June 2017

3311 Greenbank Road

Transportation Impact Study

Prepared for:

Minto Communities

Prepared by:

PARSONS

3311 Greenbank Road

Transportation Impact Study

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June 8, 2017

476248 – 01000

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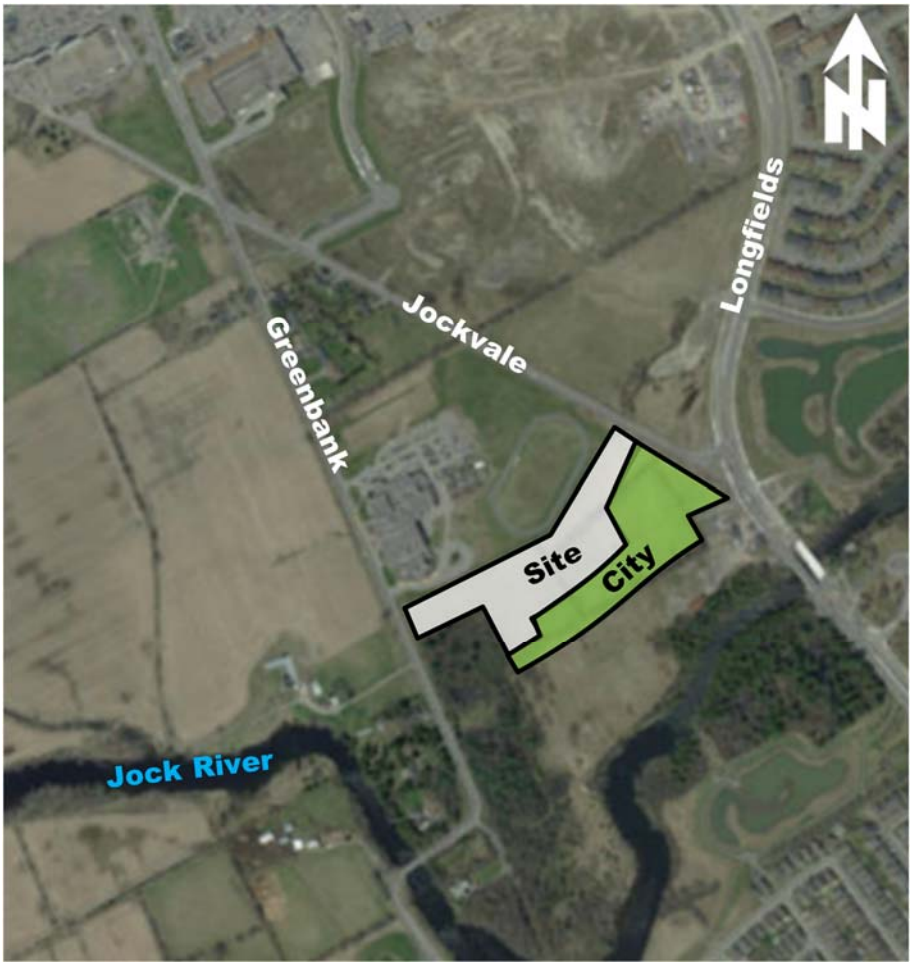
Transportation Impact Study

1. INTRODUCTION

Minto Communities, in conjunction with the City of Ottawa, is planning a residential subdivision in the South Nepean Town Centre. To support this development at 3311 Greenbank Road, a Transportation Impact Study is required to satisfy the site plan application. The residential development will consist of 146 executive townhomes and 108 mid-rise condominium units. The 108 mid-rise units will be on a future City parcel and are included within the scope of this study. The proposed site is north of the Jock River, on the south side of St. Joseph High School and is currently vacant land.

Figure 1 illustrates the local context of the site and Figure 2 illustrates the proposed Site Plan.

Figure 1: Local Context



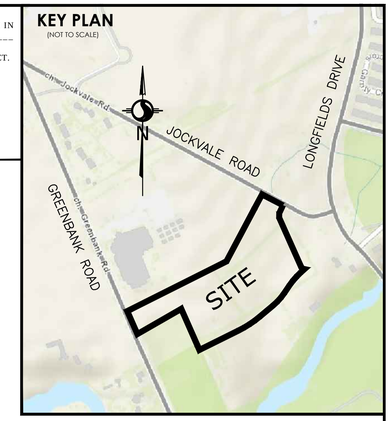
For this assessment, the horizon years will be analyzed for the year 2020 representing full occupancy, and 2025, which is 5-years beyond the full build-out. The study area will consist of the signalized intersection of Greenbank Road and Jockvale Road. The site will access Greenbank Road directly at a single access point, Street No. 1, and have an emergency access point located on Jockvale Road. The Street No. 1 intersection is anticipated to be a minor stop controlled intersection. Street No. 6 is proposed to connect to Longfields Drive in the future, but will require the decommissioning of Jockvale Road and development of the City owned parcel. The Street No. 6 is not considered to be in place within the scope of this study.

6 June 2017 9:16 AM

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED _____20____
THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT. THIS____DAY OF_____,2017.

DON HERWEYER, MCIP RPP
MANAGER, DEVELOPMENT REVIEW-SOUTH
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

KEY PLAN
(NOT TO SCALE)



DRAFT PLAN OF SUBDIVISION of

PART OF LOTS 12 AND 13 CONCESSION 2 (RIDEAU FRONT)

(GEOGRAPHIC TOWNSHIP OF NEPEAN)

CITY OF OTTAWA

Scale 1:1000

20 0 20 40 60 METRES

METRIC CONVERSION
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SCHEDULE OF LAND USE			
BLOCK	USE	UNITS	AREA (Ha/ac)
1 TO 32	RESIDENTIAL	148	3.13/7.73
33	MISC.		0.04/0.09
34	RESERVE		0.004/0.01
STREETS	STREET		1.60/3.96
TOTAL		148	4.77/11.79

INFORMATION: REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT R.S.O. 1990

a. SEE PLAN
b. SEE PLAN
c. SEE PLAN
d. SEE PROPOSED LAND USE SCHEDULE (ABOVE)
e. SEE PLAN
f. SEE PLAN
g. SEE PLAN
h. CITY WATER AVAILABLE
i. SEE SOIL REPORT
j. SEE TOPOGRAPHICAL INFORMATION
k. ALL CITY SERVICES AVAILABLE
l. NO EASEMENTS REGISTERED ON TITLE

OWNER'S CERTIFICATE
I HEREBY AUTHORIZE STANTEC GEOMATICS LTD. TO SUBMIT THIS DRAFT PLAN OF SUBDIVISION ON MY BEHALF

DATED : _____ DATED : _____

SUSAN MURPHY
VICE PRESIDENT, DEVELOPMENT

BRENT STRACHAN
SENIOR VICE PRESIDENT, DEVELOPMENT

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO ADJOINING LANDS HAVE BEEN ACCURATELY AND CORRECTLY SHOWN.

DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

Stantec
Stantec Geomatics Ltd.
CANADA LANDS SURVEYORS
ONTARIO LAND SURVEYORS
1331 CLYDE AVENUE, SUITE 400
OTTAWA, ONTARIO, K2C 3G4
TEL. 613.722.4420 FAX. 613.722.2799
stantec.com

DRAWN: CEC	CHECKED: *	PM: FP	FIELD: *	PROJECT No.: 161613630-131

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2. EXISTING CONDITIONS

2.1. AREA ROAD NETWORK

Greenbank Road is a north-south arterial roadway in South Nepean, transitioning from an urban cross-section, north of Jockvale Road, into a rural cross-section across the Jock River. Adjacent to the site, Greenbank Road is a 2-lane roadway with auxiliary lanes at Jockvale Road. The posted speed limit is 60 km/h, with a 40km/h school zone located approximately 100m south of Jockvale Road to approximately 130m north of the 90 bend to cross the Jock River. A rumble strip and paved shoulder are provided on the east side of the roadway for pedestrian connectivity before a pathway begins at St. Joseph High School and proceed north.

Jockvale Road is a north-south local roadway adjacent that connects Greenbank Road to Longfields Drive. South of Longfields Drive, Jockvale Road is an urban arterial road. The local road section is a 2-lane roadway with paved shoulders. The posted speed limit is 60 km/h and a right-turn auxiliary lane is provided at Greenbank Road. The Southwest Transitway connects to Jockvale Road approximately 115m south of Greenbank Road.

2.2. PEDESTRIAN/CYCLING NETWORK

Pedestrian facilities in the vicinity of the site are provided along the east side of Greenbank Road in the form of a paved shoulder and rumble strip and a pathway starting at St. Joseph High School. A multi-use pathway and sidewalk border the Southwest Transitway extension, and the multi-use pathway links the transit turnaround to Greenbank Road, south of Jockvale Road. Beyond the immediate area, sidewalks exist along Longfields Drive and throughout the Barrhaven Town Centre and Chapman Mills Marketplace.

Similarly, the cycling facilities are provided along the same paved shoulder along Greenbank Road, and multi-use pathway along the Transitway. Bike lanes are provided north of Marketplace Avenue and along Longfields Drive. Ultimately, Greenbank Road will be a spine route within the City.

2.3. TRANSIT NETWORK

Figure 3 illustrates the Area Transit Network in South Nepean.

Transit service within the vicinity of the site is currently provided by OC Transpo Peak Hour Route #177 along Jockvale Road, and #175 and 186 along Longfields Drive. The Transitway terminus and turnaround has stops for Regular Routes 95, 99, 170, 171, 173 and 176, and Peak Hour Routes #175, 177 and 186, providing frequent service in the area. Route #305 travels to North Gower and runs only on Friday.

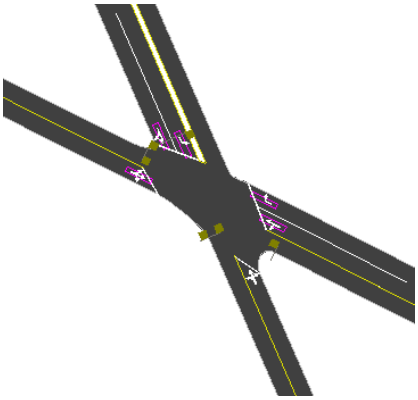
Rapid transit service (in the form of BRT) is provided along the existing Southwest Transitway, and in the future, will be located along Chapman Mills Drive and Greenbank Road.

Figure 3: Area Transit Network

2.4. EXISTING STUDY AREA INTERSECTIONS

Greenbank Road and Jockvale Road

The Greenbank/Jockvale intersection is a signalized four-legged intersection. The north and eastbound approaches consist of a shared left/through/right lane. The westbound approach consists of a single shared left/through lane and a single right-turn lane. The southbound approach consists of a single left-turn lane and a shared through/right-turn lane. All movements are permitted at this location.



2.5. EXISTING INTERSECTION OPERATIONS

Figure 4 illustrates the 2017 existing weekday peak hour traffic volumes and Table 1 summarizes the existing intersection operations at the study area intersections.

The traffic volumes were provided by the City of Ottawa and are included in Appendix A.

The following Table 1 provides a summary of existing traffic operations at study area intersections based on the SYNCHRO (V8) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject intersection as a whole was assessed based on a weighted v/c ratio. The unsignalized intersections will be assessed in terms of delay and the corresponding LoS. The SYNCHRO model output of existing conditions is provided within Appendix B.

Figure 4: Existing Peak Hour Traffic Volumes

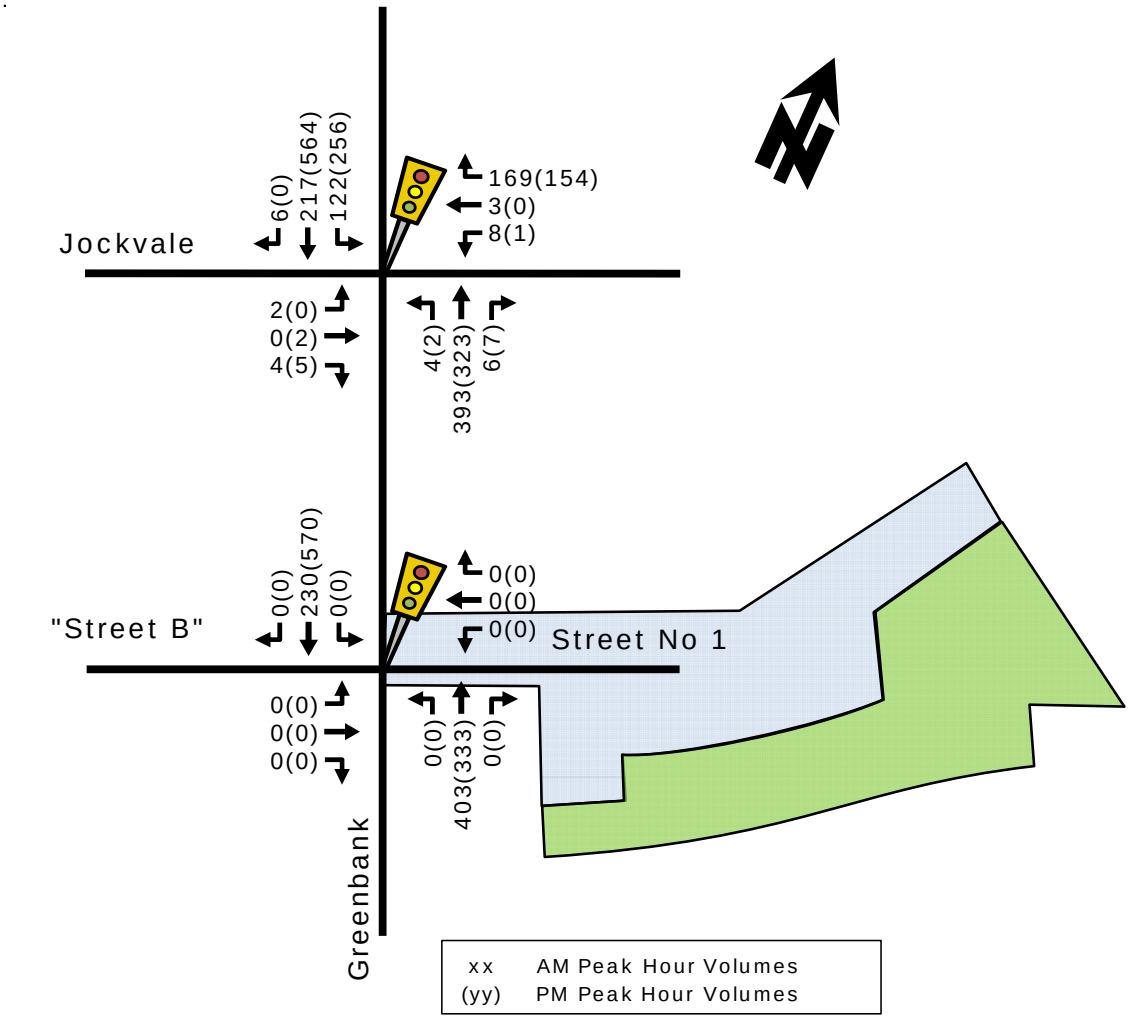


Table 1: Existing Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Greenbank/Jockvale	A (A)	0.48 (0.49)	SBL (SBL)	15.3 (15.5)	A (A)	0.36 (0.38)
Notes: • Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 1, the intersection of Greenbank Road and Jockvale Road currently operates at a LoS 'A' during the weekday peak hours. The southbound left-turn movement is the critical movement during both peak hours and operates at a LoS 'A'.

2.6. EXISTING ROAD SAFETY CONDITIONS

Collision history for study area roads (2013 to 2015, inclusive) was obtained from the City of Ottawa and most collisions (83%) involved only property damage, indicating low impact speeds, and 17% involved personal injuries.

The primary causes of collisions cited by police include; rear end (63%), single vehicle (20%), and angled and approaching (6% each) type collisions.

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

- 1.46/MEV along Greenbank Road between Jockvale Road and the Jock River; and
- 1.44/MEV at the Greenbank Road/Jockvale Road intersection.

The road segment of Greenbank Road, between Jockvale Road and the Jock River has experienced six accidents involving rear end collisions and six single vehicle accidents during the 3-year review period. The single vehicle accidents are driver error due to Greenbank Road being predominantly straight and relatively flat grade through the segment. The six read end accidents have all occurred in the southbound direction, likely due to turning movements or stopping at St. Joseph High School.

At the Greenbank Road and Jockvale Road intersection 11 of the 16 rear end accidents occur on the westbound approach, with the remaining 5 accidents split between the north, south and eastbound approaches. Only one of the rear end accidents involved a car making a left-turn, with the remaining either stopped or making a right-turn. With over 90% of the traffic on the westbound approach making the right-turn movement, it is expected that this would be the primary location for accidents at the intersection. Although it is understood that this intersection will be decommissioned once Chapman Mills Drive is extended, the City may want to consider additional warning signage along Jockvale Road, of a physical treatment, such as skid resistant asphalt for the interim safety improvement of this intersection.

The source collision data as provided by the City of Ottawa and related analysis is provided as Appendix C.

3. DEMAND FORECASTING

3.1. PLANNED STUDY AREA TRANSPORTATION NETWORK CHANGES

3.1.1. GREENBANK ROAD

The Greenbank Road Class Environmental Assessment Study was completed in 2006 to widen Greenbank Road to 4-lanes from Malvern Drive to Cambrian Road. Centre bus rapid transit lanes were included from Chapman Mills Drive south, as an extension of Southwest Transitway. South of Chapman Mills Drive, the re-alignment will swing west to cross the Jock River and loop around Mattamy's Half Moon Bay to connect to Cambrian Road. The right-of-way typical cross-section will likely include 2.0m wide concrete sidewalk on either side of the roadway, 2.0m cycle track/lane in each direction, two 3.5m travel lanes in each direction, 4.5m landscaped median, and 4.0m transit lane in each direction.

It has been indicated by the City that while originally anticipated to be constructed as a 2-lane roadway, during Phase 1 of the City's TMP Affordable Network (2013-2019), focus and funding have been shifted to the widening of Strandherd Drive. As such, it is not expected that Greenbank Road will be re-aligned or widened within the build-out horizons of this study and was agreed upon by City Staff during the pre-consultation meeting to exclude it from the future road network analysis.

3.1.2. CHAPMAN MILLS

The Chapman Mills Extension and Bus Rapid Transit Environmental Assessment Study was completed at the end of 2016, identifying the extension of the Chapman Mills Drive corridor from Longfields Drive through to Strandherd Drive, and the bus rapid transit corridor from the Southwest Transitway to Borrisokane Road. The right-of-way includes a typical cross-section of 2.8m wide concrete sidewalk on either side of the roadway, 2.0m cycle track in each direction, 1.2m boulevard, 2.5m parking lane in each direction, 3.5m travel lane in each direction, 4.5m landscaped median, and 4.0m transit lane in each direction.

While the corridor is scheduled within the City's TMP Affordable Network for Phase 2 (2020-2025), the design and construction is subject to budgetary constraints and will potentially be constructed by the adjacent developers prior to the City's planned initiation. As these developments are unknown at this time, it was agreed upon during pre-consultation with City Staff that Chapman Mills would not be included in the future conditions of this study.

3.2. OTHER AREA DEVELOPMENT

3.2.1. CHOICE REALTY – 3201 GREENBANK ROAD

Within the Chapman Mills Marketplace, Choice Realty is currently proposing a retail expansion on the southeastern quadrant of the Greenbank Road and marketplace Avenue intersection, including 8,500 sq. ft. of retail and 8,449 sq. ft. of restaurant space. The anticipated traffic impact south of the site, towards the Greenbank Road and Jockvale Road intersection, is less than 10 vehicles, with majority assumed to be pass-by traffic.

3.2.2. NEPEAN TOWN CENTRE DEVELOPMENT CORP. (NTCDC)

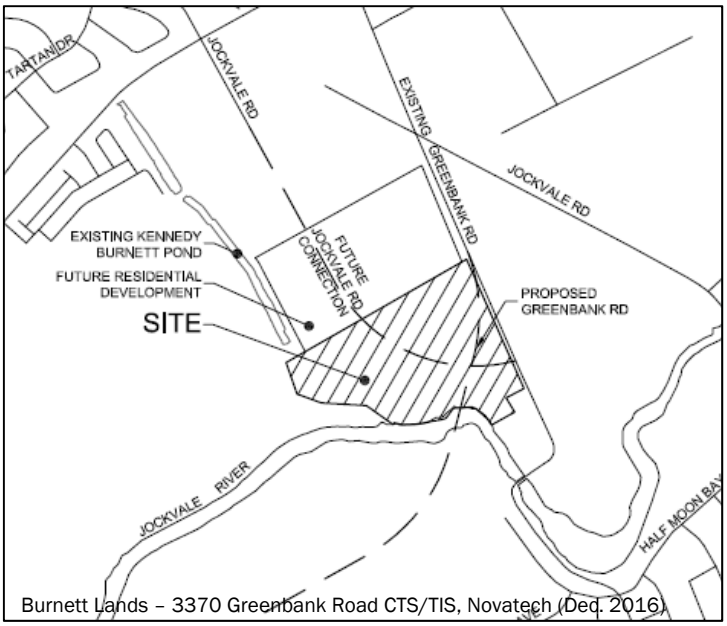
The NTCDC site is located at 3288 Greenbank Road and has recently undergone an official plan amendment to allow an increase in development density and changes to the road network plan proposed within the South Nepean Town Centre CDP. The 12.75-hectare site is bounded by Greenbank Road on the east, future Chapman Mills Drive on the north, the Kennedy-Burnett SWM Facility to the west and Claridge's Burnett lands (see Section 3.2.3) to the south. In total, the site concept includes 482 mid-rise mixed use units, 343 high-rise mixed use units, and 496 mid-rise residential units.

3.2.3. BURNETT LANDS – 3370 GREENBANK ROAD (CLARIDGE)

The plan of subdivision and official plan amendment have been submitted for 3370 Greenbank Road, located west of Greenbank Road and north of the Jock River. The development is proposed to include 247 townhomes and 420 condominium units. Ultimately the re-aligned Greenbank Road will bisect the development, but in the interim, the proposed access locations will connect to existing Greenbank Road south of Jockvale Road and opposite Minto's site Street No. 1 access. The anticipated build out of the Burnett Lands is 2020 for Phase 1 (177 townhomes), and 2020 for Phases 2 and 3 (70 townhomes and 720 condominiums).

Figure 5 illustrates the area context plan for the Burnett Lands.

Figure 5: Claridge Burnett Lands Area Context



Burnett Lands – 3370 Greenbank Road CTS/TIS, Novatech (Dec. 2016)

As discussed previously, the re-alignment of Greenbank Road will not proceed within Phase 1 of Ottawa's TMP Affordable Network. This may impact the viability of the proposed build-out phases, access locations, and road improvements required to support the development. As such, the forecasted development volumes and required transportation network improvements have not been included in the subsequent analysis in this study.

It is acknowledged that NTCDC and Minto's 3311 Greenbank Road development sites have been included in the background projections of the CTS/TIS (Dec. 2016) submitted to the City and the recommendations for the intersection configurations along re-aligned Greenbank Road remain valid.

3.3. BACKGROUND TRAFFIC GROWTH

Table 2 summarizes the historic growth along Greenbank Road.

The background traffic growth along Greenbank Road was calculated based on historical count data (years 2006, 2012, and 2016) provided by the City of Ottawa at the Greenbank Road and Jockvale Road intersection.

Table 2: Greenbank Road Historic Growth (2006 – 2016)

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	0.28%	9.10%	-8.74%	-6.28%	**1.65%**
AM Peak	-2.89%	2.14%	-9.06%	-47.75%	**-2.07%**
PM Peak	2.25%	10.64%	-9.12%	-8.43%	**2.88%**

As shown above, Jockvale Road has experienced a significant decline in traffic, likely due to the construction of Longfields Drive and a shift to Greenbank Road given the decreased connectivity of Jockvale Road. Given the summary above, a 2% background traffic growth rate was applied to the north and southbound volumes along Greenbank Road and 0% traffic growth applied along Jockvale Road, to account for the continued background development south of the Jock River. The background traffic growth and analysis is provided within Appendix D.

Figure 6 illustrates the background traffic projections and Table 3 summarizes the intersection operations for the 2020 horizon year (when the site is expected to be fully built).

Figure 7 illustrates the background traffic projections and Table 4 summarizes the intersection operations for the 2025 horizon year (5-years beyond full build-out).

Figure 6: Projected 2020 Baseline Traffic Volumes

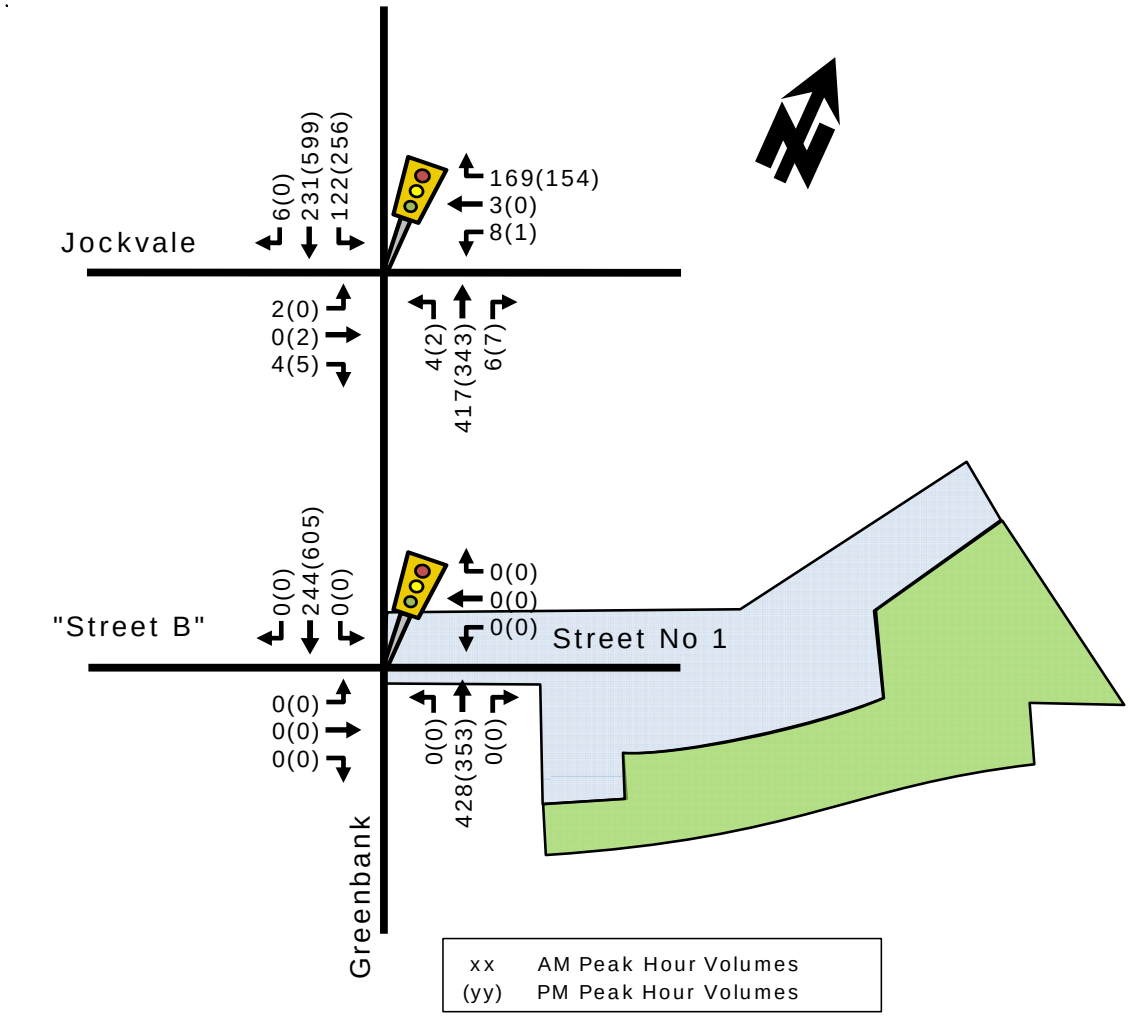


Table 3: Projected Background 2020 Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Greenbank/Jockvale	A (A)	0.59 (0.60)	SBL (SBL)	17.6 (18.0)	A (A)	0.42 (0.44)
Notes: • Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 3, the intersection of Greenbank Road and Jockvale Road is anticipated to operate at a similar LoS as the existing conditions in 2020.

Figure 7: Projected 2025 Baseline Traffic Volumes

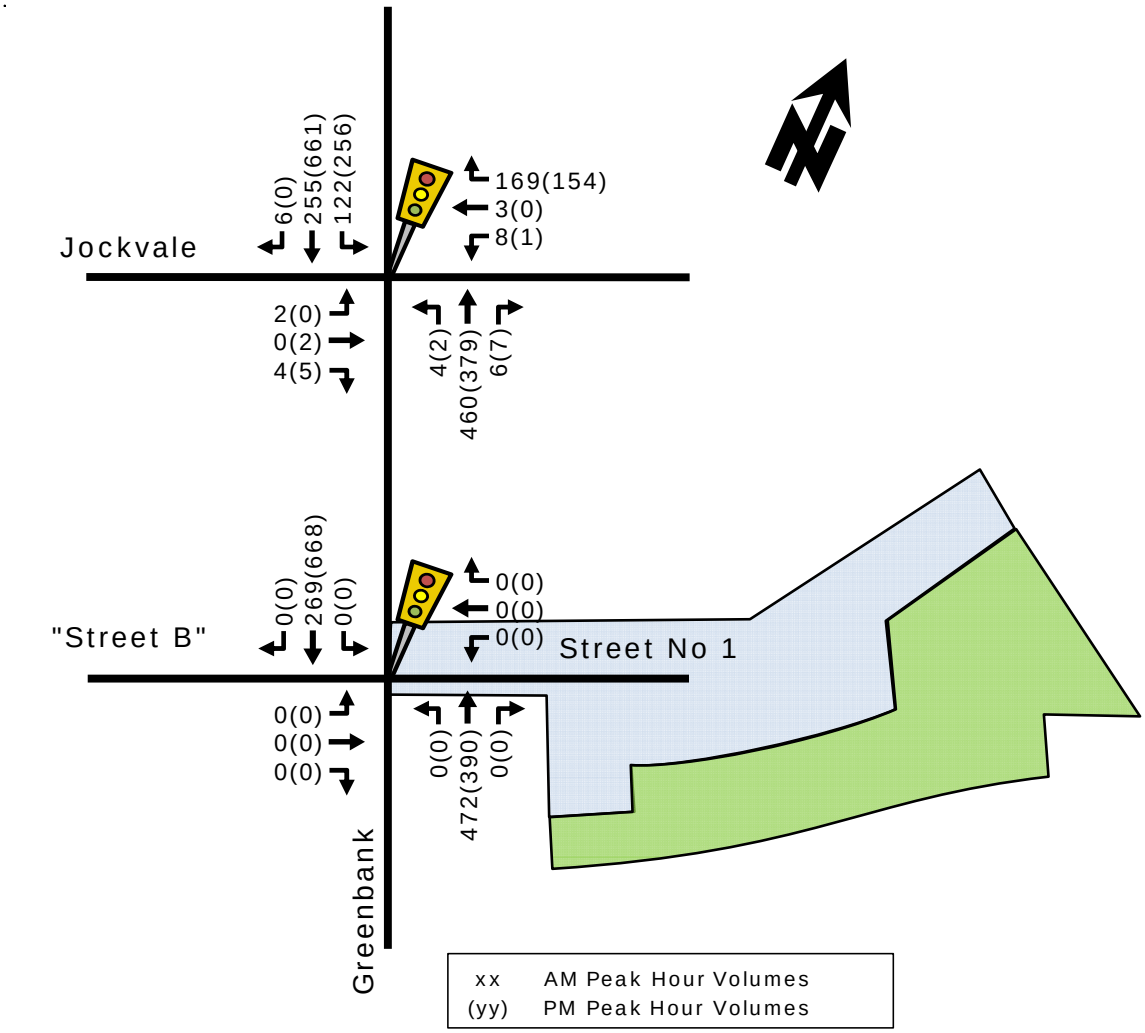


Table 4: Projected Background 2025 Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Greenbank/Jockvale	A (A)	0.48 (0.60)	SBL (SBL)	14.6 (17.7)	A (A)	0.41 (0.47)
Notes: • Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 4, the intersection of Greenbank Road and Jockvale Road is anticipated to operate at a similar LoS as the existing conditions and 2020 background conditions.

The SYNCHRO model output of the background conditions is provided within Appendix E.

3.4. SITE TRIP GENERATION

The trip generation rates for the proposed development consisting of 146 residential townhomes and 108 low-rise condominium units were obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, which are summarized in Table 5.

It is noted that, while the low-rise condo units within the City owned parcel adjacent to Jockvale Road and Longfields Road my not proceed until Jockvale Road is decommissioned, a conservative approach was taken to estimating the traffic utilizing the Greenbank Road/Street No. 1 intersection within this study.

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development. This approach is considered appropriate within the industry for infill developments in proximity to high quality transportation infrastructure.

Table 5: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
Executive Townhomes	ITE 230	T = 0.44(du); Ln(T) = 0.80 ln(du) + 0.26	T = 0.52(du); Ln(T) = 0.82 ln(du) + 0.32
Low-Rise Condo	ITE 231	T = 0.67(du); T = 0.88(du) – 49.7	T = 0.78(du); N/A
Notes: T = Average Vehicle Trip Ends du = dwelling units			

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. As such, the person trip generation for the proposed site is summarized in Table 6.

Table 6: Modified Person Trip Generation

Land Use	Area	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Townhomes (Minto)	146 du	15	76	91	71	36	107
Low-Rise Condo (City)	108 du	14	45	59	63	47	110
Total Person Trips		**29**	**121**	**150**	**134**	**83**	**217**
Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%							

The person trips shown in Table 6 for the proposed site were then reduced by modal share values based on the site's location and proximity to adjacent communities, employment, other shopping uses and transit availability. Modal share values for townhomes and condominium land uses within the proposed development are summarized in Table 7 and Table 8, with the total site-generated vehicle traffic summarized in Table 9.

Table 7: Minto Townhome Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	55%	9	42	51	40	20	60
Auto Passenger	20%	3	16	19	14	8	22
Transit	15%	2	11	13	10	5	15
Non-motorized	10%	1	7	8	7	3	10
Total Person Trips	100%	15	76	91	71	36	107
Total 'New' Auto Trips		**9**	**42**	**51**	**40**	**20**	**60**

Table 8: City Low-Rise Condominium Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	55%	8	25	33	35	26	61
Auto Passenger	20%	3	9	12	13	10	23
Transit	15%	2	7	9	9	7	16
Non-motorized	10%	1	4	5	6	4	10
Total Person Trips	100%	14	45	59	63	47	110
Total 'New' Auto Trips		**8**	**25**	**33**	**35**	**26**	**61**

Table 9: Total Site Vehicle Trip Generation

Land Use	AM Peak (veh/h)			PM Peak (veh/h)		
	In	Out	Total	In	Out	Total
Townhomes	9	42	51	40	20	60
Low-Rise Condos	8	25	33	35	26	61
Total 'New' Auto Trips	**17**	**67**	**84**	**75**	**46**	**121**

As shown in Table 9, the resulting number of potential 'new' two-way vehicle trips for the proposed development is approximately 84 and 121 veh/h during the weekday morning and afternoon peak hours, respectively.

3.5. VEHICLE TRAFFIC DISTRIBUTION AND ASSIGNMENT

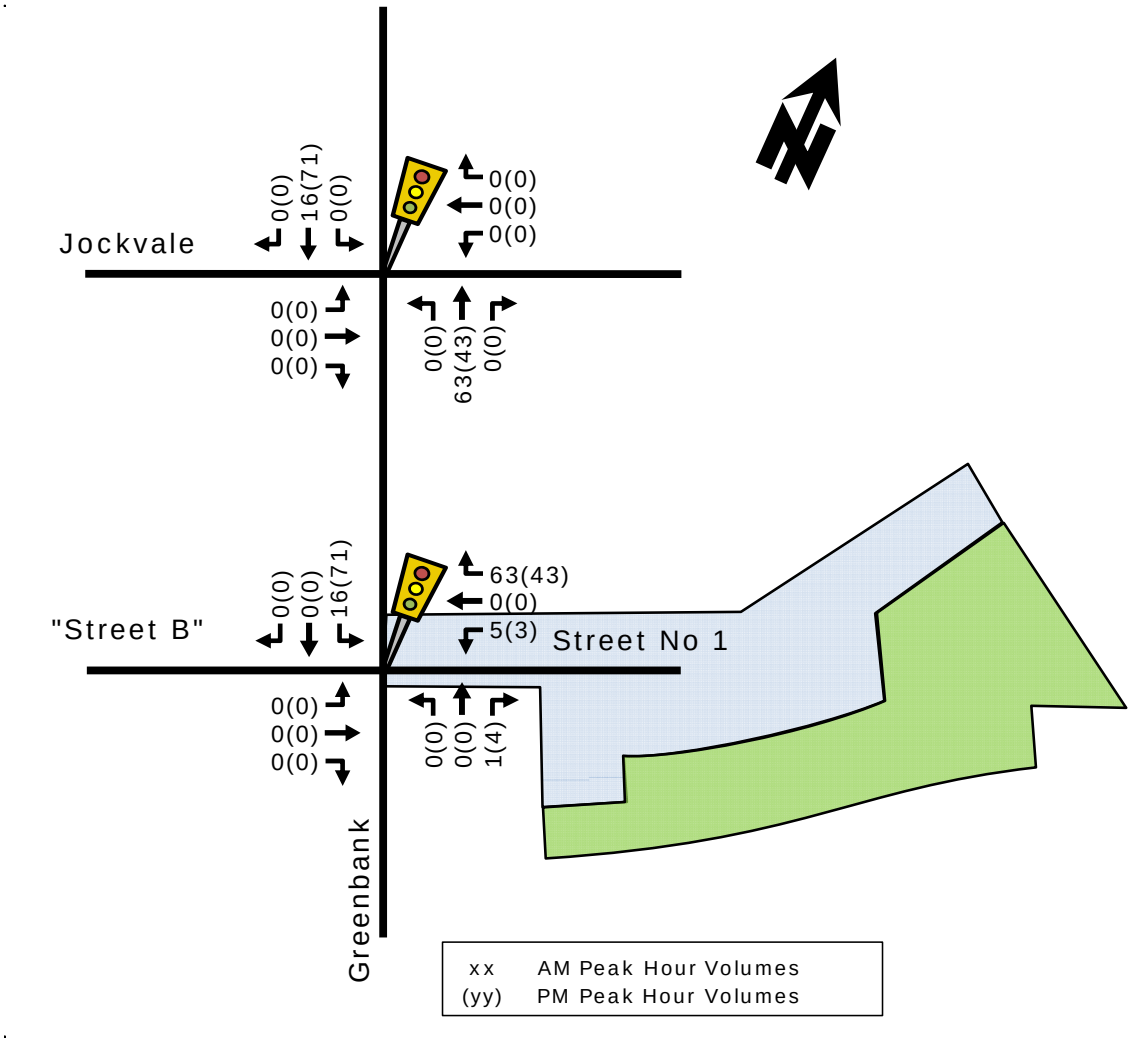
Traffic distribution was based on the different types of land uses, existing volume splits at study area intersections and our knowledge of the surrounding area. The resultant distribution is outlined as follows.

- 6% to/from the south via Greenbank Road
- 94% to/from the north via Greenbank Road

100%

Based on this distribution, 'new' site-generated trips were assigned to study area intersections, which are illustrated in Figure 8.

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 9: Total Projected 2020 Peak Hour Traffic Volumes

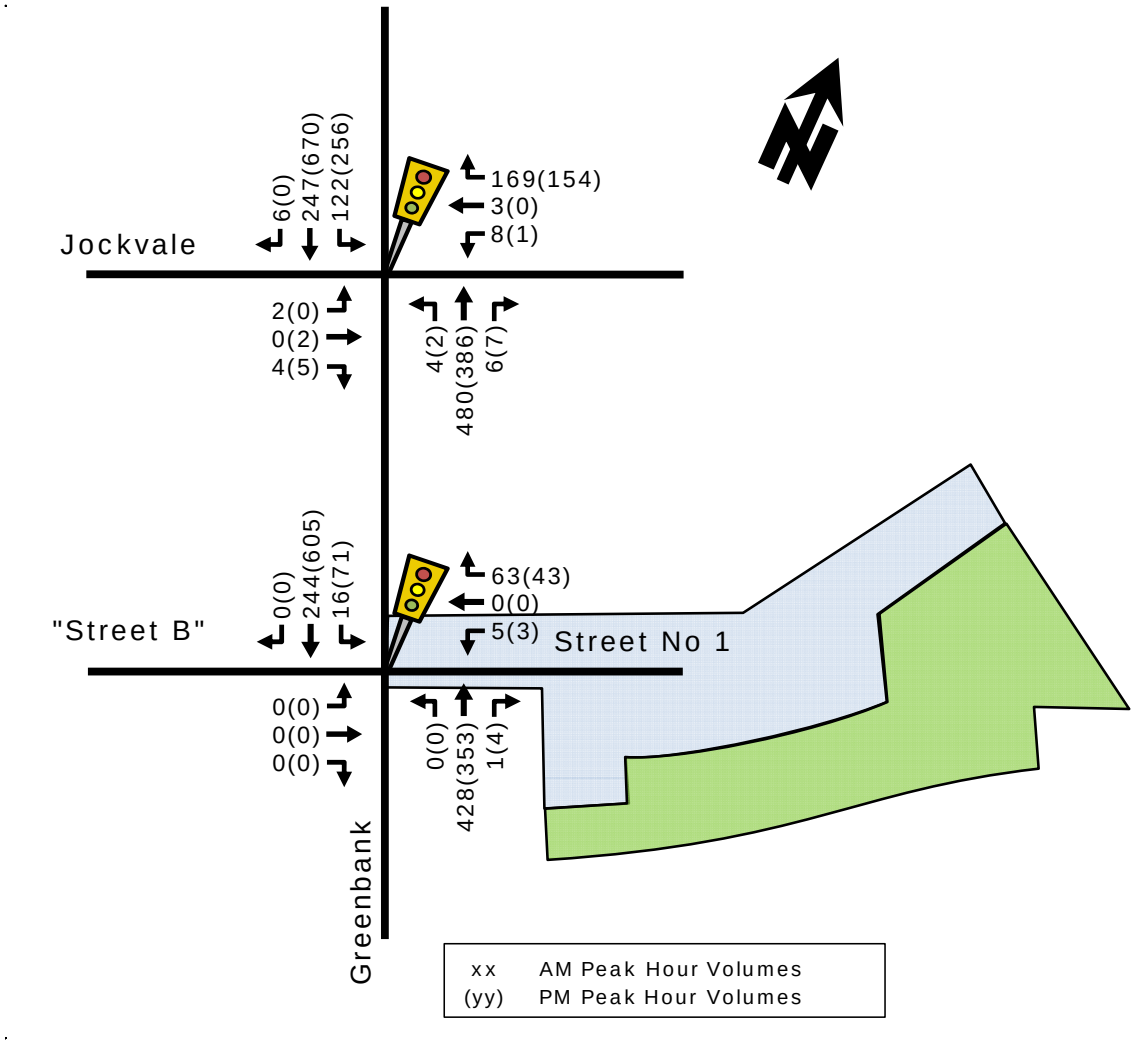


Table 10: Projected Performance of 2020 Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Greenbank/Jockvale	A (C)	0.59 (0.75)	SBL (SBL)	17.3 (16.3)	A (A)	0.47 (0.56)
Greenbank/Street No. 1	B (B)	12.0 (11.8)	WB (WB)	1.3 (1.5)	A (A)	-
Notes: • Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 10, the intersection of Greenbank Road and Jockvale Road is anticipated to operate with similar conditions as the 2020 background conditions during the AM peak and the LoS will decrease to a 'C' during the PM peak. At the site access, Street No. 1 and Greenbank Road, the westbound approach will operate at a LoS 'B' during the peak hours and the overall intersection will operate at a LoS 'A'.

While the intersection does not warrant signalization, the warrant for a southbound left-turn lane is triggered during the PM peak. The storage length required is approximately 18m and a taper length of 35m (10:1 ratio) to meet TAC minimums for an unsignalized intersection. The St. Joseph High School driveway is approximately 65m north of the proposed Street No. 1 intersection and, if the minimums are provided, the left-turn lane would begin at or immediately south of the driveway entrance. Depending on the results of the functional design, the ability to meet these minimums

may be limited. Ultimately, this portion of Greenbank Road will become a cul-de-sac when the roadway is re-aligned to the west and would no longer require a left turn lane. Therefore, it is recommended to maintain the existing cross-section of Greenbank Road without the southbound left-turn lane and monitor its operation pose development.

4.2. PROJECTED 2025 CONDITIONS AT FIVE YEARS BEYOND SITE BUILD-OUT

The total projected 2025 volumes associated with the proposed development were derived by superimposing 'new' site-generated volumes (Figure 8) onto projected 2025 baseline traffic volumes (Figure 7). The resulting total projected 2025 volumes are illustrated as Figure 10.

Table 11 provides a projected performance summary for study area intersections, based on total projected 2025 traffic volumes (5-years beyond full site build-out). The detailed SYNCHRO model output of projected conditions is provided within Appendix G.

Figure 10: Total Projected 2025 Peak Hour Traffic Volumes

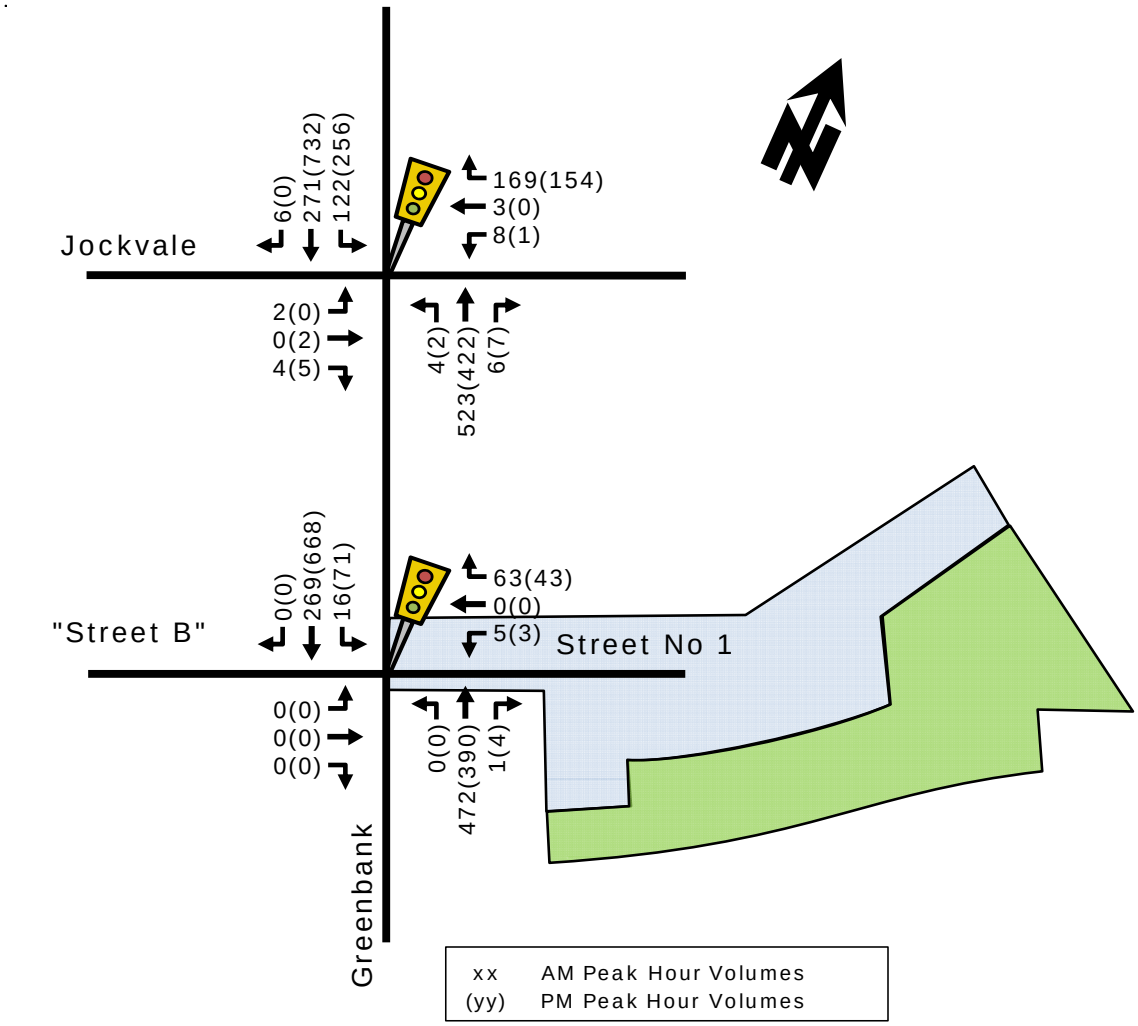


Table 11: Projected Performance of 2025 Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Greenbank/Jockvale	A (C)	0.59 (0.75)	SBL (SBL)	17.1 (16.1)	A (A)	0.50 (0.60)
Greenbank/Street No. 1	B (B)	12.6 (12.4)	WB (WB)	1.2 (1.6)	A (A)	-
Notes: • Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 11, the study area intersections are anticipated to operate at similar LoS as the 2020 total horizon and do not require any additional improvements.

4.3. NEIGHBOURHOOD IMPACTS

Based on the location of the proposed development, a single connection to Greenbank Road is provided for general traffic and a secondary access to Jockvale Road will be made for emergency access. No site generated traffic will connect through local roads as the collector road, Street No. 1, and the future collector road immediately south of the site, provide a high level of connectivity to the adjacent arterial road network. Overall the proposed development is projected to generate 1 new vehicle every 0.5 to 0.75 minutes (on average) on Greenbank Road.

With respect to neighbourhood transit, the site is projected to generate an approximate total of 24 and 35 'new' two-way person transit trips during the weekday morning and afternoon peak hours, respectively. This amount of person traffic can be easily accommodated by the nearby rapid transit station, whether within the Chapman Mills Marketplace, Strandherd Park & Ride, or Chapman Mills BRT.

5. TRANSPORTATION DEMAND MANAGEMENT

Depending on the nature of a development, Transportation Demand Management (TDM) strategies have the potential to be an integral part of a planned development to address and support the City's policies regarding TDM. For this particular site, its proximity to the existing transit service is considered advantageous in lessening the reliance on the private automobile. Several other TDM measures could also be considered, including:

- Improving the quality and safety of pedestrian facilities, such as enhanced sidewalks/lighting;
- Promote transit passes and park & ride options within the Nepean Town Centre and Barrhaven; and
- Promote appropriate car sharing programs/facilities to reduce auto ownership and attract residents who do not own a vehicle.

TDM strategies are important in encouraging active modes of transportation to/from the site, further lessening the reliance on the private automobile.

6. SITE PLAN REVIEW

This section provides an overview of site access, internal roadways, active mode circulation, parking, and traffic calming.

Site Access

Based on the projected volumes and projected operation of the Greenbank Road and Street No. 1, a minor street stop-control is recommended. No auxiliary lanes are recommended along Street No. 1.

The left-turn lane warrant is triggered at full build out of the site, townhomes and low-rise condo units in the southbound direction along Greenbank Road. A storage length of 18m and taper of 35m is required to meet TAC minimums. The proximity to the St. Joseph High School driveway may limit the extent to which these minimums can be met. In addition,

the re-alignment of Greenbank Road will ultimately remove the need for the left-turn lane as the existing Greenbank Road will become a cul-de-sac south of the subject site. Therefore, it is recommended to maintain the existing cross-section of Greenbank Road without the southbound left-turn lane and monitor its operation pose development.

Internal Roadways

The typical cross-section for residential roads outlined within the South Nepean Town Centre CDP states the need for a 20.0m right-of-way including 4.0m streetscape space with sidewalks on both sides of the road, two 2.5m parking lanes, and two 3.25m travel lanes. As part of the City's ongoing right-of-way standard review, a 22.0m right-of-way has been estimated to be the minimum required to support sidewalks on both sides. Currently, only the 16.5m and 18.0m cross-sections have been approved. Theses cross-sections require a four-party trench to support a sidewalk on one side of the roadway. As such, the CDP policy may not be applicable moving forward.

Given the ambiguity of the CDP policy and current City review of typical road cross-sections, this presents the opportunity to review the road cross-section required to meet the CDP goals. The following excerpts outline the philosophy and form of the road network within the CDP:

- Section 2.5 Goal 2 – High Quality Urban Design – *"(4) To develop attractive streetscapes during the design of the public realm, built form, streetscapes and other public areas."*
- Section 2.5 Goal 5 – Efficient Transportation System – *"(2) To develop a grid of continuous and interconnected arterial, collector and local streets and laneways facilitating efficient movement by all modes of transportation."*
- Section 2.5 Goal 5 – Efficient Transportation System – *"(3) To develop a pedestrian-friendly, tree-lined, and bicycle friendly system of streets that is well connected to public facilities, parks, commercial areas and surrounding communities."*
- Section.2.2 Streetscape – *"Build sidewalks that are at least 2.0 metres on all streets…"*

To meet the CDP policy goals and align with recent planning policies, such as Building Better Smarter Suburbs, revised right-of-ways and pavement widths are proposed.

Table 12 summarizes the proposed street classification, right-of-way (ROW), and pavement width for the road network within the subject site.

Table 12: Internal Roadway Classification

Street	Classification	ROW	Proposed Pavement Width
Street No. 1	Collector	20m	9.0m
Street No. 2	Local	18m	8.5m
Street No. 3			
Street No. 4			
Street No. 5			
Street No. 6	Local	20m	9.0m

Street No. 1 and 6 match the proposed CDP right-of-way but a reduction in the pavement width is proposed to include two 3.25m travel lanes and one 2.5m parking lane. The remaining right-of-way space may be used for trees and streetscaping along both sides of the road. For Streets No. 2–5, the pavement width is proposed to be reduced to 8.5m, including two 4.25m travel lanes and the remaining space be dedicated to trees and streetscaping in the boulevards.

The recommended changes will continue to provide a highly connected network transitioning from the local roads, to the Street No.1 serving as the primary collector, to the arterial road network on Greenbank and Longfields.

Parking

On-street parking is anticipated to be available throughout the subject site, with dedicated parking lanes proposed on the south side to Street No. 1 and 6. The south side parking location for both roads has been proposed to reduce driveway

conflicts of residential units fronting onto the roads, and buffer pedestrian facilities from the roadway. It is estimated that approximately 40 cars (280m) can be accommodated along Street No. 1 and approximately 50 cars (380m) can be accommodated along Street No. 6.

The local roads, Streets No. 2–5 will provide the opportunity for parking on one side of the road, although the driveway spacing will allow approximately three cars per side of the road.

Sidewalks

Figure 11 illustrates the pedestrian and cycling connectivity for the proposed site.

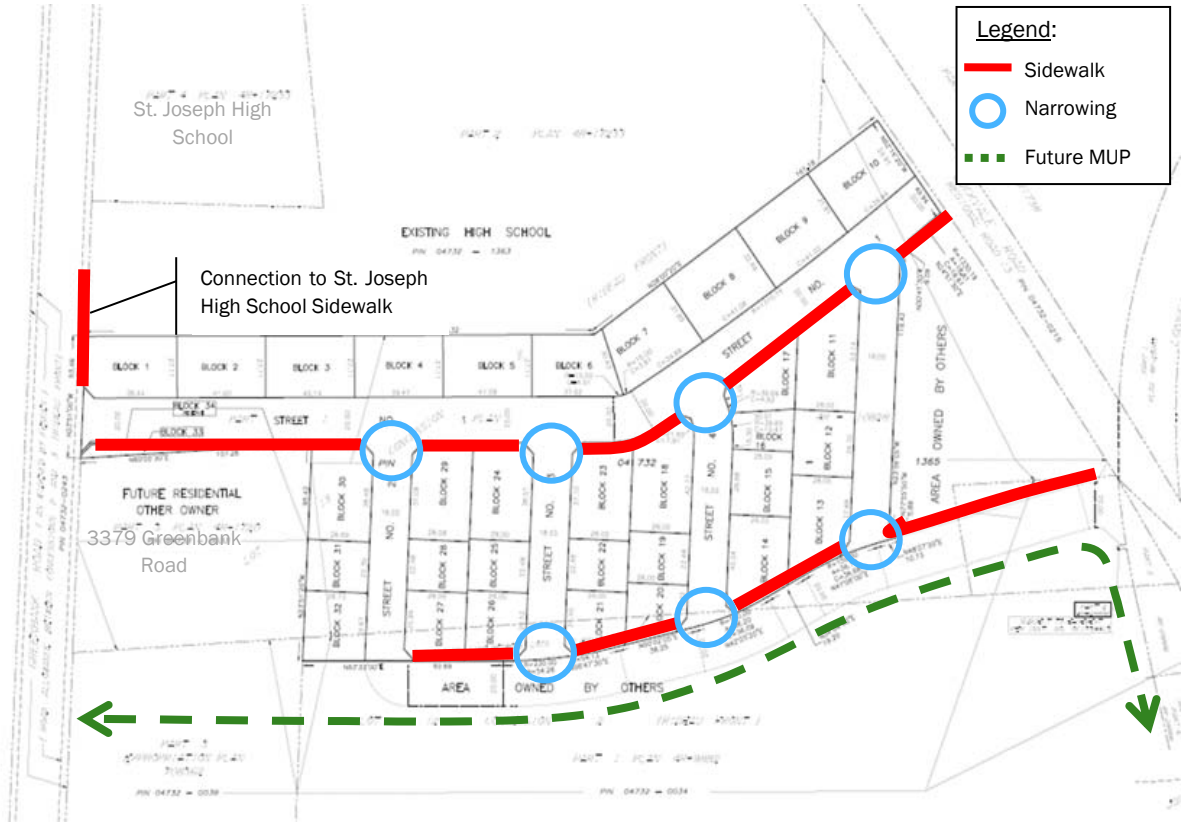
Sidewalks are proposed along the south side of Street No. 1 and from the intersection at Greenbank Road to the sidewalk provided along the frontage of St. Joseph High School. The placement of the sidewalk along the south side of Street No. 1 is proposed to avoid conflicts with driveways, approximately 45% of the frontage, and allow use of the driveways without potential increases the setback requirements.

No sidewalks are proposed along Streets No. 2–5 to avoid driveway conflicts and short block lengths do not pose a barrier for to adjacent pedestrian facilities. The low speeds and volumes anticipated along each of these roads do not pose a safety concern and the short block length is approximately 90–110m in total will provide the connectivity for residents on the local roads.

Street No. 6 is proposed to include a sidewalk along the north side to provide balance along the corridor with the City's future multi-use pathway through the Jock River greenspace.

Traffic calming features are also proposed in conjunction with the sidewalk network.

Figure 11: Pedestrian and Cycling Connectivity Plan



Cycling

No dedicated cycling facilities are proposed within the development, conforming with the South Nepean Town Centre CDP, and remain as shared space within the proposed roadways. Future facilities, in the form of a multi-use pathway, will be provided by the City along Street No. 6 as illustrated in Figure 11.

Traffic Calming

The inclusion of passive traffic calming features within new developments is currently being incorporated into the City's policy and guidelines. The curvilinear nature of Street No. 1 and 6 do not lend themselves to the implementation of passive calming features along the street. Given this, it is recommended that narrowings can be included on Street No. 2–5 at the connections to Street No. 1 and 6 to reduce the pedestrian crossing distance and limit turning speeds within the development. The reduced pavement width at these narrowings is recommended to be 7.0m.

7. FINDINGS AND RECOMMENDATIONS

Based on the foregoing analysis of the proposed development, the following transportation-related conclusions are offered:

EXISTING CONDITIONS

- The study area intersections adjacent to the site are currently operating 'as a whole' with an overall LoS 'A' during the weekday morning and afternoon peak hours.
- With regard to 'critical movements' at study area intersections, they are noted as operating at an acceptable LoS 'A' during the peak hours.
- Based on the available data, safety issues have been noted on the westbound approach of Jockvale Road at the intersection with Greenbank Road. The proposed development is not anticipated to exacerbate this issue and the City may wish to investigate this issue further, prior to infrastructure improvements (e.g. the closure of Jockvale Road) eliminate this concern.

PROJECTED CONDITIONS

- Based on historic counts along Greenbank Road, the study area has experienced a decrease in overall growth in during the AM peak and an increase during the PM peak. However, to account for local area development within the vicinity of the site, a 2% annual growth rate was assumed during both peak hours.
- The proposed development is projected to generate 'new' two-way vehicle volumes of approximately 84 and 121 veh/h during the weekday morning and afternoon peak hours, respectively.
- Given the background traffic volumes, no mitigative measures along Greenbank Road and at the Jockvale Road intersection are recommended.
- At full occupancy (year 2020), the study area intersections 'as a whole' are projected to operate at an acceptable LoS 'A' during both peak hours.
- At full occupancy (year 2020), the 'critical movements' at the study area intersections are projected to operate at an acceptable LoS 'C' or better during both peak hours.
- At 5-years beyond site build-out (2025), study area intersections 'as a whole' are projected to operate at an acceptable LoS 'A' during both peak hours.
- At 5-years beyond site build-out (2025), the 'critical movements' at the study area intersections are projected to operate at an acceptable LoS 'C' or better during both peak hours.

SITE PLAN

- Traffic signal control is not warranted at the proposed intersection of Street No. 1 and Greenbank Road, based on projected volumes and anticipated operations.
- Sidewalks will be provided along the south side of Street No. 1 and a connection along Greenbank Road will be provided to the St. Joseph High School sidewalks.

- Curb narrowings/bulb-outs should be provided at Street Nos. 2, 3 and 4 to reduce pedestrian crossing distance and reduce turning speeds to and from Street No. 1 and Street No. 6.

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

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Reviewed By:

Christopher Gordon, P.Eng.
Senior Project Manager

Appendix A

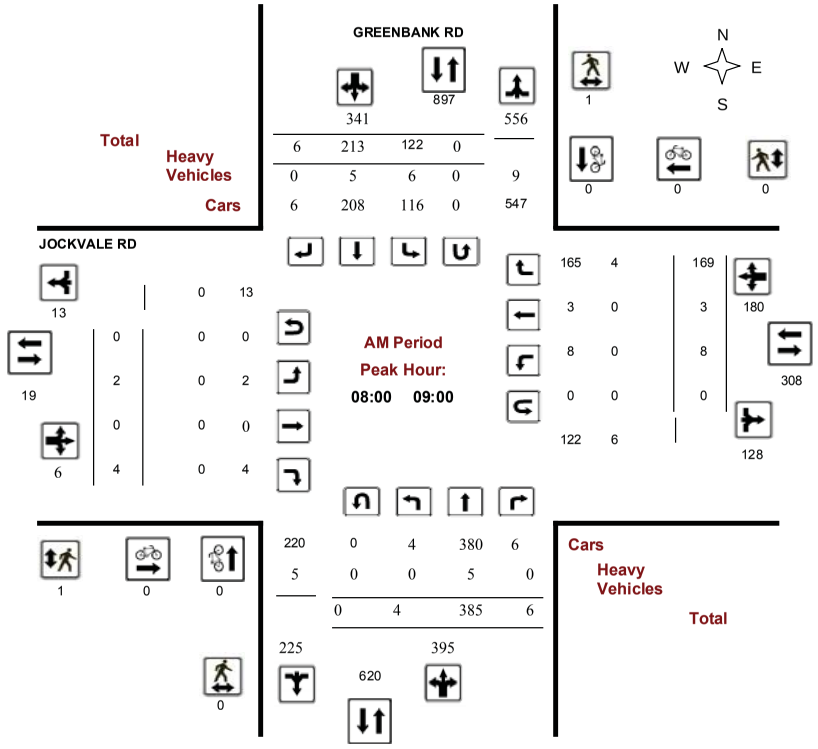
Transportation Services - Traffic Services

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

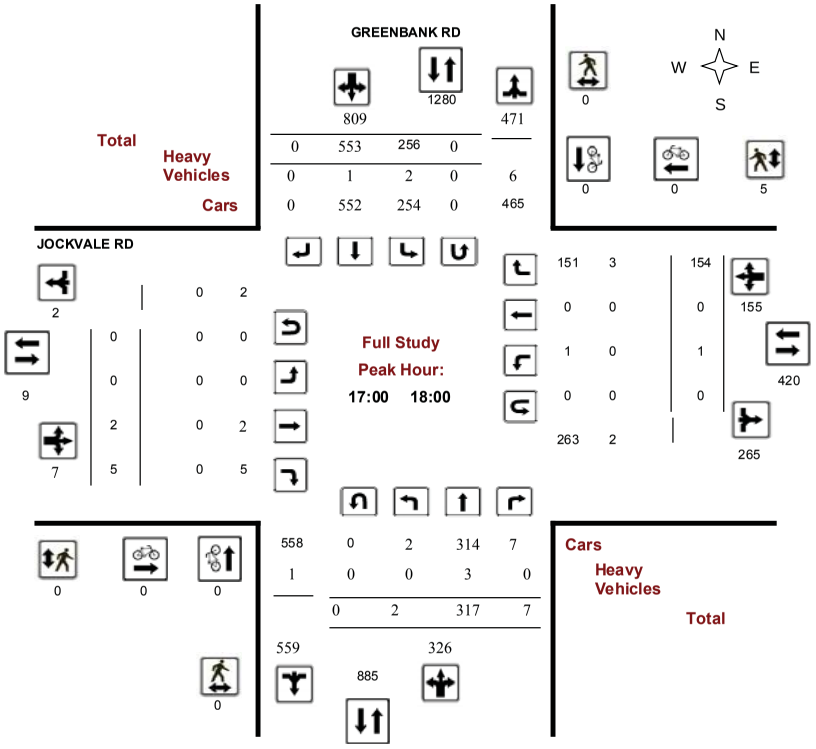
Transportation Services - Traffic Services

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

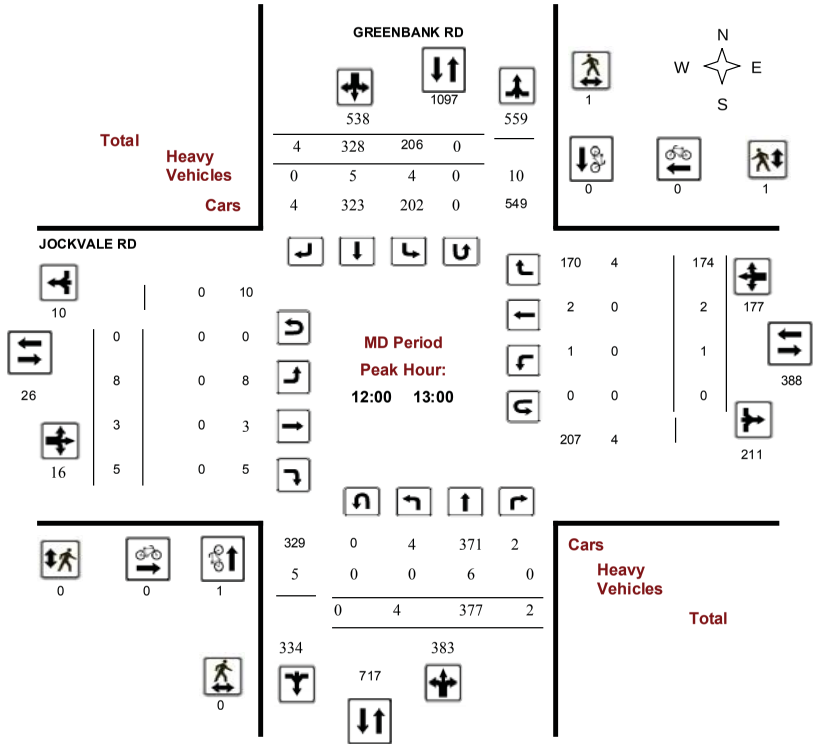
Transportation Services - Traffic Services

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



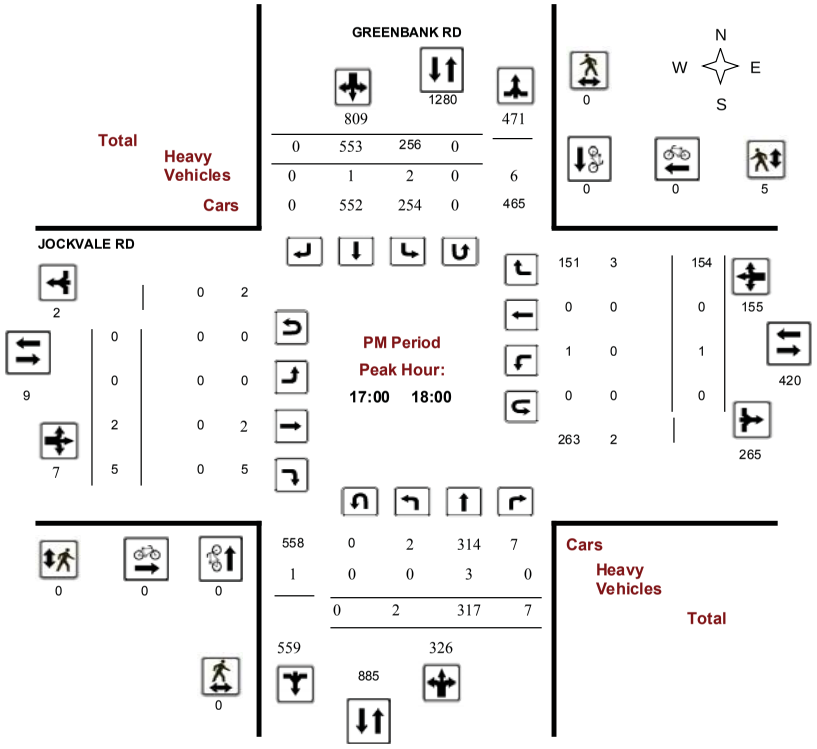
Transportation Services - Traffic Services

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



Transportation Services - Traffic Services

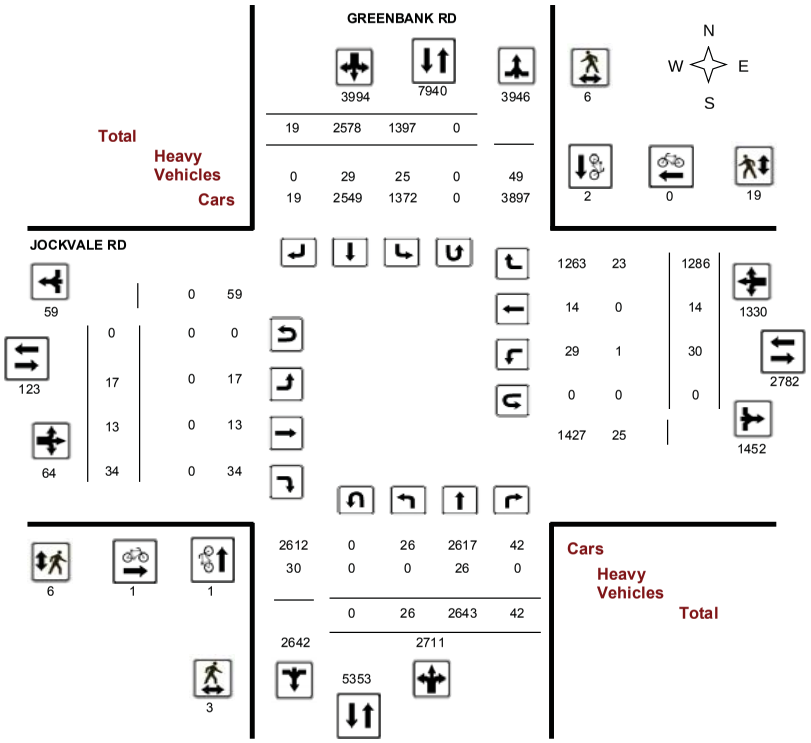
Turning Movement Count - Full Study Diagram

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

Appendix B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	393	6	122	217	6
Future Volume (vph)	2	0	4	8	3	169	4	393	6	122	217	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1722	1517		1780		1695	1777	
Flt Permitted		0.88			0.89	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1436			1581	1517		1777		1695	1777	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	0	4	8	3	178	4	414	6	128	228	6
RTOR Reduction (vph)	0	6	0	0	0	142	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	11	36	0	424	0	128	234	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Effective Green, g (s)		3.9			3.9	20.5		68.2		15.9	88.1	
Actuated g/C Ratio		0.04			0.04	0.20		0.68		0.16	0.88	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		56			61	310		1211		269	1565	
v/s Ratio Prot						0.02				c0.08	0.13	
v/s Ratio Perm		0.00			c0.01	0.01		c0.24				
v/c Ratio		0.00			0.18	0.12		0.35		0.48	0.15	
Uniform Delay, d1		46.2			46.5	32.4		6.6		38.3	0.8	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.0			1.4	0.2		0.8		1.3	0.2	
Delay (s)		46.2			47.9	32.6		7.4		39.6	1.0	
Level of Service		D			D	C		A		D	A	
Approach Delay (s)		46.2			33.4			7.4			14.7	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	393	6	122	217	6
Future Volume (vph)	2	0	4	8	3	169	4	393	6	122	217	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1720	1517		1780		1695	1777	
Flt Permitted		0.88			0.88	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1436			1561	1517		1777		1695	1777	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	0	4	9	3	184	4	427	7	133	236	7
RTOR Reduction (vph)	0	6	0	0	0	142	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	12	42	0	438	0	133	243	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.6			1.6	14.7		64.7		13.1	84.9	
Effective Green, g (s)		4.0			4.0	20.9		67.8		16.2	88.0	
Actuated g/C Ratio		0.04			0.04	0.21		0.68		0.16	0.88	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		57			62	317		1204		274	1563	
v/s Ratio Prot						0.02				c0.08	0.14	
v/s Ratio Perm		0.00			c0.01	0.01		c0.25				
v/c Ratio		0.00			0.19	0.13		0.36		0.49	0.16	
Uniform Delay, d1		46.1			46.4	32.2		6.9		38.1	0.8	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.0			1.5	0.2		0.9		1.4	0.2	
Delay (s)		46.1			48.0	32.4		7.7		39.5	1.0	
Level of Service		D			D	C		A		D	A	
Approach Delay (s)		46.1			33.3			7.7			14.6	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Appendix C

Total Area

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	18	1	1	1	2	6	0	0	29	83%
Non-fatal injury	4	0	0	1	0	1	0	0	6	17%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**22**	**1**	**1**	**2**	**2**	**7**	**0**	**0**	**35**	100%
	#1 or 63%	#5 or 3%	#5 or 3%	#3 or 6%	#3 or 6%	#2 or 20%	#7 or 0%	#7 or 0%		

GREENBANK RD / GREENBANK RD

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2013-2015	14	8,775	1095	**1.46**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	4	0	0	0	2	5	0	0	11	79%
Non-fatal injury	2	0	0	0	0	1	0	0	3	21%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**6**	**0**	**0**	**0**	**2**	**6**	**0**	**0**	**14**	100%
	43%	0%	0%	0%	14%	43%	0%	0%		

GREENBANK RD / JOCKVALE RD

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2013-2015	21	13,300	1095	**1.44**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	14	1	1	1	0	1	0	0	18	86%
Non-fatal injury	2	0	0	1	0	0	0	0	3	14%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**16**	**1**	**1**	**2**	**0**	**1**	**0**	**0**	**21**	100%
	76%	5%	5%	10%	0%	5%	0%	0%		

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2015

Location: GREENBANK RD @ JOCKVALE RD

Traffic Control: Traffic signal

Total Collisions: 15

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jan-11, Sat,18:30	Clear	SMV other	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Skidding/sliding	
2014-Feb-01, Sat,15:10	Clear	Rear end	P.D. only	Ice	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					North	Stopped	Pick-up truck	Other motor vehicle	
2014-Feb-11, Tue,08:25	Clear	Rear end	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Pick-up truck	Other motor vehicle	
2014-Apr-03, Thu,13:14	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Slowing or stopping	Pick-up truck	Other motor vehicle	
2014-Jul-12, Sat,14:19	Clear	Rear end	P.D. only	Dry	West	Turning right	Pick-up truck	Other motor vehicle	
					West	Turning right	Pick-up truck	Other motor vehicle	
2014-Jul-08, Tue,13:54	Clear	Rear end	P.D. only	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle	
					West	Turning right	Pick-up truck	Other motor vehicle	

2015-Jan-16, Fri,10:00	Clear	Rear end	Non-fatal injury	Packed snow	South	Slowing or stopping	Automobile, station wagon	Skidding/sliding
					South	Slowing or stopping	Pick-up truck	Other motor vehicle
2015-Jul-10, Fri,13:20	Clear	Rear end	P.D. only	Dry	South	Turning left	Passenger van	Other motor vehicle
					South	Turning left	Pick-up truck	Other motor vehicle
2015-Mar-17, Tue,23:57	Clear	Angle	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2015-Apr-16, Thu,20:44	Clear	Sideswipe	P.D. only	Dry	South	Slowing or stopping	Pick-up truck	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jul-26, Sun,13:00	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Delivery van	Other motor vehicle
2015-Feb-21, Sat,15:00	Snow	Rear end	P.D. only	Loose snow	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Turning left	Pick-up truck	Other motor vehicle
2015-Aug-01, Sat,13:34	Clear	Rear end	P.D. only	Dry	West	Turning right	Pick-up truck	Other motor vehicle
					West	Turning right	Automobile, station wagon	Other motor vehicle
2015-Jun-11, Thu,18:52	Clear	Rear end	P.D. only	Dry	West	Turning right	Pick-up truck	Other motor vehicle

					West	Turning right	Pick-up truck	Other motor vehicle	
2015-Dec-21, Mon,09:31	Rain	Rear end	P.D. only	Wet	West	Slowing or stopping	Delivery van	Other motor vehicle	
					West	Stopped	Pick-up truck	Other motor vehicle	

Location: GREENBANK RD btwn JOCKVALE RD & CAMBRIAN RD

Traffic Control: No control **Total Collisions:** 10

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Feb-12, Wed,10:37	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Slowing or stopping	Construction equipment	Other motor vehicle	
2015-Jan-20, Tue,15:12	Clear	Rear end	Non-fatal injury	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	
					South	Stopped	Passenger van	Other motor vehicle	
2014-Sep-26, Fri,14:20	Clear	SMV other	P.D. only	Dry	North	Turning left	Pick-up truck	Ditch	
2014-Dec-12, Fri,08:10	Snow	Rear end	P.D. only	Loose snow	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Turning left	Pick-up truck	Other motor vehicle	
2015-May-07, Thu,07:51	Clear	Rear end	Non-fatal injury	Dry	South	Going ahead	Passenger van	Other motor vehicle	
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2015-Sep-15, Tue,18:27	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Pick-up truck	Other motor vehicle	

					South	Stopped	Pick-up truck	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2015-May-07, Thu,21:33	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild
2015-Jan-17, Sat,08:55	Clear	Approaching	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Skidding/sliding
					North	Going ahead	Pick-up truck	Other motor vehicle
2015-Jan-30, Fri,07:25	Snow	SMV other	Non-fatal injury	Packed snow	North	Going ahead	Pick-up truck	Skidding/sliding
2015-Dec-10, Thu,01:00	Rain	SMV other	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Steel guide rail

Collision Main Detail Summary

OnTRAC Reporting System

FROM: 2013-01-01 TO: 2014-01-01

GREENBANK RD, CAMBRIAN RD to JOCKVALE RD

Former Municipality: **Nepean** Traffic Control: **No control** Number of Collisions: **4**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
1	2013-01-28	Mo	12:18	Snow	Daylight	Single vehicle	P.D. only	V1 N	Packed snow	Going ahead	Automobile, station	Snowbank / drift	0
2	2013-01-31	Thu	21:45	Clear	Dark	Single vehicle	P.D. only	V1 S	Dry	Going ahead	Pick-up truck	Ran off road	0
3	2013-02-27	We	12:34	Snow	Daylight	Approaching	P.D. only	V1 S V2 N	Loose snow Loose snow	Going ahead Going ahead	Pick-up truck Delivery van	Other motor vehicle Other motor vehicle	0
4	2013-05-31	Fri	17:55	Clear	Daylight	Rear end	P.D. only	V1 S V2 S	Dry Dry	Slowing or Turning left	Automobile, station Automobile, station	Other motor vehicle Other motor vehicle	0

GREENBANK RD & JOCKVALE RD

Former Municipality: **Nepean** Traffic Control: **Traffic signal** Number of Collisions: **6**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
5	2013-01-25	Fri	08:16	Clear	Daylight	Rear end	P.D. only	V1 W V2 W	Loose snow Loose snow	Turning right Turning right	Automobile, station Pick-up truck	Other motor vehicle Other motor vehicle	0
6	2013-02-25	Mo	10:15	Clear	Daylight	Rear end	P.D. only	V1 W V2 W V3 W	Wet Wet Wet	Slowing or Going ahead Stopped	Pick-up truck Automobile, station Automobile, station	Other motor vehicle Other motor vehicle Other motor vehicle	0
7	2013-05-20	Mo	19:50	Clear	Daylight	Turning	P.D. only	V1 N V2 S	Dry Dry	Turning left Going ahead	Pick-up truck Automobile, station	Other motor vehicle Other motor vehicle	0
8	2013-07-04	Thu	14:29	Clear	Daylight	Angle	Non-fatal	V1 S V2 W	Dry Dry	Slowing or Going ahead	Automobile, station Bicycle	Cyclist Other motor vehicle	0
9	2013-07-17	We	20:55	Clear	Dusk	Rear end	Non-fatal	V1 W V2 W	Dry Dry	Going ahead Stopped	Automobile, station Pick-up truck	Other motor vehicle Other motor vehicle	0
10	2013-11-25	Mo	13:00	Clear	Daylight	Rear end	P.D. only	V1 W V2 W	Dry Dry	Turning right Turning right	Pick-up truck Automobile, station	Other motor vehicle Other motor vehicle	0

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

Appendix D

Greenbank / Jockvale
8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	15-Jun-06	3943	0	1110	0	3452	0	135	0	8640
2012	16-Aug-12	4457	0	2322	0	2361	0	118	0	9258
2016	16-Aug-16	3994	0	2711	0	1330	0	64	0	8099

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006		3943	3943	8640				
2012		4457	4457	9258		13.0%	13.0%	7.2%
2016		3994	3994	8099		-10.4%	-10.4%	-12.5%

Regression Estimate	2006	4070	4070
Regression Estimate	2016	4185	4185
Average Annual Change		**0.28%**	**0.28%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	135		135	8640				
2012	118		118	9258	-12.6%		-12.6%	7.2%
2016	64		64	8099	-45.8%		-45.8%	-12.5%

Regression Estimate	2006	142	142
Regression Estimate	2016	74	74
Average Annual Change		**-6.28%**	**-6.28%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006		3452	3452	8640				
2012		2361	2361	9258		-31.6%	-31.6%	7.2%
2016		1330	1330	8099		-43.7%	-43.7%	-12.5%

Regression Estimate	2006	3500	3500
Regression Estimate	2016	1402	1402
Average Annual Change		**-8.74%**	**-8.74%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	1110		1110	8640				
2012	2322		2322	9258	109.2%		109.2%	7.2%
2016	2711		2711	8099	16.8%		16.8%	-12.5%

Regression Estimate	2006	1176	1176
Regression Estimate	2016	2810	2810
Average Annual Change		**9.10%**	**9.10%**

Greenbank / Jockvale
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	15-Jun-06	443		318		491		58		1310
2012	16-Aug-12	328		336		338		6		1008
2016	16-Aug-16	341		395		180		9		925

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006		443	443	1310				
2012		328	328	1008		-26.0%	-26.0%	-23.1%
2016		341	341	925		4.0%	4.0%	-8.2%

Regression Estimate	2006	429	429
Regression Estimate	2016	320	320
Average Annual Change		**-2.89%**	**-2.89%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	58		58	1310				
2012	6		6	1008	-89.7%		-89.7%	-23.1%
2016	9		9	925	50.0%		50.0%	-8.2%

Regression Estimate	2006	52	52
Regression Estimate	2016	0	0
Average Annual Change		**-47.75%**	**-47.75%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006		491	491	1310				
2012		338	338	1008		-31.2%	-31.2%	-23.1%
2016		180	180	925		-46.7%	-46.7%	-8.2%

Regression Estimate	2006	500	500
Regression Estimate	2016	193	193
Average Annual Change		**-9.06%**	**-9.06%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	318		318	1310				
2012	336		336	1008	5.7%		5.7%	-23.1%
2016	395		395	925	17.6%		17.6%	-8.2%

Regression Estimate	2006	311	311
Regression Estimate	2016	384	384
Average Annual Change		**2.14%**	**2.14%**

Greenbank / Jockvale
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	15-Jun-06	657		110		443		18		1228
2012	16-Aug-12	923		312		322		13		1570
2016	16-Aug-16	809		326		155		7		1297

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006		657	657	1228				
2012		923	923	1570		40.5%	40.5%	27.9%
2016		809	809	1297		-12.4%	-12.4%	-17.4%

Regression Estimate	2006	703	703
Regression Estimate	2016	878	878
Average Annual Change		**2.25%**	**2.25%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	18		18	1228				
2012	13		13	1570	-27.8%		-27.8%	27.9%
2016	7		7	1297	-46.2%		-46.2%	-17.4%

Regression Estimate	2006	18	18
Regression Estimate	2016	8	8
Average Annual Change		**-8.43%**	**-8.43%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006		443	443	1228				
2012		322	322	1570		-27.3%	-27.3%	27.9%
2016		155	155	1297		-51.9%	-51.9%	-17.4%

Regression Estimate	2006	457	457
Regression Estimate	2016	175	175
Average Annual Change		**-9.12%**	**-9.12%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	110		110	1228				
2012	312		312	1570	183.6%		183.6%	27.9%
2016	326		326	1297	4.5%		4.5%	-17.4%

Regression Estimate	2006	129	129
Regression Estimate	2016	355	355
Average Annual Change		**10.64%**	**10.64%**

Appendix E

2020 Background - AM
1: Greenbank Road & Jockvale Road 06/02/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	417	6	122	231	6
Future Volume (vph)	2	0	4	8	3	169	4	417	6	122	231	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1722	1517		1780		1695	1778	
Flt Permitted		1.00			1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1624			1784	1517		1777		1695	1778	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	0	4	8	3	178	4	439	6	128	243	6
RTOR Reduction (vph)	0	6	0	0	0	153	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	11	25	0	449	0	128	249	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Effective Green, g (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Actuated g/C Ratio		0.02			0.02	0.14		0.65		0.13	0.85	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		24			26	216		1156		216	1511	
v/s Ratio Prot						0.02				c0.08	0.14	
v/s Ratio Perm		0.00			c0.01	0.00		c0.25				
v/c Ratio		0.00			0.42	0.12		0.39		0.59	0.16	
Uniform Delay, d1		48.5			48.8	37.4		8.1		41.1	1.3	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.1			10.7	0.2		1.0		4.3	0.2	
Delay (s)		48.6			59.5	37.6		9.1		45.5	1.5	
Level of Service		D			E	D		A		D	A	
Approach Delay (s)		48.6			38.9			9.1			16.5	
Approach LOS		D			D			A			B	

Intersection Summary				
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.42			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.6	
Intersection Capacity Utilization	58.3%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

2020 Background - PM
1: Greenbank Road & Jockvale Road 06/02/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	417	6	122	231	6
Future Volume (vph)	2	0	4	8	3	169	4	417	6	122	231	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1720	1517		1780		1695	1777	
Flt Permitted		1.00			1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1624			1784	1517		1777		1695	1777	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	0	4	9	3	184	4	453	7	133	251	7
RTOR Reduction (vph)	0	6	0	0	0	109	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	12	75	0	464	0	133	258	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.6			1.6	14.7		64.7		13.1	84.9	
Effective Green, g (s)		1.6			1.6	14.7		64.7		13.1	84.9	
Actuated g/C Ratio		0.02			0.02	0.15		0.65		0.13	0.85	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		25			28	222		1149		222	1508	
v/s Ratio Prot						0.04				c0.08	0.15	
v/s Ratio Perm		0.00			c0.01	0.01		c0.26				
v/c Ratio		0.00			0.43	0.34		0.40		0.60	0.17	
Uniform Delay, d1		48.4			48.7	38.3		8.4		41.0	1.3	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.1			10.2	0.9		1.1		4.3	0.2	
Delay (s)		48.5			58.9	39.2		9.5		45.3	1.6	
Level of Service		D			E	D		A		D	A	
Approach Delay (s)		48.5			40.4			9.5			16.4	
Approach LOS		D			D			A			B	

Intersection Summary				
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.6	
Intersection Capacity Utilization	58.3%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

2025 AM Peak - Background
1: Greenbank Road & Jockvale Road 06/02/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	460	6	122	255	6
Future Volume (vph)	2	0	4	8	3	169	4	460	6	122	255	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1722	1517		1781		1695	1778	
Flt Permitted		0.88			0.89	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1436			1581	1517		1778		1695	1778	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	0	4	8	3	178	4	484	6	128	268	6
RTOR Reduction (vph)	0	6	0	0	0	142	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	11	36	0	494	0	128	274	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Effective Green, g (s)		3.9			3.9	20.5		68.2		15.9	88.1	
Actuated g/C Ratio		0.04			0.04	0.20		0.68		0.16	0.88	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		56			61	310		1212		269	1566	
v/s Ratio Prot						0.02				c0.08	0.15	
v/s Ratio Perm		0.00			c0.01	0.01		c0.28				
v/c Ratio		0.00			0.18	0.12		0.41		0.48	0.17	
Uniform Delay, d1		46.2			46.5	32.4		7.0		38.3	0.8	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.0			1.4	0.2		1.0		1.3	0.2	
Delay (s)		46.2			47.9	32.6		8.0		39.6	1.1	
Level of Service		D			D	C		A		D	A	
Approach Delay (s)		46.2			33.4			8.0			13.3	
Approach LOS		D			C			A			B	

Intersection Summary				
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.41			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

2025 PM Peak - Background
1: Greenbank Road & Jockvale Road 06/02/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	460	6	122	255	6
Future Volume (vph)	2	0	4	8	3	169	4	460	6	122	255	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1720	1517		1780		1695	1778	
Flt Permitted		1.00			1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1624			1784	1517		1777		1695	1778	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	0	4	9	3	184	4	500	7	133	277	7
RTOR Reduction (vph)	0	6	0	0	0	86	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	12	98	0	511	0	133	284	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.6			1.6	14.7		64.7		13.1	84.9	
Effective Green, g (s)		1.6			1.6	14.7		64.7		13.1	84.9	
Actuated g/C Ratio		0.02			0.02	0.15		0.65		0.13	0.85	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		25			28	222		1149		222	1509	
v/s Ratio Prot						c0.06				c0.08	0.16	
v/s Ratio Perm		0.00			0.01	0.01		c0.29				
v/c Ratio		0.00			0.43	0.44		0.44		0.60	0.19	
Uniform Delay, d1		48.4			48.7	38.9		8.7		41.0	1.4	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.1			10.2	1.4		1.2		4.3	0.3	
Delay (s)		48.5			58.9	40.3		10.0		45.3	1.6	
Level of Service		D			E	D		A		D	A	
Approach Delay (s)		48.5			41.4			10.0			15.6	
Approach LOS		D			D			A			B	

Intersection Summary				
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.6	
Intersection Capacity Utilization	62.1%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Appendix F

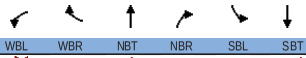
2020 Total - AM
1: Greenbank Road & Jockvale Road 06/01/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	480	6	122	247	6
Future Volume (vph)	2	0	4	8	3	169	4	480	6	122	247	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1722	1517		1781		1695	1778	
Flt Permitted		1.00			1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1624			1784	1517		1778		1695	1778	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	0	4	8	3	178	4	505	6	128	260	6
RTOR Reduction (vph)	0	6	0	0	0	123	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	11	55	0	515	0	128	266	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Effective Green, g (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Actuated g/C Ratio		0.02			0.02	0.14		0.65		0.13	0.85	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		24			26	216		1157		216	1511	
v/s Ratio Prot						0.03				c0.08	0.15	
v/s Ratio Perm		0.00			c0.01	0.00		c0.29				
v/c Ratio		0.00			0.42	0.25		0.44		0.59	0.18	
Uniform Delay, d1		48.5			48.8	38.1		8.6		41.1	1.3	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.1			10.7	0.6		1.2		4.3	0.3	
Delay (s)		48.6			59.5	38.7		9.8		45.5	1.6	
Level of Service		D			E	D		A		D	A	
Approach Delay (s)		48.6			39.9			9.8			15.8	
Approach LOS		D			D			A			B	

Intersection Summary				
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.6	
Intersection Capacity Utilization	62.7%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

2020 Total - AM
2: Greenbank Road & Street No 1 06/01/2017



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	63	428	1	16	244
Future Volume (Veh/h)	5	63	428	1	16	244
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	66	451	1	17	257
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	742	452			452	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	742	452			452	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	89			98	
cM capacity (veh/h)	377	608			1109	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	71	452	274
Volume Left	5	0	17
Volume Right	66	1	0
cSH	583	1700	1109
Volume to Capacity	0.12	0.27	0.02
Queue Length 95th (m)	3.1	0.0	0.4
Control Delay (s)	12.0	0.0	0.7
Lane LOS	B		A
Approach Delay (s)	12.0	0.0	0.7
Approach LOS	B		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

2020 Total - PM
1: Greenbank Road & Jockvale Road 06/01/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2	5	1	0	154	2	389	7	256	670	0
Future Volume (vph)	0	2	5	1	0	154	2	389	7	256	670	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.90			1.00	0.85		1.00		1.00	1.00	
Flt Protected		1.00			0.95	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1612			1695	1517		1779		1695	1784	
Flt Permitted		1.00			1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1612			1784	1517		1776		1695	1784	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2	5	1	0	167	2	423	8	278	728	0
RTOR Reduction (vph)	0	5	0	0	0	114	0	0	0	0	0	0
Lane Group Flow (vph)	0	2	0	0	1	53	0	433	0	278	728	0
Turn Type		NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases				8		8	2					
Actuated Green, G (s)		1.4			1.4	23.2		56.2		21.8	85.1	
Effective Green, g (s)		1.4			1.4	23.2		56.2		21.8	85.1	
Actuated g/C Ratio		0.01			0.01	0.23		0.56		0.22	0.85	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		22			24	351		998		369	1518	
v/s Ratio Prot		0.00				c0.03				c0.16	c0.41	
v/s Ratio Perm					0.00	0.00		0.24				
v/c Ratio		0.09			0.04	0.15		0.43		0.75	0.48	
Uniform Delay, d1		48.7			48.6	30.6		12.7		36.6	1.9	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		1.9			0.7	0.2		1.4		8.4	1.1	
Delay (s)		50.5			49.4	30.8		14.1		45.0	3.0	
Level of Service		D			D	C		B		D	A	
Approach Delay (s)		50.5			30.9			14.1			14.6	
Approach LOS		D			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.6	
Intersection Capacity Utilization	80.7%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

2020 Total - PM
2: Greenbank Road & Street No 1 06/01/2017

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	3	43	353	4	71	605
Future Volume (Veh/h)	3	43	353	4	71	605
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	47	384	4	77	658
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1198	386			388	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1198	386			388	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	93			93	
cM capacity (veh/h)	192	662			1170	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	50	388	735
Volume Left	3	0	77
Volume Right	47	4	0
cSH	577	1700	1170
Volume to Capacity	0.09	0.23	0.07
Queue Length 95th (m)	2.2	0.0	1.6
Control Delay (s)	11.8	0.0	1.7
Lane LOS	B		A
Approach Delay (s)	11.8	0.0	1.7
Approach LOS	B		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		

Appendix G

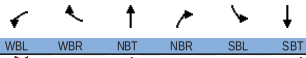
2025 Total - AM
1: Greenbank Road & Jockvale Road 06/01/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	4	8	3	169	4	523	6	122	271	6
Future Volume (vph)	2	0	4	8	3	169	4	523	6	122	271	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.91			1.00	0.85		1.00		1.00	1.00	
Flt Protected		0.98			0.96	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1597			1722	1517		1781		1695	1779	
Flt Permitted		1.00			1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1624			1784	1517		1778		1695	1779	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2	0	4	8	3	178	4	551	6	128	285	6
RTOR Reduction (vph)	0	6	0	0	0	102	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	11	76	0	561	0	128	291	0
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Effective Green, g (s)		1.5			1.5	14.3		65.1		12.8	85.0	
Actuated g/C Ratio		0.02			0.02	0.14		0.65		0.13	0.85	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		24			26	216		1157		216	1512	
v/s Ratio Prot						0.04				c0.08	0.16	
v/s Ratio Perm		0.00			c0.01	0.01		c0.32				
v/c Ratio		0.00			0.42	0.35		0.48		0.59	0.19	
Uniform Delay, d1		48.5			48.8	38.7		8.9		41.1	1.3	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.1			10.7	1.0		1.5		4.3	0.3	
Delay (s)		48.6			59.5	39.7		10.4		45.5	1.6	
Level of Service		D			E	D		B		D	A	
Approach Delay (s)		48.6			40.8			10.4			15.0	
Approach LOS		D			D			B			B	

Intersection Summary				
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.6	
Intersection Capacity Utilization	66.4%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

2025 Total - AM
2: Greenbank Road & Street No 1 06/01/2017



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	63	472	1	16	269
Future Volume (Veh/h)	5	63	472	1	16	269
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	66	497	1	17	283
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	814	498			498	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	814	498			498	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	88			98	
cM capacity (veh/h)	342	573			1066	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	71	498	300
Volume Left	5	0	17
Volume Right	66	1	0
cSH	547	1700	1066
Volume to Capacity	0.13	0.29	0.02
Queue Length 95th (m)	3.4	0.0	0.4
Control Delay (s)	12.6	0.0	0.6
Lane LOS	B		A
Approach Delay (s)	12.6	0.0	0.6
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

2025 Total - PM
1: Greenbank Road & Jockvale Road 06/01/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2	5	1	0	154	2	422	7	256	732	0
Future Volume (vph)	0	2	5	1	0	154	2	422	7	256	732	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Lane Util. Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Frt		0.90			1.00	0.85		1.00		1.00	1.00	
Flt Protected		1.00			0.95	1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1612			1695	1517		1780		1695	1784	
Flt Permitted		1.00			1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1612			1784	1517		1776		1695	1784	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2	5	1	0	167	2	459	8	278	796	0
RTOR Reduction (vph)	0	5	0	0	0	95	0	0	0	0	0	0
Lane Group Flow (vph)	0	2	0	0	1	72	0	469	0	278	796	0
Turn Type		NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases				8		8	2					
Actuated Green, G (s)		1.4			1.4	23.2		56.2		21.8	85.1	
Effective Green, g (s)		1.4			1.4	23.2		56.2		21.8	85.1	
Actuated g/C Ratio		0.01			0.01	0.23		0.56		0.22	0.85	
Clearance Time (s)		6.4			6.4	7.1		7.1		7.1	7.1	
Vehicle Extension (s)		3.0			3.0	3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		22			24	351		998		369	1518	
v/s Ratio Prot		0.00				c0.04				c0.16	c0.45	
v/s Ratio Perm					0.00	0.00		0.26				
v/c Ratio		0.09			0.04	0.20		0.47		0.75	0.52	
Uniform Delay, d1		48.7			48.6	31.0		13.0		36.6	2.0	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		1.9			0.7	0.3		1.6		8.4	1.3	
Delay (s)		50.5			49.4	31.2		14.6		45.0	3.3	
Level of Service		D			D	C		B		D	A	
Approach Delay (s)		50.5			31.4			14.6			14.1	
Approach LOS		D			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.6	
Intersection Capacity Utilization	86.0%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

2025 Total - PM
2: Greenbank Road & Street No 1 06/01/2017

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	3	43	390	4	71	668
Future Volume (Veh/h)	3	43	390	4	71	668
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	47	424	4	77	726
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1306	426			428	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1306	426			428	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	93			93	
cM capacity (veh/h)	164	628			1131	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	50	428	803
Volume Left	3	0	77
Volume Right	47	4	0
cSH	537	1700	1131
Volume to Capacity	0.09	0.25	0.07
Queue Length 95th (m)	2.3	0.0	1.7
Control Delay (s)	12.4	0.0	1.7
Lane LOS	B		A
Approach Delay (s)	12.4	0.0	1.7
Approach LOS	B		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		