0		0	0		0	0	
Storage Cap Reductn	0		0		0		0	0		0	0	
Reduced v/c Ratio	0.26		0.05		0.01		0.30	0.26		0.01	0.44	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 12.1	Intersection LOS: B
Intersection Capacity Utilization 60.2%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector/Loblaws



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	117	86	141	124	185	149	578	70	195	734	36
Future Volume (vph)	44	117	86	141	124	185	149	578	70	195	734	36
Satd. Flow (prot)	1658	1633	0	1658	1569	0	1658	3263	0	3216	3287	0
Flt Permitted	0.294			0.458			0.950			0.950		
Satd. Flow (perm)	511	1633	0	799	1569	0	1648	3263	0	3216	3287	0
Satd. Flow (RTOR)		29			59			13			5	
Lane Group Flow (vph)	44	203	0	141	309	0	149	648	0	195	770	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)	13.0	35.0		13.0	35.0		20.0	52.0		20.0	52.0	
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)	29.4	22.9		30.9	25.5		13.9	53.1		12.0	51.2	
Actuated g/C Ratio	0.24	0.19		0.26	0.21		0.12	0.44		0.10	0.43	
v/c Ratio	0.24	0.61		0.56	0.82		0.78	0.45		0.61	0.55	
Control Delay	30.8	44.6		41.5	53.6		77.7	25.5		61.5	22.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.8	44.6		41.5	53.6		77.7	25.5		61.5	22.4	
LOS	C	D		D	D		E	C		E	C	
Approach Delay		42.2			49.8			35.3			30.3	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	7.6	38.8		25.9	60.3		35.3	59.1		25.5	48.6	
Queue Length 95th (m)	16.0	62.1		41.5	#93.5		#71.4	81.5		m34.8	m59.1	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	189	409		252	417		200	1450		367	1404	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.50		0.56	0.74		0.74	0.45		0.53	0.55	

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: 120
Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
2: Greenbank & Marketplace

09-17-2019

Maximum v/c Ratio: 0.82

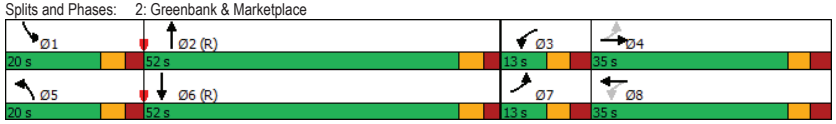
Intersection Signal Delay: 36.7	Intersection LOS: D
Intersection Capacity Utilization 76.7%	ICU Level of Service D
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

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

Splits and Phases: 2: Greenbank & Marketplace



Lanes, Volumes, Timings
3: Greenbank & Strandherd

09-17-2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	902	272	229	779	184	273	366	123	251	463	174
Future Volume (vph)	190	902	272	229	779	184	273	366	123	251	463	174
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3190	0	3216	3316	1483
Flt Permitted	0.166			0.115			0.950			0.950		
Satd. Flow (perm)	289	3316	1483	201	3316	1454	3192	3190	0	3216	3316	1453
Satd. Flow (RTOR)			272			184		37				174
Lane Group Flow (vph)	190	902	272	229	779	184	273	489	0	251	463	174
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (%)	15.0%	34.2%	34.2%	15.0%	34.2%	34.2%	20.0%	30.8%		20.0%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	45.6	34.5	34.5	46.0	34.7	34.7	15.0	33.8		14.4	33.2	33.2
Actuated g/C Ratio	0.38	0.29	0.29	0.38	0.29	0.29	0.12	0.28		0.12	0.28	0.28
v/c Ratio	0.80	0.95	0.44	1.07	0.81	0.33	0.68	0.53		0.65	0.51	0.33
Control Delay	48.2	61.0	6.2	110.6	47.7	6.4	75.4	22.6		58.3	39.3	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	48.2	61.0	6.2	110.6	47.7	6.4	75.4	22.6		58.3	39.3	7.0
LOS	D	E	A	F	D	A	E	C		E	D	A
Approach Delay		48.3			53.4			41.5			38.4	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	29.4	115.2	0.0	~47.4	94.7	0.0	37.3	22.7		31.0	51.1	0.0
Queue Length 95th (m)	#61.5	#157.2	20.5	#99.9	119.6	17.1	m51.7	29.8		44.0	70.2	17.8
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	240	953	620	215	958	551	474	924		474	916	527
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.79	0.95	0.44	1.07	0.81	0.33	0.58	0.53		0.53	0.51	0.33

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 7 (6%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 46.4	Intersection LOS: D
Intersection Capacity Utilization 93.7%	ICU Level of Service F
Analysis Period (min) 15	

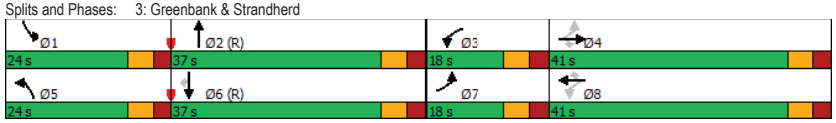
Description: As per timing plans provided 26-Nov-2018

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

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

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

Splits and Phases: 3: Greenbank & Strandherd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	27	3	89	35	120	4	558	57	50	754	70
Future Volume (vph)	54	27	3	89	35	120	4	558	57	50	754	70
Satd. Flow (prot)	1658	1745	1483	1658	1515	0	1658	3260	0	1658	1745	1483
Flt Permitted	0.595			0.740			0.368			0.950		
Satd. Flow (perm)	1030	1745	1414	1260	1515	0	641	3260	0	1652	1745	1440
Satd. Flow (RTOR)			124		120			14				70
Lane Group Flow (vph)	54	27	3	89	155	0	4	615	0	50	754	70
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Prot	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8			2					6
Detector Phase	4	4	4	8	8		2	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		5.0	10.0	10.0
Minimum Split (s)	24.7	24.7	24.7	34.0	34.0		34.6	34.6		11.6	34.6	34.6
Total Split (s)	34.0	34.0	34.0	34.0	34.0		42.2	42.2		13.8	56.0	56.0
Total Split (%)	37.8%	37.8%	37.8%	37.8%	37.8%		46.9%	46.9%		15.3%	62.2%	62.2%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	3.4	3.4	3.4	2.4	2.4		2.9	2.9		2.9	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.7	6.7	6.7	5.7	5.7		6.6	6.6		6.6	6.6	6.6
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None	None	None	None		C-Max	C-Max		None	C-Max	C-Max
Act Effct Green (s)	14.1	14.1	14.1	15.1	15.1		53.7	53.7		7.5	62.6	62.6
Actuated g/C Ratio	0.16	0.16	0.16	0.17	0.17		0.60	0.60		0.08	0.70	0.70
v/c Ratio	0.34	0.10	0.01	0.42	0.44		0.01	0.32		0.36	0.62	0.07
Control Delay	37.1	30.0	0.0	37.9	13.0		13.8	11.9		60.2	10.7	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	37.1	30.0	0.0	37.9	13.0		13.8	11.9		60.2	10.7	0.4
LOS	D	C	A	D	B		B	B		E	B	A
Approach Delay		33.5			22.1			11.9			12.7	
Approach LOS		C			C			B			B	
Queue Length 50th (m)	9.3	4.5	0.0	15.4	5.8		0.3	28.1		9.7	28.8	0.0
Queue Length 95th (m)	16.7	9.7	0.0	24.1	18.7		2.6	57.4		22.2	66.0	0.5
Internal Link Dist (m)		239.9			403.7			204.2			161.2	
Turn Bay Length (m)	38.0		60.0	38.0			38.0			38.0		
Base Capacity (vph)	312	529	515	396	558		382	1949		144	1213	1023
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.17	0.05	0.01	0.22	0.28		0.01	0.32		0.35	0.62	0.07

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 14.6	Intersection LOS: B
Intersection Capacity Utilization 82.2%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 5: Greenbank & Chapman Mills

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	73	6	9	546	736	110
Future Volume (vph)	73	6	9	546	736	110
Satd. Flow (prot)	1652	0	1658	1745	1714	0
Flt Permitted	0.956		0.291			
Satd. Flow (perm)	1652	0	508	1745	1714	0
Satd. Flow (RTOR)	4				17	
Lane Group Flow (vph)	79	0	9	546	846	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	26.2		23.1	23.1	23.1	
Total Split (s)	26.3		63.7	63.7	63.7	
Total Split (%)	29.2%		70.8%	70.8%	70.8%	
Yellow Time (s)	3.3		3.7	3.7	3.7	
All-Red Time (s)	1.9		1.4	1.4	1.4	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.2		5.1	5.1	5.1	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		Max	Max	Max	
Act Effct Green (s)	10.8		71.9	71.9	71.9	
Actuated g/C Ratio	0.12		0.81	0.81	0.81	
v/c Ratio	0.39		0.02	0.39	0.61	
Control Delay	40.3		3.0	4.3	6.8	
Queue Delay	0.0		0.0	0.0	0.3	
Total Delay	40.3		3.0	4.3	7.2	
LOS	D		A	A	A	
Approach Delay	40.3			4.3	7.2	
Approach LOS	D			A	A	
Queue Length 50th (m)	13.6		0.3	25.3	51.6	
Queue Length 95th (m)	25.1		1.5	46.2	98.4	
Internal Link Dist (m)	444.3			187.4	204.2	
Turn Bay Length (m)			38.0			
Base Capacity (vph)	398		413	1417	1396	
Starvation Cap Reductn	0		0	0	155	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.20		0.02	0.39	0.68	

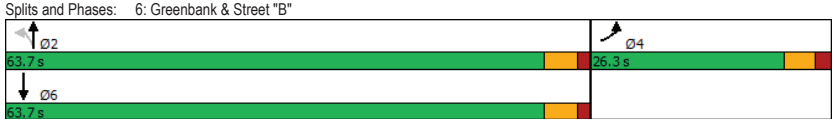
Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 88.5
Natural Cycle: 70
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.61

Lanes, Volumes, Timings
6: Greenbank & Street "B"

09-17-2019

Intersection Signal Delay: 7.8	Intersection LOS: A
Intersection Capacity Utilization 64.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 6: Greenbank & Street "B"



HCM 6th AWSC
8: Jockvale & Chapman Mills

09-17-2019

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	20	0	109	0	0	27
Future Vol, veh/h	20	0	109	0	0	27
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	0	109	0	0	27
Number of Lanes	1	0	1	0	0	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.2	7.8	6.7
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	0%	0%	100%
Vol Thru, %	0%	100%	0%
Vol Right, %	100%	0%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	27	20	109
LT Vol	0	0	109
Through Vol	0	20	0
RT Vol	27	0	0
Lane Flow Rate	27	20	109
Geometry Grp	1	1	1
Degree of Util (X)	0.027	0.023	0.127
Departure Headway (Hd)	3.556	4.063	4.197
Convergence, Y/N	Yes	Yes	Yes
Cap	994	880	858
Service Time	1.624	2.094	2.207
HCM Lane V/C Ratio	0.027	0.023	0.127
HCM Control Delay	6.7	7.2	7.8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.1	0.4

Appendix J

Synchro Intersection Worksheets – 2030 Future Total Conditions

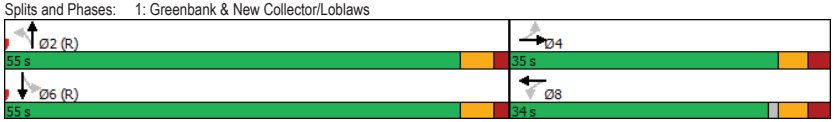
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	0	7	1	0	5	20	619	1	5	328	38
Future Volume (vph)	43	0	7	1	0	5	20	619	1	5	328	38
Satd. Flow (prot)	1658	1457	0	0	1512	0	1658	3316	0	1658	3252	0
Flt Permitted	0.754				0.959		0.534			0.417		
Satd. Flow (perm)	1310	1457	0	0	1461	0	927	3316	0	725	3252	0
Satd. Flow (RTOR)		496			29						22	
Lane Group Flow (vph)	43	7	0	0	6	0	20	620	0	5	366	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	33.8	33.8		34.0	34.0		31.2	31.2		31.2	31.2	
Total Split (s)	35.0	35.0		34.0	34.0		55.0	55.0		55.0	55.0	
Total Split (%)	38.9%	38.9%		37.8%	37.8%		61.1%	61.1%		61.1%	61.1%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.7	1.7		1.7	1.7	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8			5.8		5.4	5.4		5.4	5.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	13.6	13.6			13.6		73.7	73.7		73.7	73.7	
Actuated g/C Ratio	0.15	0.15			0.15		0.82	0.82		0.82	0.82	
v/c Ratio	0.22	0.01			0.02		0.03	0.23		0.01	0.14	
Control Delay	33.6	0.0			0.2		5.7	4.5		6.2	4.0	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	33.6	0.0			0.2		5.7	4.5		6.2	4.0	
LOS	C	A			A		A	A		A	A	
Approach Delay		28.9			0.2			4.6			4.0	
Approach LOS		C			A			A			A	
Queue Length 50th (m)	7.3	0.0			0.0		0.7	13.5		0.2	6.8	
Queue Length 95th (m)	13.5	0.0			0.0		4.7	40.3		1.9	22.2	
Internal Link Dist (m)		520.6			55.4			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	425	807			493		759	2714		593	2666	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.10	0.01			0.01		0.03	0.23		0.01	0.14	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.23

Intersection Signal Delay: 5.5	Intersection LOS: A
Intersection Capacity Utilization 41.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector/Loblaws



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	17	16	36	23	106	98	477	74	65	321	6
Future Volume (vph)	12	17	16	36	23	106	98	477	74	65	321	6
Satd. Flow (prot)	1658	1607	0	1658	1514	0	1658	3243	0	3216	3304	0
Flt Permitted	0.644			0.669			0.950			0.950		
Satd. Flow (perm)	1123	1607	0	1166	1514	0	1655	3243	0	3209	3304	0
Satd. Flow (RTOR)		16			106			18			2	
Lane Group Flow (vph)	12	33	0	36	129	0	98	551	0	65	327	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)	12.0	35.0		12.0	35.0		15.0	58.0		15.0	58.0	
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)	14.3	10.8		15.6	13.2		13.3	77.5		7.8	69.7	
Actuated g/C Ratio	0.12	0.09		0.13	0.11		0.11	0.65		0.06	0.58	
v/c Ratio	0.08	0.21		0.21	0.49		0.54	0.26		0.31	0.17	
Control Delay	40.2	34.2		43.8	20.6		60.5	10.8		63.7	10.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	40.2	34.2		43.8	20.6		60.5	10.8		63.7	10.6	
LOS	D	C		D	C		E	B		E	B	
Approach Delay		35.8			25.6			18.3			19.4	
Approach LOS		D			C			B			B	
Queue Length 50th (m)	2.5	4.0		7.5	4.8		23.2	32.0		8.6	12.8	
Queue Length 95th (m)	7.8	14.1		16.6	24.6		40.2	48.4		16.4	18.6	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	158	393		174	440		183	2101		239	1918	
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	0.08	0.08		0.21	0.29		0.54	0.26		0.27	0.17	

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: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 20.3	Intersection LOS: C
Intersection Capacity Utilization 53.3%	ICU Level of Service A
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 2: Greenbank & Marketplace

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	164	588	82	71	694	163	106	361	87	175	227	125
Future Volume (vph)	164	588	82	71	694	163	106	361	87	175	227	125
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3201	0	3216	3316	1483
Flt Permitted	0.210			0.362			0.950			0.950		
Satd. Flow (perm)	364	3316	1446	629	3316	1432	3206	3201	0	3163	3316	1462
Satd. Flow (RTOR)			149			163		23				149
Lane Group Flow (vph)	164	588	82	71	694	163	106	448	0	175	227	125
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (s)	19.0	41.0	41.0	19.0	41.0	41.0	24.0	36.0		24.0	36.0	36.0
Total Split (%)	15.8%	34.2%	34.2%	15.8%	34.2%	34.2%	20.0%	30.0%		20.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	50.5	40.9	40.9	43.9	35.5	35.5	9.3	35.4		11.8	37.9	37.9
Actuated g/C Ratio	0.42	0.34	0.34	0.37	0.30	0.30	0.08	0.30		0.10	0.32	0.32
v/c Ratio	0.60	0.52	0.14	0.24	0.71	0.30	0.43	0.47		0.55	0.22	0.22
Control Delay	30.2	34.9	0.5	21.8	42.5	6.5	76.1	27.5		57.9	31.3	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	30.2	34.9	0.5	21.8	42.5	6.5	76.1	27.5		57.9	31.3	4.0
LOS	C	C	A	C	D	A	E	C		E	C	A
Approach Delay		30.6			34.6			36.8			33.7	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	24.5	63.1	0.0	10.0	81.6	0.0	14.3	46.2		21.7	21.6	0.0
Queue Length 95th (m)	39.9	84.8	0.0	19.3	104.3	16.4	24.4	66.2		32.7	33.4	9.8
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	287	1131	591	356	982	538	474	959		474	1047	563
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.57	0.52	0.14	0.20	0.71	0.30	0.22	0.47		0.37	0.22	0.22

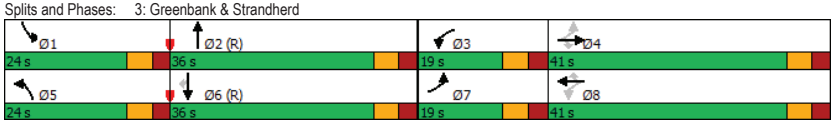
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 94 (78%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 33.7	Intersection LOS: C
Intersection Capacity Utilization 83.1%	ICU Level of Service E
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

Splits and Phases: 3: Greenbank & Strandherd

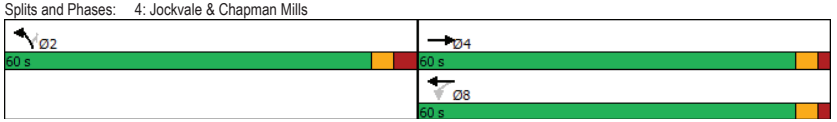


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	79	9	44	55	53	26
Future Volume (vph)	79	9	44	55	53	26
Satd. Flow (prot)	1711	0	1658	1745	1658	1483
Flt Permitted			0.700		0.950	
Satd. Flow (perm)	1711	0	1186	1745	1640	1436
Satd. Flow (RTOR)	6					26
Lane Group Flow (vph)	88	0	44	55	53	26
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0
Minimum Split (s)	24.8		24.8	24.8	34.8	34.8
Total Split (s)	60.0		60.0	60.0	60.0	60.0
Total Split (%)	50.0%		50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	1.9		1.9	1.9	3.5	3.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.2		5.2	5.2	6.8	6.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max		Max	Max	None	None
Act Effct Green (s)	59.5		59.5	59.5	13.1	13.1
Actuated g/C Ratio	0.74		0.74	0.74	0.16	0.16
v/c Ratio	0.07		0.05	0.04	0.20	0.10
Control Delay	5.4		5.9	5.7	29.7	11.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	5.4		5.9	5.7	29.7	11.2
LOS	A		A	A	C	B
Approach Delay	5.4			5.8	23.6	
Approach LOS	A			A	C	
Queue Length 50th (m)	3.1		1.6	2.0	7.4	0.0
Queue Length 95th (m)	13.3		8.3	9.5	16.6	6.1
Internal Link Dist (m)	223.3			240.5	108.6	
Turn Bay Length (m)			38.0		38.0	
Base Capacity (vph)	1274		882	1298	1110	970
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.07		0.05	0.04	0.05	0.03

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 80
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.20

Intersection Signal Delay: 10.9 Intersection LOS: B
Intersection Capacity Utilization 35.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Jockvale & Chapman Mills



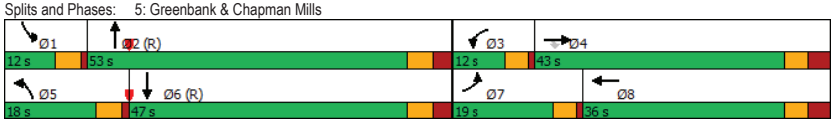
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	134	50	34	156	40	74	491	49	30	257	54
Future Volume (vph)	82	134	50	34	156	40	74	491	49	30	257	54
Satd. Flow (prot)	1658	1745	1483	1658	1682	0	1658	3260	0	1658	1690	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1642	1745	1419	1628	1682	0	1646	3260	0	1649	1690	0
Satd. Flow (RTOR)			157		10			10			10	
Lane Group Flow (vph)	82	134	50	34	196	0	74	540	0	30	311	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	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	9.5	34.7	34.7	9.5	34.7		9.7	34.6		10.9	34.6	
Total Split (s)	19.0	43.0	43.0	12.0	36.0		18.0	53.0		12.0	47.0	
Total Split (%)	15.8%	35.8%	35.8%	10.0%	30.0%		15.0%	44.2%		10.0%	39.2%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.0	3.4	3.4	1.0	3.4		1.0	2.9		1.0	2.9	
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)	4.3	6.7	6.7	4.3	6.7		4.7	6.6		4.7	6.6	
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)	11.0	25.0	25.0	7.1	19.1		10.6	66.7		7.4	61.4	
Actuated g/C Ratio	0.09	0.21	0.21	0.06	0.16		0.09	0.56		0.06	0.51	
v/c Ratio	0.54	0.37	0.12	0.35	0.71		0.51	0.30		0.30	0.36	
Control Delay	64.5	41.9	0.6	64.1	58.6		63.5	18.0		60.9	23.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	64.5	41.9	0.6	64.1	58.6		63.5	18.0		60.9	23.2	
LOS	E	D	A	E	E		E	B		E	C	
Approach Delay		41.1			59.4			23.5			26.6	
Approach LOS		D			E			C			C	
Queue Length 50th (m)	19.7	29.7	0.0	8.2	44.5		17.8	39.8		7.2	46.5	
Queue Length 95th (m)	35.9	42.8	0.0	19.4	64.6		33.0	66.1		17.4	89.9	
Internal Link Dist (m)		240.5			403.7			204.2			161.2	
Turn Bay Length (m)	38.0		60.0	38.0			38.0			38.0		
Base Capacity (vph)	203	527	538	106	418		187	1815		109	869	
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	0.40	0.25	0.09	0.32	0.47		0.40	0.30		0.28	0.36	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
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: 0.71

Intersection Signal Delay: 33.1	Intersection LOS: C
Intersection Capacity Utilization 65.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: Greenbank & Chapman Mills

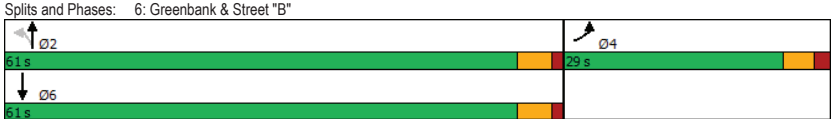


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	72	8	3	510	285	27
Future Volume (vph)	72	8	3	510	285	27
Satd. Flow (prot)	1647	0	1658	1745	1724	0
Flt Permitted	0.957		0.571			
Satd. Flow (perm)	1647	0	996	1745	1724	0
Satd. Flow (RTOR)	6				10	
Lane Group Flow (vph)	80	0	3	510	312	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	
Minimum Split (s)	26.2		23.1	23.1	23.1	
Total Split (s)	29.0		61.0	61.0	61.0	
Total Split (%)	32.2%		67.8%	67.8%	67.8%	
Yellow Time (s)	3.3		3.7	3.7	3.7	
All-Red Time (s)	1.9		1.4	1.4	1.4	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.2		5.1	5.1	5.1	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		Max	Max	Max	
Act Effct Green (s)	9.2		69.1	69.1	69.1	
Actuated g/C Ratio	0.11		0.81	0.81	0.81	
v/c Ratio	0.44		0.00	0.36	0.22	
Control Delay	40.5		3.0	4.1	3.2	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	40.5		3.0	4.1	3.2	
LOS	D		A	A	A	
Approach Delay	40.5			4.1	3.2	
Approach LOS	D			A	A	
Queue Length 50th (m)	13.0		0.1	22.0	11.2	
Queue Length 95th (m)	24.1		0.8	41.9	22.6	
Internal Link Dist (m)	444.3			187.4	204.2	
Turn Bay Length (m)			38.0			
Base Capacity (vph)	466		808	1417	1402	
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	0.17		0.00	0.36	0.22	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 85.1
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.44

Intersection Signal Delay: 7.0 Intersection LOS: A
Intersection Capacity Utilization 41.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 6: Greenbank & Street "B"



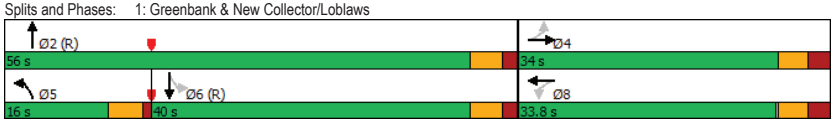
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	0	26	1	0	5	66	578	1	5	693	103
Future Volume (vph)	107	0	26	1	0	5	66	578	1	5	693	103
Satd. Flow (prot)	1658	1456	0	0	1512	0	1658	3316	0	1658	3240	0
Flt Permitted	0.754				0.966		0.950			0.434		
Satd. Flow (perm)	1310	1456	0	0	1472	0	1653	3316	0	754	3240	0
Satd. Flow (RTOR)		341			86						21	
Lane Group Flow (vph)	107	26	0	0	6	0	66	579	0	5	796	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8						6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	33.8	33.8		33.8	33.8		10.8	30.8		33.4	33.4	
Total Split (s)	34.0	34.0		33.8	33.8		16.0	56.0		40.0	40.0	
Total Split (%)	37.8%	37.8%		37.6%	37.6%		17.8%	62.2%		44.4%	44.4%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	2.5	2.5		2.5	2.5		1.0	1.7		1.7	1.7	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8			5.8		4.7	5.4		5.4	5.4	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Act Effct Green (s)	14.6	14.6			14.3		8.7	67.8		56.4	56.4	
Actuated g/C Ratio	0.16	0.16			0.16		0.10	0.75		0.63	0.63	
v/c Ratio	0.50	0.05			0.02		0.41	0.23		0.01	0.39	
Control Delay	40.4	0.2			0.2		45.2	5.6		14.0	13.0	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	40.4	0.2			0.2		45.2	5.6		14.0	13.0	
LOS	D	A			A		D	A		B	B	
Approach Delay		32.6			0.2			9.6			13.0	
Approach LOS		C			A			A			B	
Queue Length 50th (m)	18.5	0.0			0.0		11.5	14.7		0.4	37.6	
Queue Length 95th (m)	28.4	0.0			0.0		23.9	37.3		2.8	79.3	
Internal Link Dist (m)		520.6			48.8			161.2			210.2	
Turn Bay Length (m)	38.0						38.0			38.0		
Base Capacity (vph)	410	690			520		209	2498		472	2039	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.26	0.04			0.01		0.32	0.23		0.01	0.39	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 16 (18%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 13.2	Intersection LOS: B
Intersection Capacity Utilization 55.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Greenbank & New Collector/Loblaws



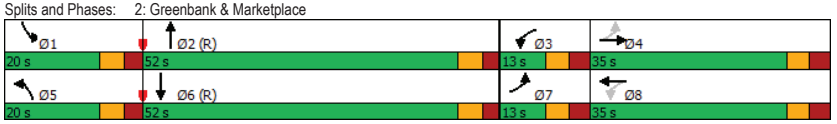
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	117	86	141	124	185	149	469	70	195	599	36
Future Volume (vph)	44	117	86	141	124	185	149	469	70	195	599	36
Satd. Flow (prot)	1658	1633	0	1658	1569	0	1658	3253	0	3216	3279	0
Flt Permitted	0.294			0.458			0.950			0.950		
Satd. Flow (perm)	511	1633	0	799	1569	0	1646	3253	0	3216	3279	0
Satd. Flow (RTOR)		29			59			16			6	
Lane Group Flow (vph)	44	203	0	141	309	0	149	539	0	195	635	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)	13.0	35.0		13.0	35.0		20.0	52.0		20.0	52.0	
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)	29.4	22.9		30.9	25.5		13.9	53.1		12.0	51.2	
Actuated g/C Ratio	0.24	0.19		0.26	0.21		0.12	0.44		0.10	0.43	
v/c Ratio	0.24	0.61		0.56	0.82		0.78	0.37		0.61	0.45	
Control Delay	30.8	44.6		41.5	53.6		77.7	24.1		67.1	18.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.8	44.6		41.5	53.6		77.7	24.1		67.1	18.1	
LOS	C	D		D	D		E	C		E	B	
Approach Delay		42.2			49.8			35.7			29.6	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	7.6	38.8		25.9	60.3		35.3	46.6		25.7	32.3	
Queue Length 95th (m)	16.0	62.1		41.5	#93.5		#71.4	65.9		m36.9	m41.6	
Internal Link Dist (m)		102.8			148.8			210.2			171.8	
Turn Bay Length (m)	25.0			55.0			60.0			56.0		
Base Capacity (vph)	189	409		252	417		200	1447		367	1401	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.50		0.56	0.74		0.74	0.37		0.53	0.45	

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: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82
Intersection Signal Delay: 37.0 Intersection LOS: D
Intersection Capacity Utilization 74.9% ICU Level of Service D
Analysis Period (min) 15
Description: As per timing plans provided 26-Nov-2018
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Greenbank & Marketplace



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	186	942	136	183	784	184	151	401	93	251	498	168
Future Volume (vph)	186	942	136	183	784	184	151	401	93	251	498	168
Satd. Flow (prot)	1658	3316	1483	1658	3316	1483	3216	3214	0	3216	3316	1483
Flt Permitted	0.162			0.115			0.950			0.950		
Satd. Flow (perm)	283	3316	1464	201	3316	1483	3213	3214	0	3210	3316	1464
Satd. Flow (RTOR)			149			184		22				168
Lane Group Flow (vph)	186	942	136	183	784	184	151	494	0	251	498	168
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (s)	18.0	41.0	41.0	18.0	41.0	41.0	24.0	37.0		24.0	37.0	37.0
Total Split (%)	15.0%	34.2%	34.2%	15.0%	34.2%	34.2%	20.0%	30.8%		20.0%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7		3.7	3.7	3.7
All-Red Time (s)	2.9	2.8	2.8	2.9	2.8	2.8	2.6	2.8		2.6	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.6	6.5	6.5	6.6	6.5	6.5	6.3	6.5		6.3	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max	Max	None	Max	Max	None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	45.6	34.6	34.6	46.0	34.7	34.7	11.0	33.8		14.4	37.2	37.2
Actuated g/C Ratio	0.38	0.29	0.29	0.38	0.29	0.29	0.09	0.28		0.12	0.31	0.31
v/c Ratio	0.79	0.99	0.26	0.86	0.82	0.33	0.52	0.54		0.65	0.48	0.29
Control Delay	47.4	68.7	5.4	61.9	47.9	6.3	71.2	26.4		58.3	36.0	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	47.4	68.7	5.4	61.9	47.9	6.3	71.2	26.4		58.3	36.0	6.2
LOS	D	E	A	E	D	A	E	C		E	D	A
Approach Delay		58.8			43.4			36.9			36.6	
Approach LOS		E			D			D			D	
Queue Length 50th (m)	28.7	122.3	0.0	29.5	95.5	0.0	20.7	31.6		31.0	52.6	0.0
Queue Length 95th (m)	#59.9	#168.3	12.6	#71.5	120.6	17.2	m31.3	44.7		44.0	72.5	16.9
Internal Link Dist (m)		186.3			415.8			171.8			236.6	
Turn Bay Length (m)	70.0		100.0	130.0			60.0			85.0		160.0
Base Capacity (vph)	238	955	528	215	960	560	474	920		474	1028	570
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.78	0.99	0.26	0.85	0.82	0.33	0.32	0.54		0.53	0.48	0.29

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

Maximum v/c Ratio: 0.99

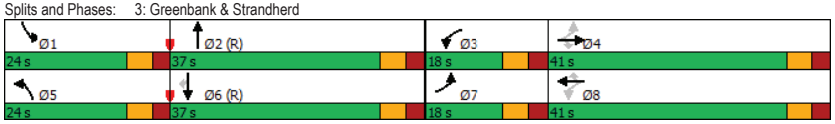
Intersection Signal Delay: 45.7	Intersection LOS: D
Intersection Capacity Utilization 91.5%	ICU Level of Service F
Analysis Period (min) 15	

Description: As per timing plans provided 26-Nov-2018

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

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

Splits and Phases: 3: Greenbank & Strandherd

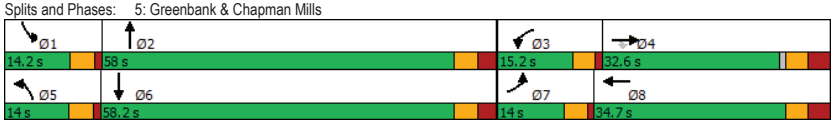


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	206	88	99	165	40	81	502	57	50	578	102
Future Volume (vph)	91	206	88	99	165	40	81	502	57	50	578	102
Satd. Flow (prot)	1658	1745	1483	1658	1686	0	1658	3255	0	1658	1697	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1642	1745	1400	1616	1686	0	1651	3255	0	1650	1697	0
Satd. Flow (RTOR)			114		9			12			9	
Lane Group Flow (vph)	91	206	88	99	205	0	81	559	0	50	680	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	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	13.0	24.7	24.7	11.7	34.7		11.2	34.6		11.6	34.6	
Total Split (s)	14.0	32.6	32.6	15.2	34.7		14.0	58.0		14.2	58.2	
Total Split (%)	11.6%	27.0%	27.0%	12.6%	28.7%		11.6%	48.0%		11.7%	48.1%	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.7	3.7		3.7	3.7	
All-Red Time (s)	1.0	3.4	3.4	1.0	3.4		1.0	2.9		1.0	2.9	
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)	4.3	6.7	6.7	4.3	6.7		4.7	6.6		4.7	6.6	
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	Max		None	Max	
Act Effct Green (s)	9.2	18.4	18.4	10.1	19.2		8.8	52.7		8.0	52.2	
Actuated g/C Ratio	0.08	0.17	0.17	0.09	0.18		0.08	0.48		0.07	0.48	
v/c Ratio	0.65	0.70	0.27	0.65	0.67		0.61	0.35		0.41	0.83	
Control Delay	73.2	56.9	5.6	70.6	52.2		71.2	19.9		61.6	37.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	3.8	
Total Delay	73.2	56.9	5.6	70.6	52.2		71.2	19.9		61.6	41.3	
LOS	E	E	A	E	D		E	B		E	D	
Approach Delay		49.0			58.2			26.4			42.7	
Approach LOS		D			E			C			D	
Queue Length 50th (m)	20.7	45.7	0.0	22.4	43.0		18.4	41.8		11.2	136.5	
Queue Length 95th (m)	#48.1	71.5	8.3	#49.0	68.5		#42.8	64.3		25.5	#237.6	
Internal Link Dist (m)		241.3			403.7			204.2			161.2	
Turn Bay Length (m)	38.0		60.0	38.0			38.0			38.0		
Base Capacity (vph)	149	433	433	167	444		143	1575		146	816	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	76	
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	0.61	0.48	0.20	0.59	0.46		0.57	0.35		0.34	0.92	

Intersection Summary
Cycle Length: 120.9
Actuated Cycle Length: 109.2
Natural Cycle: 105
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.83

Intersection Signal Delay: 41.1 Intersection LOS: D
Intersection Capacity Utilization 82.5% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Greenbank & Chapman Mills

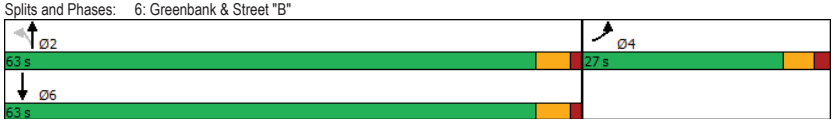


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	48	5	7	548	649	73
Future Volume (vph)	48	5	7	548	649	73
Satd. Flow (prot)	1648	0	1658	1745	1721	0
Flt Permitted	0.957		0.362			
Satd. Flow (perm)	1648	0	632	1745	1721	0
Satd. Flow (RTOR)	5				13	
Lane Group Flow (vph)	53	0	7	548	722	0
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	
Minimum Split (s)	26.2		23.1	23.1	23.1	
Total Split (s)	27.0		63.0	63.0	63.0	
Total Split (%)	30.0%		70.0%	70.0%	70.0%	
Yellow Time (s)	3.3		3.7	3.7	3.7	
All-Red Time (s)	1.9		1.4	1.4	1.4	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.2		5.1	5.1	5.1	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		Max	Max	Max	
Act Effct Green (s)	8.0		74.6	74.6	74.6	
Actuated g/C Ratio	0.09		0.87	0.87	0.87	
v/c Ratio	0.34		0.01	0.36	0.48	
Control Delay	40.3		2.4	3.2	4.1	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	40.3		2.4	3.2	4.1	
LOS	D		A	A	A	
Approach Delay	40.3			3.2	4.1	
Approach LOS	D			A	A	
Queue Length 50th (m)	8.5		0.2	21.9	33.1	
Queue Length 95th (m)	19.1		1.2	41.5	63.9	
Internal Link Dist (m)	444.3			187.4	204.2	
Turn Bay Length (m)			38.0			
Base Capacity (vph)	424		549	1516	1497	
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	0.13		0.01	0.36	0.48	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 85.8
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.48

Intersection Signal Delay: 5.1 Intersection LOS: A
Intersection Capacity Utilization 53.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 6: Greenbank & Street "B"

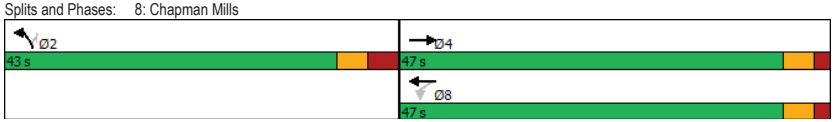


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	126	29	91	74	38	20
Future Volume (vph)	126	29	91	74	38	20
Satd. Flow (prot)	1691	0	1658	1745	1658	1483
Flt Permitted			0.659		0.950	
Satd. Flow (perm)	1691	0	1138	1745	1645	1439
Satd. Flow (RTOR)	17					20
Lane Group Flow (vph)	155	0	91	74	38	20
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0
Minimum Split (s)	23.2		23.2	23.2	34.8	34.8
Total Split (s)	47.0		47.0	47.0	43.0	43.0
Total Split (%)	52.2%		52.2%	52.2%	47.8%	47.8%
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	1.9		1.9	1.9	3.5	3.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.2		5.2	5.2	6.8	6.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Max		Max	Max	None	None
Act Effct Green (s)	57.8		57.8	57.8	13.3	13.3
Actuated g/C Ratio	0.79		0.79	0.79	0.18	0.18
v/c Ratio	0.12		0.10	0.05	0.13	0.07
Control Delay	5.2		6.2	5.8	26.1	10.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	5.2		6.2	5.8	26.1	10.9
LOS	A		A	A	C	B
Approach Delay	5.2			6.0	20.9	
Approach LOS	A			A	C	
Queue Length 50th (m)	5.4		3.5	2.8	5.5	0.0
Queue Length 95th (m)	21.3		15.5	12.3	11.3	4.8
Internal Link Dist (m)	234.6			241.3	107.8	
Turn Bay Length (m)			38.0		38.0	
Base Capacity (vph)	1344		902	1383	837	736
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.12		0.10	0.05	0.05	0.03

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 72.9
Natural Cycle: 60
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.13

Intersection Signal Delay: 8.0 Intersection LOS: A
Intersection Capacity Utilization 48.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 8: Chapman Mills



Appendix K

TDM Checklists

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 Checklist **City of Ottawa**
Version 1.0 (30 June 2017)

		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	☐

TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

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

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

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☑
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	2.3	**Bicycle repair station**	
BETTER	2.3.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☑
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☑
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	☑