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Appendix B
Transportation and Traffic Assessment Memo

***If technical reports are required in an alternative format for accessibility needs, please contact:**

Maged Elmadhoon, M.Eng., P.Eng.
Manager, Transportation Planning Public Works, Niagara Region
Phone: 905-980-6000 ext. 3583
Email: Maged.Elmadhoon@niagararegion.ca

Memorandum: Transportation Needs and Opportunity

Date: September 1, 2022 **Project No.:** 300051307.0000

Project Name: Regional Road 43 (Bridge Street) and Adjacent Municipal Roads

Client Name: Niagara Region

Submitted To: Maged Elmadhoon and Carolyn Ryall

Submitted By: Nansen Feng, Transportation Planner

Xinli Tu, Transportation Planner

Reviewed By: Ray Bacquie, Project Manager / Senior Vice President

1.0 Introduction

1.1 Background

In support of the Municipal Class Environmental Assessment (MCEA) for Bridge Street and Adjacent Municipal Roads, R.J. Burnside & Associates Limited (Burnside) has undertaken a transportation study to assess the need and opportunities for improvements in the Study Area. The analysis includes a traffic operations analysis for Regional Road 43 (Bridge Street) and adjacent municipal roadways in the City of Niagara Falls, transit service opportunities and level of service for active transportation.

1.2 Study Area

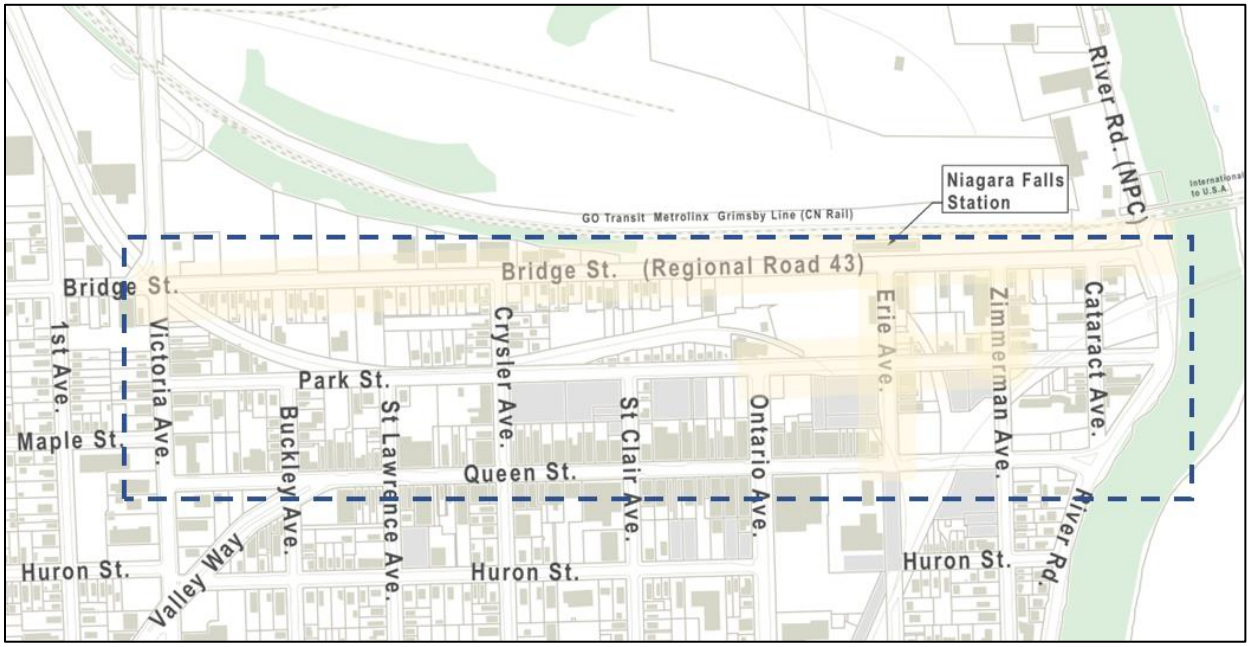
The study area is bounded by Regional Road 43 (Bridge Street) in the north, River Road in the east, Queen Street on the south, and Victoria Avenue in the west.

The analysis focuses on existing and future traffic operations at the following road segments:

- Regional Road 43 (Bridge Street) between Victoria Avenue and River Road
- Erie Avenue between Regional Road 43 (Bridge Street) and Queen Street
- Park Street between Ontario Avenue and Zimmerman Avenue
- Zimmerman Avenue between Regional Road 43 (Bridge Street) and Park Street

The Study Area and project limits are shown Figure 1.1.

Figure 1.1: Study Area



It is noted that the Victoria Avenue and Bridge Street intersection has been planned and designed through another MCEA for the extension of Regional Road 57 (Thorold Stone Road). The design of the Victoria Avenue and Bridge Street intersection as a roundabout is underway, hence analysis of the intersection is beyond the scope of this study.

1.3 Site Context

Land use within the study area consists primarily of residential with some commercial and parking uses. The analysis assesses the transportation demand implications of the future redevelopment of the area based on the Official Plan Amendment No.125 (OPA 125) Niagara Falls Transit Station Secondary Plan.

The Study Area is also adjacent to the International Crossing to the U.S.A., situated just east of Bridge Street and Niagara Road. As a result, the broader study area experiences considerable tourist traffic. Tourist traffic has been incorporated as part of the traffic growth incorporated in the Niagara Region transportation forecasting model.

Transit facilities in the area include VIA Rail Station and Niagara Falls Transit Terminal and bus service for provided by GO Transit, Niagara Falls Transit and WEGO. The analysis also includes the travel demand and operational needs of the planned Niagara Falls GO Transit Station.

2.0 Existing Traffic Conditions

2.1 Existing Road Network

Bridge Street is a major east/west roadway that extends from Regional Road 102 (Stanley Avenue) to River Road in the City of Niagara Falls. It is a two-lane road with a concrete sidewalk on the south side and on the north side east of the existing rail station. It has an approximate right-of-way width of 18 m and a regulatory speed limit of 50 km/h.

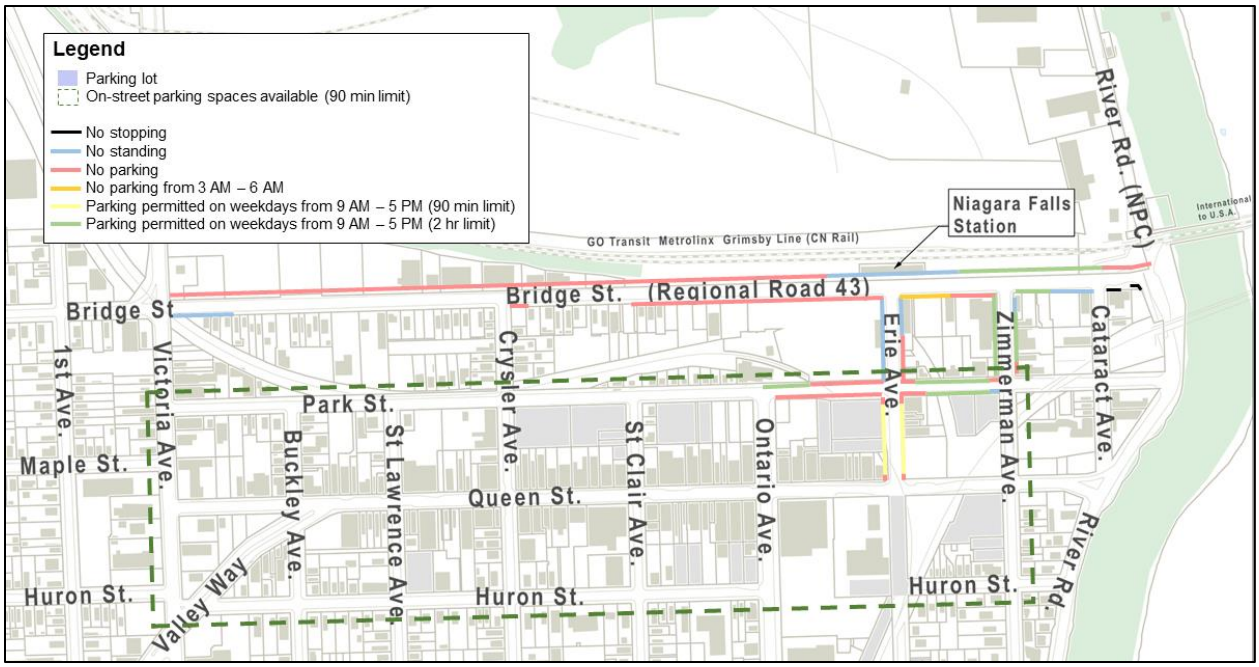
Erie Avenue is a local north/south two-lane road with concrete sidewalks on the east and west sides; it has a regulatory speed limit of 50 km/h.

Park Street is a two-lane local east/west roadway with concrete sidewalks on the north and south sides of the road, except east of Cataract Avenue and the frontage of 2781 Park Street along the north side; the regulatory speed limit of 50 km/h.

Zimmerman Avenue is a two-lane local north/south roadway that extends from Regional Road 43 (Bridget Street) to River Road. There are concrete sidewalks on the east and west sides of the road, except between Park Street and Queen Street on the east side. It has a regulatory speed limit of 50 km/h.

Parking lots and on-street parking are provided within the Study Area as shown in Figure 2.1.

Figure 2.1: Parking Lots and Restrictions along Study Road Segments



The existing control methods and pedestrian crossing measures for study intersections are summarized in Table 2.1 based on Google Street View as well as site visit observations. As shown in the table, crosswalks are missing at most intersections, even those with transit stops nearby.

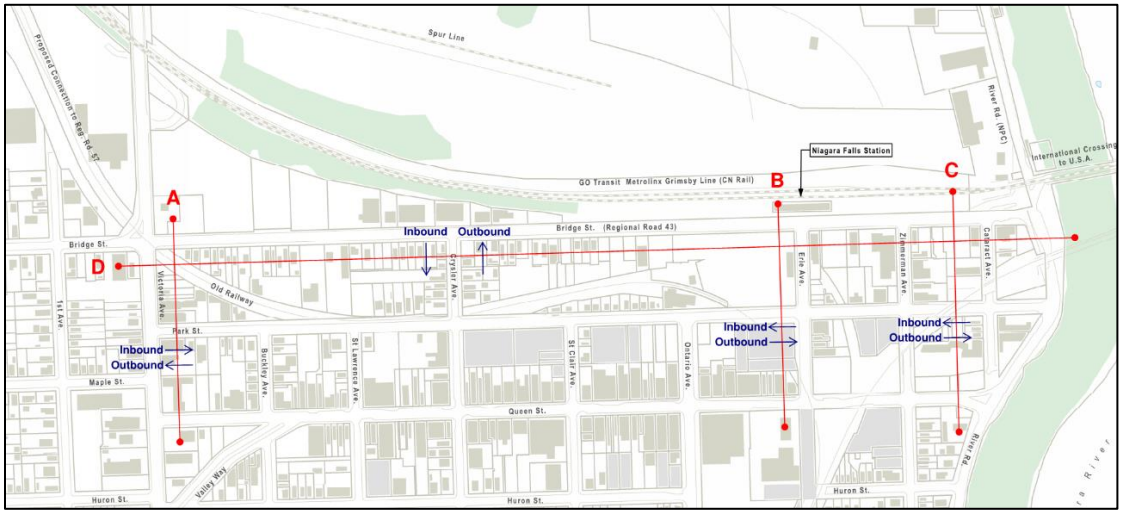
Table 2.1: Existing Control Methods and Pedestrian Crossing Measures

Intersection	Traffic Control	Crosswalk	Nearby Transit Stop
Bridge St. & River Rd.	Stop control for Bridge St.	No crosswalks	Bus stop on Bridge St.
Bridge St. & Zimmerman Ave.	Stop control for Zimmerman Ave.	No crosswalks	No transit stops
Bridge St. & Erie Ave.	Stop control for Erie Ave.	No crosswalks	Bus stop and bus terminal on Erie Ave., Go Station on Bridge St.
Bridge St. & Crysler Ave.	Stop control for Crysler Ave.	No crosswalks	No transit stops
Park St. & River Rd.	Stop control for Park St.	No crosswalks	No transit stops
Park St. & Zimmerman Ave.	Stop control for Park St.	No crosswalks	No transit stops
Park St. & Erie Ave.	Stop control for Park St.	Crosswalk for all legs	Bus stop on Erie Ave.
Park St. & Ontario Ave.	Stop control for Ontario Ave.	No crosswalks	No transit stops
Queen St & River Rd.	Stop control for Queen St.	Crosswalk crossing Queen St.	No transit stops
Queen St. & Zimmerman Ave.	Stop control for Zimmerman Ave.	Crosswalk for all legs	No transit stops
Queen St. & Erie Ave.	All-way stop control	Crosswalk for all legs	Bus stop on Queen St.
Queen St. & Ontario Ave.	All-way stop control	Crosswalk for all legs	Bus stop on Queen St.

2.2 Existing Traffic Conditions

To gauge the overall used capacity and travel patterns within the Study Area for existing conditions, a screenline analysis was conducted at the locations shown in Figure 2.2. Based on the results shown in Table 2.2, all streets are operating well under capacity during the morning and afternoon peak hour.

Figure 2.2: Screenlines



Site observations were undertaken within the study are on weekday and weekend periods on Sunday, July 19, 2020, Saturday November 2, 2020 and Friday November 12, 2021; weekday AM and PM periods were observed to be the peak demand periods. Automatic Traffic Recorder (ATR) counts and Turning Movement Counts (TMCs) from 2019 for select intersections were provided for peak season travel (April to October as per the *City of Niagara Falls Transportation Master Plan*). Since this data was collected prior to the COVID-19 pandemic, no further adjustments were applied to these counts. Turning movement patterns at intersections with no data were inferred based on available TMCs and ATR counts.

The counts at the Bridge Street / River Road / Niagara Parkway and Bridge Street / Erie Avenue intersection were collected for the weekday morning AM peak period (7:00 AM to 9:00 AM) and afternoon PM peak period (4:00 PM to 6:00 PM). The turning movement counts were undertaken by Ontario Traffic Inc., on behalf of Burnside on Tuesday, September 15, 2020. It is acknowledged that the count data was collected during Stage 3 of reopening following the COVID-19 pandemic. Since the 2020 volumes at these intersections varied significantly with midblock volumes collected for 2019, a growth factor of three was applied to all movements at the Bridge Street / River Road / Niagara Parkway and Bridge Street / Erie Avenue intersection to better reflect typical conditions. The existing traffic control and volumes are illustrated in Figure 2.3 and Figure 2.4, respectively.

Table 2.2: Screenline Results

Screenline Location	Station	Existing Volumes				Used Capacity (%)				Total Capacity (vehicles/direction)	
		AM		PM		AM		PM			
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
A - East of Victoria Street	Bridge Street	115	65	113	177	13%	7%	13%	20%	900	900
	Park Street	98	48	61	107	11%	5%	7%	12%	900	900
	Queen Street	68	58	80	79	8%	6%	9%	9%	900	900
	Total	**281**	**171**	**254**	**363**	**10%**	**6%**	**9%**	**13%**	**2,700**	**2,700**
B - West of Erie Avenue	Bridge Street	36	147	135	129	4%	16%	15%	14%	900	900
	Park Street	32	27	37	29	4%	3%	4%	3%	900	900
	Queen Street	85	105	88	145	9%	12%	10%	16%	900	900
	Total	**153**	**279**	**260**	**303**	**6%**	**10%**	**10%**	**11%**	**2,700**	**2,700**
C - West of River	Bridge Street	75	93	171	57	8%	10%	19%	6%	900	900
	Park Street	5	11	5	16	1%	1%	1%	2%	900	900
	Queen Street	45	28	42	53	5%	3%	5%	6%	900	900
	Total	**50**	**39**	**47**	**69**	**2%**	**1%**	**2%**	**3%**	**2,700**	**2,700**
D - South of Bridge Street	Victoria Avenue	286	330	352	380	32%	37%	39%	42%	900	900
	Crysler Avenue	19	28	34	49	2%	3%	4%	5%	900	900
	Erie Avenue	66	45	61	45	7%	5%	7%	5%	900	900
	Zimmerman Avenue	14	14	13	23	2%	2%	1%	3%	900	900
	Cataract Avenue	7	1	5	5	1%	0%	1%	1%	900	900
	River Road / Niagara Parkway	60	95	358	201	7%	11%	40%	22%	900	900
	Total	**452**	**513**	**823**	**703**	**8%**	**10%**	**15%**	**13%**	**5,400**	**5,400**

2.3 Existing Traffic Operations Analysis

Existing traffic operations were assessed using Synchro 11 (HCM 2000) based on the existing road network shown in Figure 2.3 and existing traffic volumes shown in Figure 2.4. Existing traffic operations are shown in Table 2.3. The Bridge Street / Victoria Avenue intersection needs have been addressed through the Thorold Stone Road Extension Class EA and the intersection is being reconstructed as a roundabout. All other intersections in the Study Area are unsignalized. Under existing conditions, during both peak hours, all movements are operating and will operate with excess capacity and a level of service B or better; delays are minimal.

Figure 2.3: Existing Traffic Control

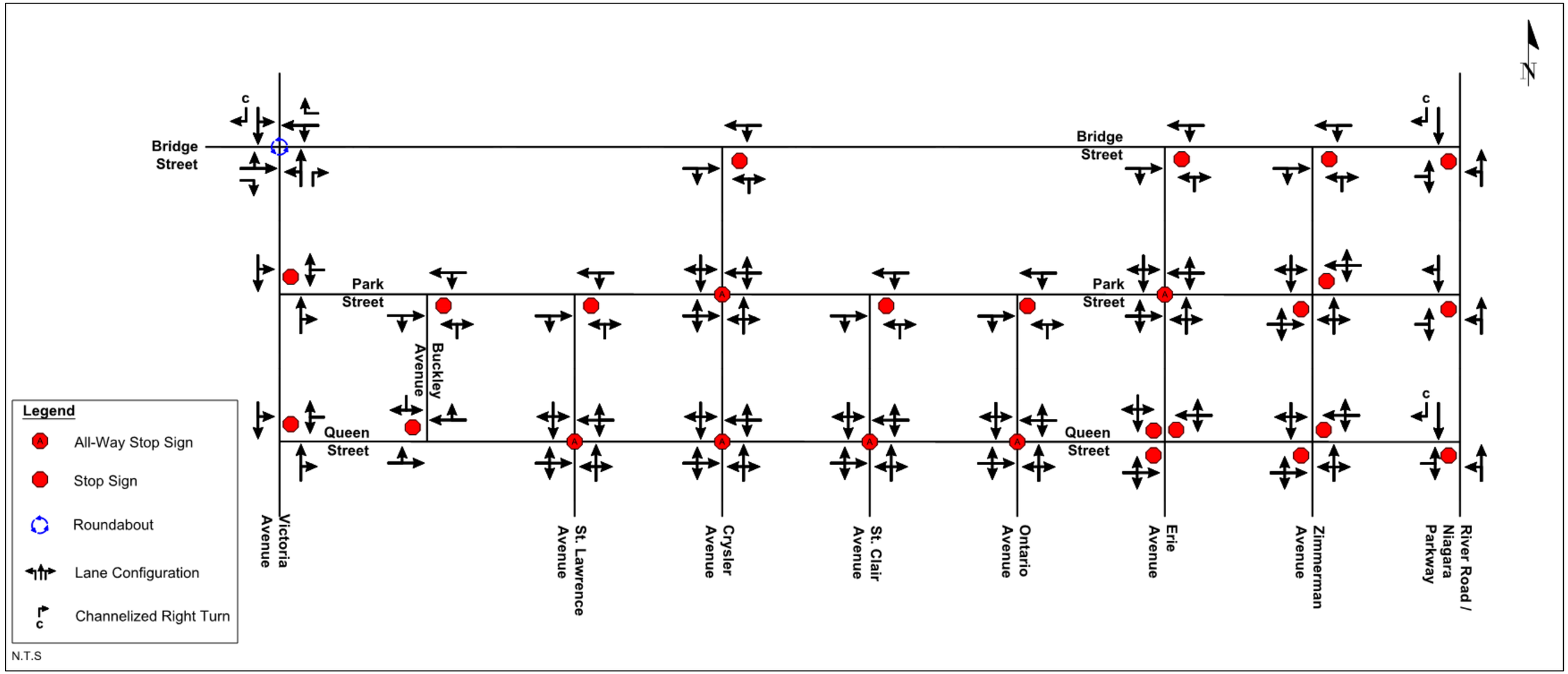


Figure 2.4: Existing Volumes

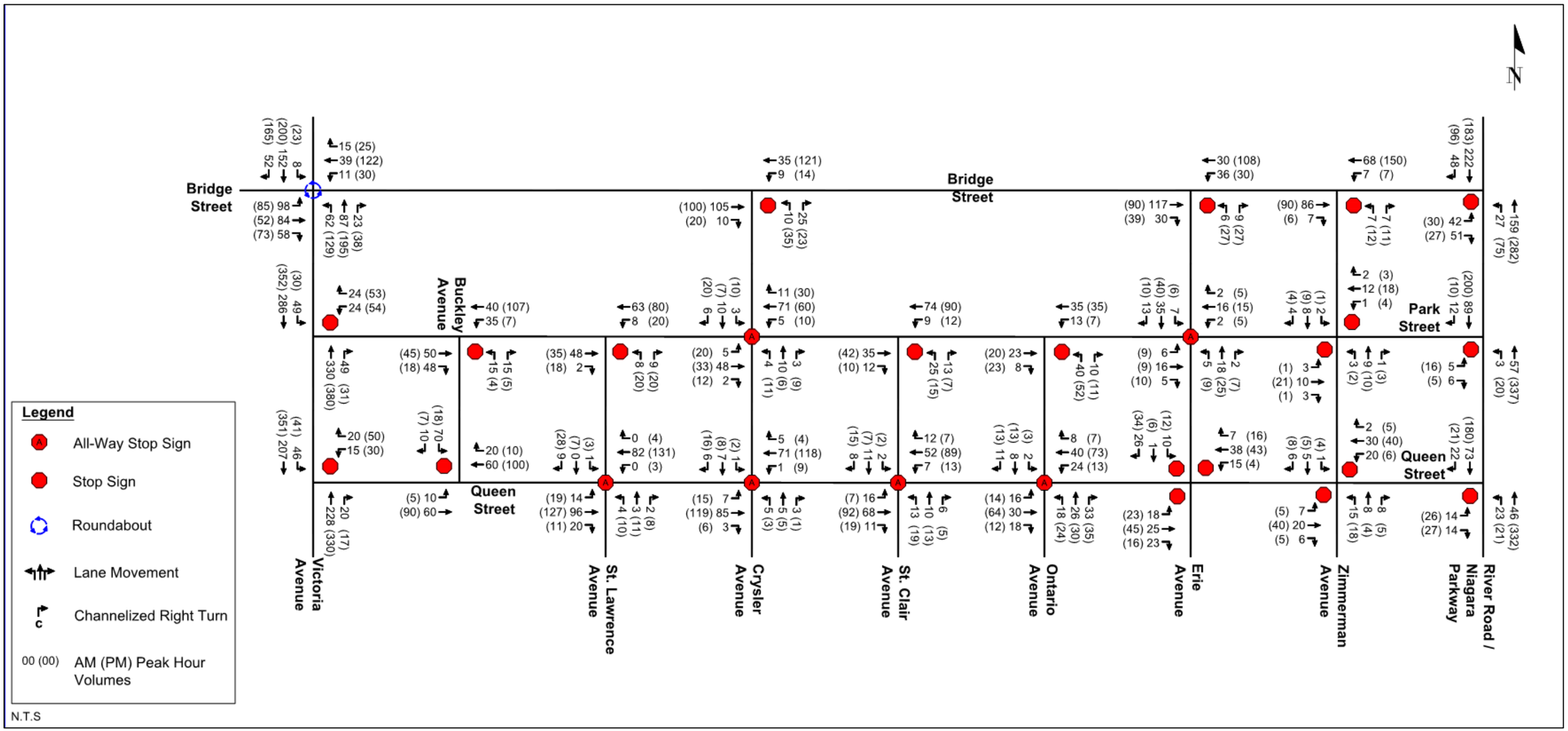


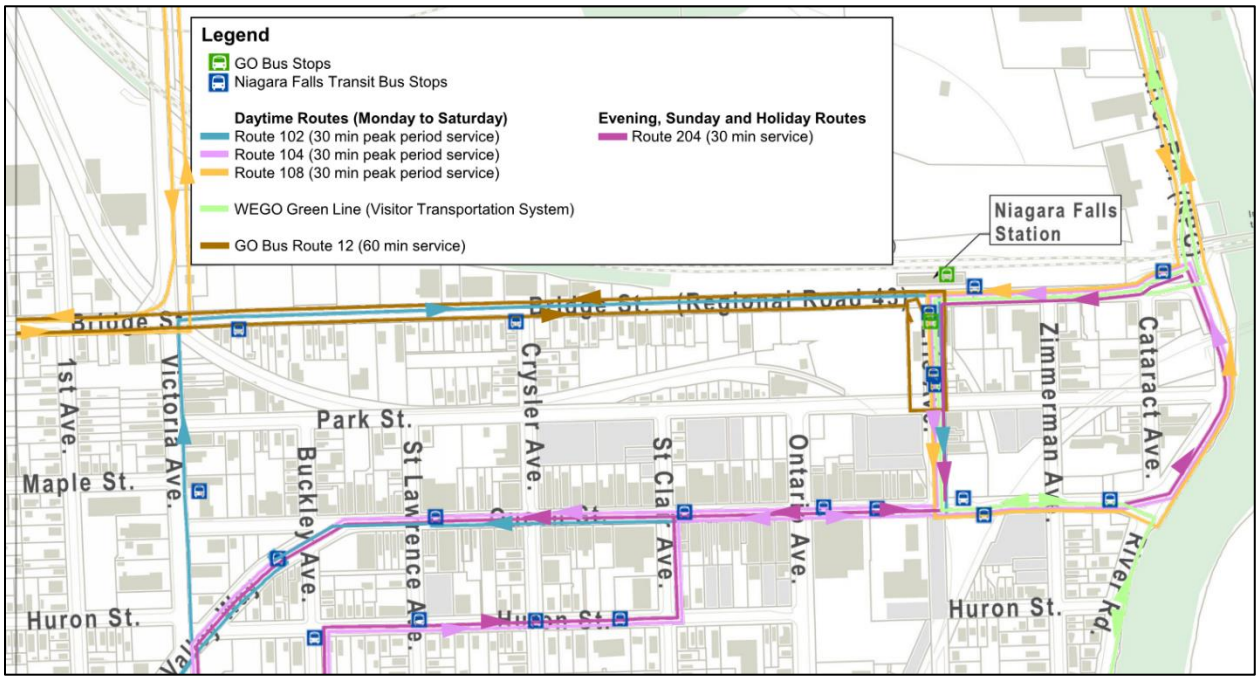
Table 2.3: Existing Unsignalized Intersection Operations

Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	LOS	Delay (s)	v/c	LOS	Delay (s)
Bridge Street and Crysler Avenue						
EBTR	0.07	A	0	0.08	A	0
WBLT	0.01	A	1.6	0.01	A	0.8
NBLR	0.04	A	9.2	0.08	B	10
Bridge Street and Erie Avenue						
EBTR	0.10	A	0	0.09	A	0
WBLT	0.03	A	4.5	0.03	A	1.9
NBLR	0.02	A	9.6	0.08	B	10.2
Bridge Street and Zimmerman Avenue						
EBTR	0.06	A	0	0.06	-	0
WBLT	0.01	A	0.8	0.01	A	0.4
NBLR	0.02	A	9.2	0.03	A	9.6
Bridge Street and River Road / Niagara Parkway						
EBL	0.11	B	13.4	0.08	B	14.5
EBR	0.09	B	10.2	0.03	A	9.4
NBL	0.03	A	8.3	0.06	A	7.9
SBL	0.04	A	0	0.06	A	0
Park Street and Ontario Avenue						
EBTR	0.02	A	0	0.03	A	0
WBLT	0.01	A	2	0.01	A	1.3
NBLR	0.06	A	9.1	0.07	A	9.2
Park Street and Erie Avenue						
EBLTR	0.03	A	7.2	0.03	A	7.2
WBLTR	0.02	A	7.2	0.03	A	7.2
NBLTR	0.03	A	7.2	0.05	A	7.3
SBLTR	0.07	A	7.2	0.07	A	7.3
Park Street and Zimmerman Avenue						
EBLTR	0.02	A	9.1	0.03	A	9.3
WBLTR	0.02	A	9.1	0.03	A	9.2
NBLTR	0	A	1.6	0	A	0.9
SBLTR	0	A	1	0	A	0.5
Queen Street and Erie Avenue						
EBLTR	0.10	A	7.4	0.12	A	7.7
WBLTR	0.09	A	7.5	0.09	A	7.5
SBLTR	0.06	A	7.4	0.08	A	7.7

2.4 Existing Transit Services

Both regional and local transit currently services the Study Area, as shown in Figure 2.5. Transit facilities such as the Niagara Falls Transit Terminal is located on the west side of Erie Avenue, between Bridge Street and Park Street. The VIA Rail Station is also located along Regional Road 43 (Bridge Street) at Erie Avenue.

Figure 2.5: Transit Service within the Study Area



Regional travel services within the study area are provided by GO Transit, Coach Canada and Megabus. GO Rail services began operations at the Niagara Falls GO station on June 26, 2021. GO Transit provides connections between the Niagara Falls VIA Rail Station and Toronto Union Station. These services include the Lakeshore West GO Train line and Bus Route 12. Megabus services the Niagara Falls Transit Terminal. It operates service to the Toronto Coach Terminal and several points in the U.S.A.

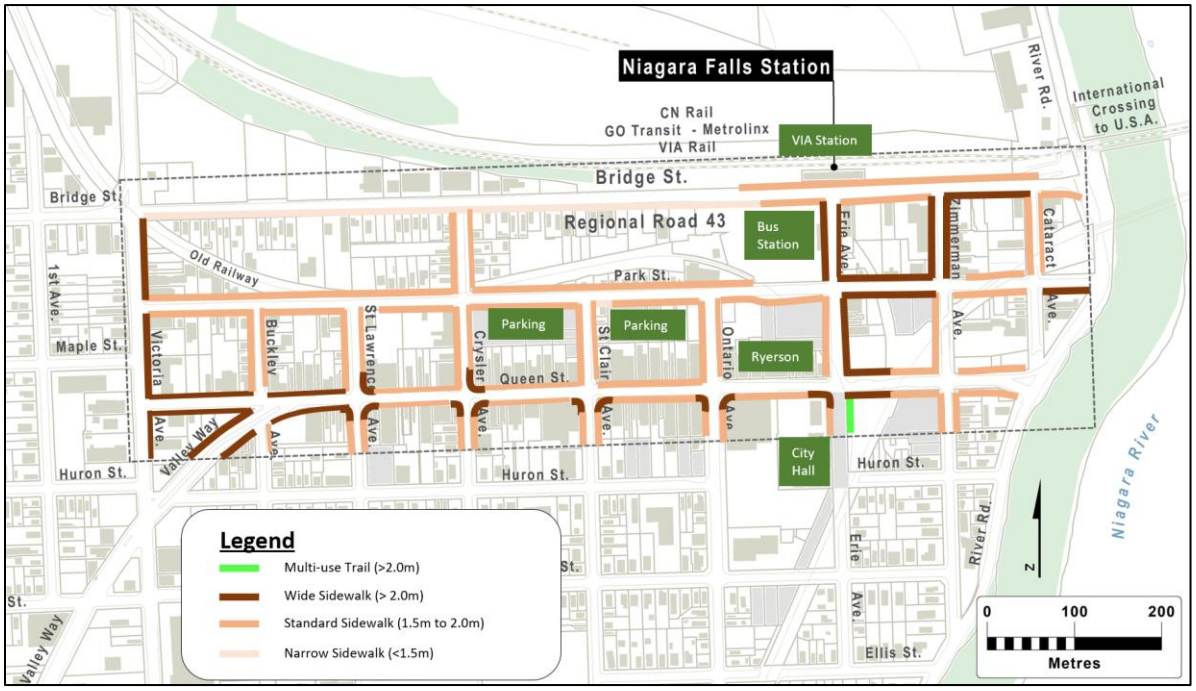
Local travel within the study area is serviced by Niagara Falls Transit and WEGO. Niagara Falls Transit routes service roads within the City of Niagara Falls. There are bus stops along Bridge Street, Victoria Street, Queen Street, Erie Street and River Road/ Niagara Parkway that service five Niagara Falls Transit routes. WEGO offers connections between major tourist attractions and hotels within the City of Niagara Falls and Niagara Parks.

Existing bus stops are well situated. All bus stops for local transit are within a 450 m walking distance (which is approximately 5 min of walk time) to residential areas.

2.5 Existing Active Transportation Network

The existing active transportation network is shown in Figure 2.6. Sidewalks are missing on the north side of Bridge Street west of the Niagara Falls VIA Rail Station. There is also sidewalk discontinuity on Park Street and Zimmerman Avenue due to the presence of the bus terminal and overhead bridge. The Olympic Torch Trail on Erie Avenue south of Queen Street is the only cycling facility separated from vehicular traffic within the Study Area.

Figure 2.6: Existing Active Transportation Network



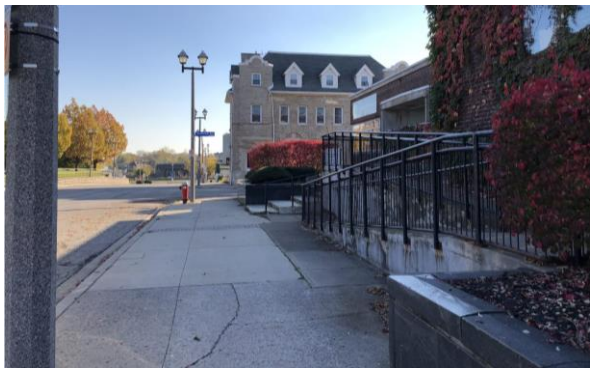
Walkability is a measure of the level of integration of pedestrian facilities and municipal infrastructure, based on design elements and characteristics of the road environment that influence the ease in which pedestrians can move through the network, conveniently, enjoyably and safely. Table 2.4 summarizes characteristics that negatively affect walkability on Bridge Street. Images in Figure 2.7 represent the existing pedestrian environment.

Table 2.4: Existing Conditions Affecting Walkability

Roadway Element	Roadway Characteristics
Sidewalk	Narrow 1.2 m south side, adjacent to traffic and discontinuous north side
Crossing Locations	No controlled crossings between Victoria Avenue and Bridge Street
Accessibility	Lack of AODA accessible crossing design elements
Utility Location	Light poles obstruct the sidewalk east and just west of Erie Avenue
Illumination	North side street illumination: no pedestrian scale lights west of Erie Avenue
Streetscape	No seating, gateways or plantings separating vehicles from pedestrians

Figure 2.7: Bridge Street Pedestrian Environment

Bridge Street north side at Via Station looking eastbound


Bridge Street east of Erie south side looking eastbound


Bridge Street west of Erie north side looking eastbound


Bridge Street west of Erie south side looking eastbound

Bridge Street east of Victoria north side looking eastbound

Bridge Street east of Victoria south side looking eastbound

Much like vehicle traffic level of service (LOS), there are measures for assessing active transportation levels of service. The existing level of service for pedestrians was assessed using the point system developed by L. Dixon (TRB Transportation Research Record 1538), which is based on the following criteria:

- Facilities provided
- Conflicts
- Amenities or speed differentials
- Motor vehicle LOS
- Maintenance
- Transportation demand modeling / multi modal integration

The existing LOS for cyclists was assessed using the Bicycle Compatibility Index (BCI) method from the Federal Highway Administration, which is based on the following criteria:

- Presence of bicycle lanes or paved shoulders
- Bicycle lane or paved shoulder width
- Curb lane width
- Curb lane and other lane volumes
- 85th percentile speed of traffic
- Presence of a parking lane with more than 30% occupancy
- Type of roadside development
- Adjustment factors for truck volumes, parking turnover and right-turn volumes

The 85th percentile speeds were assumed to be 60 km/h on Bridge Street and Park Street and 50 km/h on other roads. The curb lane volumes were estimated based on available midblock counts.

The results are summarized in the Table 2.5 below.

Table 2.5: Pedestrian and Cyclist LOS

Road	Pedestrian LOS	Cyclist LOS*
Bridge Street	C	E
Park Street	B	D
Queen Street	A	D
Zimmerman Avenue	B	D
Ontario Avenue	B	D
St. Clair Avenue	B	D
Crysler Avenue	B	D
St. Lawrence Avenue	B	D
Buckley Avenue	B	D

Due to the lack of bicycle facilities that are separated from vehicle traffic (e.g., bike lanes, multi-use path or cycle-track) in the study area, the cyclist LOS determined by BCI is moderately low (LOS of D) for most streets and is very low (LOS of E) for Bridge Street. Bridge Street also has lower than average pedestrian LOS compared to other streets due to its narrow and non-continuous sidewalks.

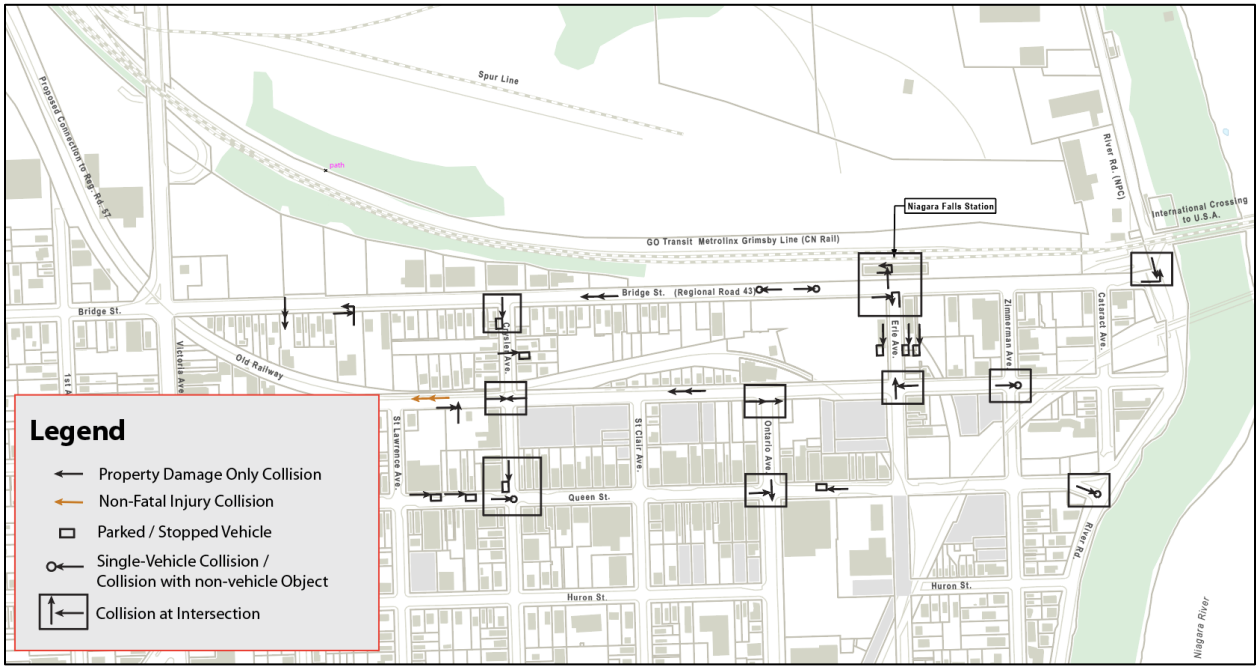
2.6 Safety Review

2.6.1 Collision Trends

A collision review was conducted for the study area. The collision diagram shown in Figure 2.8 indicates the location of recorded collisions from January 2015 to December 2019. A total of 27 collisions were recorded within the study area. One collision resulted in a non-fatal injury while the other 26 collisions resulted in property damage. The collisions do not indicate any obvious patterns related to location as collisions were not concentrated at a particular intersection or road segment. Also, no collisions involving pedestrians or cyclists were found in the record.

It should be noted that collisions involving parked/stopped vehicles make up 33% of all collisions. All three collisions along Erie Avenue between Bridge Street and Park Street in the last five years involve parked/ stopped vehicles.

Figure 2.8: Collision Diagram for Study Area



Collisions involving parked/stopped vehicles make up 33% of collisions and all three collisions along Erie Avenue between Bridge Street and Park Street in the last five years involve parked/ stopped vehicles. Given the very low number of collisions, however, does not indicate trends that would identify specific operational or design characteristics that contribute to collisions or opportunities for improvement.

2.6.2 Existing Roadway Characteristics

The frequency of collisions and level of safety if a function of traffic operations, road configurations, driver behaviour and traffic levels reflecting exposure to conflicts and potential for collisions. Bridge Street currently has low traffic volumes with low levels of vehicle-vehicle, vehicle-cyclist and vehicle-pedestrian interaction; hence it has a low potential for collisions. Severity of collisions and risk of serious injury is affected by traffic speed.

Notwithstanding the low level of collision exposure and collision trends, there are elements of traffic operations and roadway configuration that could contribute to the level of safety. Figure 2.9 illustrates the conditions through the western portion of the corridor.

Road Geometry: Bridge Street has a continuous straight alignment with a flat profile and wide pavement width, which contributes to unobstructed sight distance.

Site Accesses: There are multiple residential driveways resulting in driveway movements, including reversing vehicles interacting with pedestrians and the traffic flow. The potential for conflicts, however, are mitigated by the wide pavement width.

Figure 2.9: Bridge Street Road Characteristics

Bridge Street east of Victoria Avenue looking eastbound

Speed: The flat straight alignment, wide pavement width and lack of traffic stops along Bridge Street contribute to the potential for higher vehicle speeds.

2.6.3 Transit Operations

The existing Bus terminal the south side of Bridge Street has vehicular access via Bridge Street with stopping and boarding of passengers off-street. Driveway access is via both Park Street and Bridge Street 20 m west of Erie Avenue. This may contribute to vehicle conflicts.

The Via Rail station provides off-street parking. The station also provides GO bus service with passenger boarding on the north side of Bridge Street with a pedestrian shelter as illustrated in Figure 2.10.

Safety issues may arise from the lack of controlled crossing of Bridge Street for pedestrians or cyclists and the presence of on-street GO bus loading of passengers which may contribute to midblock pedestrian crossing activity.

Figure 2.10: Via Rail Station and GO Bus Stop

Bridge Street east of Erie Avenue looking westbound

3.0 Future Traffic Conditions

3.1 Future Road Network

Niagara Region has completed a Municipal Class Environmental Assessment (MCEA) for the extension of Regional Road 57 (Thorold Stone Road) from Regional Road 102 (Stanley Avenue) to Victoria Avenue. This MCEA was approved in 2009, with construction to begin in 2020. This project includes a new five-legged roundabout at the Bridge Street and Victoria Avenue intersection. According to the MCEA, traffic redistribution forecasts estimate approximately 600 trips along Bridge Street by 2021. To account for the additional trips generated along Bridge Street, as a result of the Thorold Stone Road extension, 100 trips per direction were added to Bridge Street under future conditions. These trips were derived based on the difference between trips associated with the Thorold Stone Road extension and projected future traffic growth without the road extension.

3.2 Future Transit Improvements

The Niagara Falls GO Transit Station will be constructed on the existing VIA Rail Station along Regional Road 43 (Bridge Street) at Erie Avenue within the 2041 horizon year. GO Rail services is anticipated to begin in the summer of 2021. Primary access to the site is via Bridge Street. According to the Niagara Falls *2020 Capital Projects Budget* approved by Council on December 10, 2019, the Bridge Street Multi-Modal Hub has also been approved. The project is deemed high priority. The hub will increase access to transportation options for residents using GO Transit. It is expected that these improvements will result in higher transit mode share.

3.3 Future Development

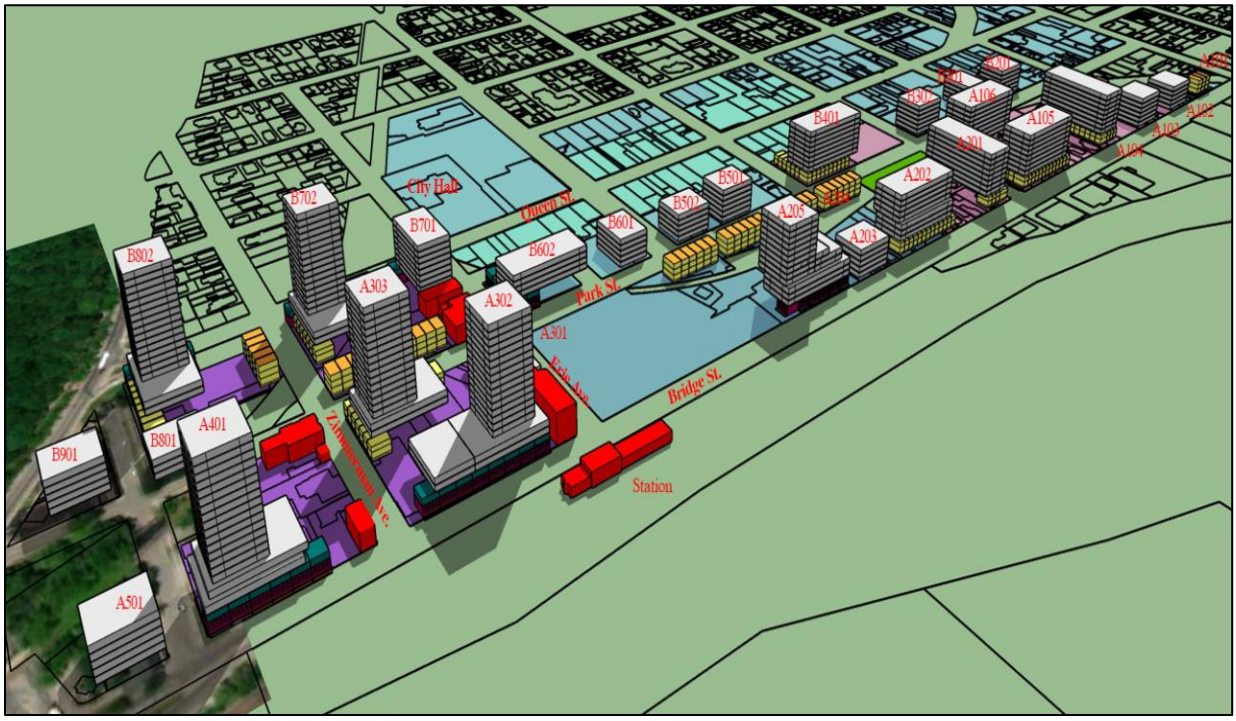
The Niagara Falls VIA Rail/GO Transit Station Area Zoning map from the Region of Niagara Falls provides a block-by-block summary of potential developments based on the land use policies of the Secondary Plan. It is assumed that these developments will reach build-out within the 2041 horizon year. Blocks ‘A’ and ‘B’ refer to developments south of Bridge Street and south of Park Street, respectively, as shown in Figure 3.1. The potential developments and associated land uses are summarized in Table 3.1.

Since the completion of the traffic analysis and justification of transportation needs, the Calibrex development, which is located in the southwest quadrant of the Zimmerman Avenue and Park Street intersection (Block B7 in **Error! Reference source not found.**), proposed a new site composition that resulted in a higher residential unit count and less commercial space than previously proposed. However, given the excess capacity at intersections near the site under future 2041 conditions (as presented in the subsequent sections), the anticipated change in traffic will not result in significant change to the findings. In addition, it is also recognized that these site statistics are still preliminary and subject to change.

Table 3.1: Potential Developments Summary

Block	Townhouse (Units)	Mid-Rise Apartment Building (Units)	High-Rise Apartment Building (Units)	Commercial Area (m^2)	Office Area (m^2)
A	165	836	644	2,800	2,128
B	74	750	160	2,352	2,352
Total	**239**	**1,586**	**804**	**5,152**	**4,480**

Figure 3.1: Potential Secondary Plan Developments



Trip generation for the proposed developments was based on data contained in the *Trip Generation Manual, 10th Edition*, published by the Institute of Transportation Engineers (ITE). For a conservative analysis, no trip reduction rates were applied. The trips generated from the Secondary Plan development were adjusted to account for the 5% non-auto trips in the ITE trip data. This trip total was further disaggregated into modes according to the breakdown in

Table 3.2. The non-auto mode split of 15% was derived partly based on the projected 10% total non-auto use by 2031 as per the *Niagara Falls Sustainable Transportation Master Plan* (AECOM, 2011). The transit mode split was further increased to reflect the transit improvements discussed in Section 3.2.

Table 3.2: Mode Split Breakdown for Secondary Plan Trips

	Mode Split	AM Trips	PM Trips
Auto	85%	916	1,257
Transit	5%	54	74
Walk	9%	97	133
Cycle	1%	11	15
ITE Total Trips		**1,078**	**1,479**
ITE Vehicle Trips		**1,024**	**1,405**

Trip distribution was derived from TTS data. For trip assignment, it was assumed that trips travelling to/from Blocks 'A' and Blocks 'B' will take Bridge Street and Park Street, respectively, to enter/ exit the site. Since site driveways for Secondary Plan developments were unknown, it is assumed that the majority (80%) of trips will access sites from Bridge Street or Park Street and the remaining trips will access sites via local north-south roads.

The estimated distribution of site trips is summarized in Table 3.3.

Table 3.3: Trip Distribution

To/From	Via	Distribution
North	Victoria Avenue	21%
	River Street / Niagara Parkway	24%
South	Victoria Avenue	24%
	River Street / Niagara Parkway	8%
	Ontario Ave	4%
West	Bridge Street	19%

3.4 Future Traffic Conditions

3.4.1 Future Traffic Volumes

Future traffic volumes will consist of existing traffic, plus background traffic (50 vehicles or 1.5%) including additional traffic generated as a result of the Thorold Stone Road extension currently under construction (50 vehicles or 1.5%) and traffic generated from the Secondary Plan development. Traffic volumes were projected to the design year of 2041. Future traffic volumes are shown in Figure 3.2.

3.4.2 Future Traffic Operations

Future traffic operations were assessed using Synchro 11 (HCM 2000) based on traffic volumes shown in Figure 3.2. Future traffic operations are shown in Table 3.4. As per the City's Traffic Impact Study Guidelines, individual movements that exceed LOS E at unsignalized intersections should be identified for road or intersection improvement.

Figure 3.2: 2041 Future Traffic Volumes

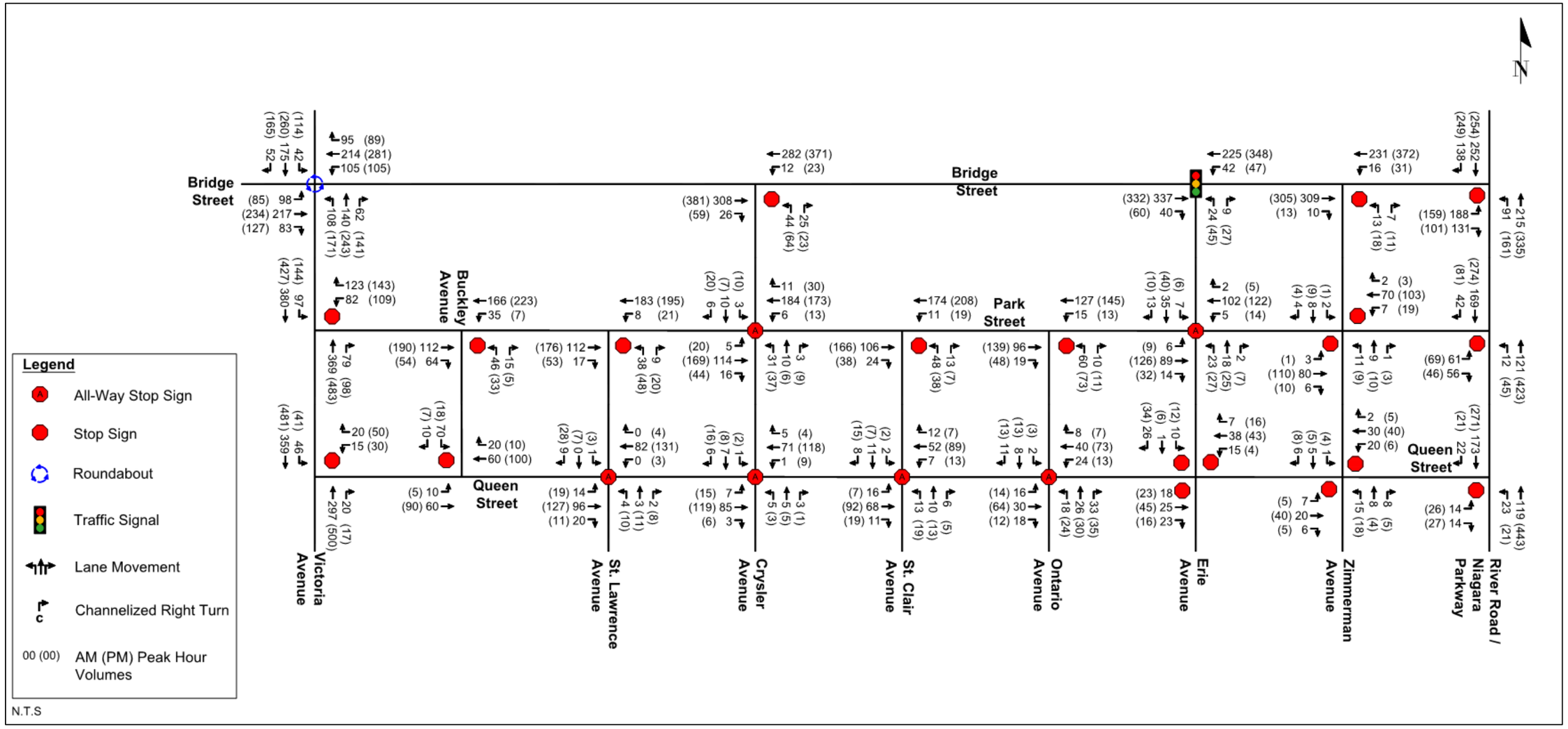


Table 3.4: 2041 Future Unsignalized Intersection Operations

Movement	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	LOS	Delay (s)	v/c	LOS	Delay (s)
Bridge Street and Crysler Avenue						
EBTR	0.21	A	0	0.28	A	0
WBLT	0.01	A	0.4	0.02	A	0.8
NBLR	0.17	B	14.5	0.3	C	20.8
Bridge Street and Zimmerman Avenue						
EBTR	0.2	A	0	0.2	A	0
WBLT	0.01	A	0.6	0.03	A	0.9
NBLR	0.05	B	12.8	0.08	C	15.1
Bridge Street and River Road / Niagara Parkway						
EBL	0.81	F (C)*	54.5	0.73	F (C)*	53.4
EBR	0.24	B	11.9	0.15	B	10.9
NBL	0.11	A	8.7	0.13	A	8.3
SBL	0.1	A	0	0.15	A	0
Park Street and Ontario Avenue						
EBTR	0.07	A	0	0.12	A	0
WBLT	0.01	A	0.9	0.01	A	0.7
NBLR	0.11	B	10.9	0.15	B	12
Park Street and Erie Avenue						
EBLTR	0.14	A	7.9	0.22	A	8.5
WBLTR	0.14	A	8	0.19	A	8.5
NBLTR	0.06	A	7.9	0.09	A	8.2
SBLTR	0.07	A	7.8	0.08	A	8.1
Park Street and Zimmerman Avenue						
EBLTR	0.12	A	9.8	0.16	B	10
WBLTR	0.1	A	9.9	0.17	B	10.3
NBLTR	0.01	A	3.8	0.01	A	3.1
SBLTR	0	A	1	0.00	A	0.5
Queen Street and Erie Avenue						
EBLTR	0.10	A	7.4	0.12	A	7.7
WBLTR	0.09	A	7.5	0.09	A	7.5
SBLTR	0.06	A	7.4	0.09	A	7.7

Note: F (C) denotes level of service 'C' based on a two-staged left turn

Under future conditions, during both peak hours, all movements are operating and will operate with excess capacity and a level of service C or better, with the exception of the eastbound left movement at Niagara Parkway / River Road and Bridge Street. This movement is forecasted to operate with a LOS of F with maximum (95th percentile) queues of 50 m AM and 37 m PM. It is noted, however, the analysis is a conservative approach, where vehicles were assumed to wait for gaps such that left turns could be made in one movement.

Commonly, these left-turning vehicles would take advantage of the centre median area to cross traffic, reducing delays and queues at the stop-controlled approach. Modelling of the two-stage entry on Synchro, for this movement indicates a more realistic LOS of C (20 sec delay) and a 21 m queue which will not obstruct vehicles at Cataract Avenue on the west.

Traffic signal warrant analysis was assessed; signal warrants will not be met at this intersection based on 2041 projected volumes. It is recommended that future traffic be monitored at Niagara Parkway / River Road and Bridge Street through traffic impact studies for developments in the Secondary Plan Area to determine if traffic signals are warranted based on actual traffic counts or updated forecasts.

3.4.3 Left Turn Warrants

The warrants for left turn lanes were reviewed at intersections along the corridor, based on Ministry of Transportation monographs contained in the *MTO Design Supplement for Geometric Design Guide for Canadian Roads – April 2020*.

The results for the Bridge Street / Erie Avenue intersection summarized in Table 3.5, indicate that afternoon peak hour volumes just meet the warrant for a left turn lane. However, this analysis assumes a design speed of 60 km/h, which is 10 km/h higher than the assumed unposted speed of 50 km/h along Bridge Street. The warrant is not met based on a design speed of 50 km/h.

Table 3.5: Left Turn Lane Warrant Analysis

Location: Bridge Street / Erie Avenue		
Design Speed = 60 km/h	**Time Period = 2041 Total Traffic**	
Approach Direction	**Westbound**	
Peak Hours	Morning	Afternoon
Advancing Traffic	267	395
Opposing Traffic	377	392
Left Turning Traffic	42	47
Percentage of Left Turning Traffic	15.7%	11.9%
Reference: *MTO Design Supplement for Geometric Design Guide for Canadian Roads – April 2020*	Exhibit 9A-8	Exhibit 9A-7
Storage Length or Warrant	**Left Turn Lane Not Warranted**	**Left Turn Lane Warranted**

It should also be noted that there is turning movement activity along Bridge Street at Erie Avenue, Crysler Avenue and driveways at the west end of the corridor (near Victoria Avenue). However, exclusive turn lanes or two-way centre left turn lanes along other segments of the corridor are not warranted in the short term and warrants by 2041 are dependent upon access locations for new development blocks. Additionally, a left turn lane would increase the pedestrian crossing distance. This is not ideal considering the higher active transportation mode split associated with sites in close proximity to transportation facilities (i.e., GO station, VIA Station and Transit Terminal).

It is noted that it is Region of Niagara policy to implement left turn lanes at signalized intersections.

3.5 Future Transit Needs and Opportunities

There are plans to replace the existing bus terminal currently on the south side of Bridge Street. Plans include an upgrade the Via Rail site and adjacent Niagara Region lands on the north side of Bridge Street, to provide bus bays and parking.

Future bus demand has been estimated through forecasts from the Niagara Region Transportation Master Plan and information provided by City of Niagara Falls and other transit providers. Table 3.6 summarizes future transit demand.

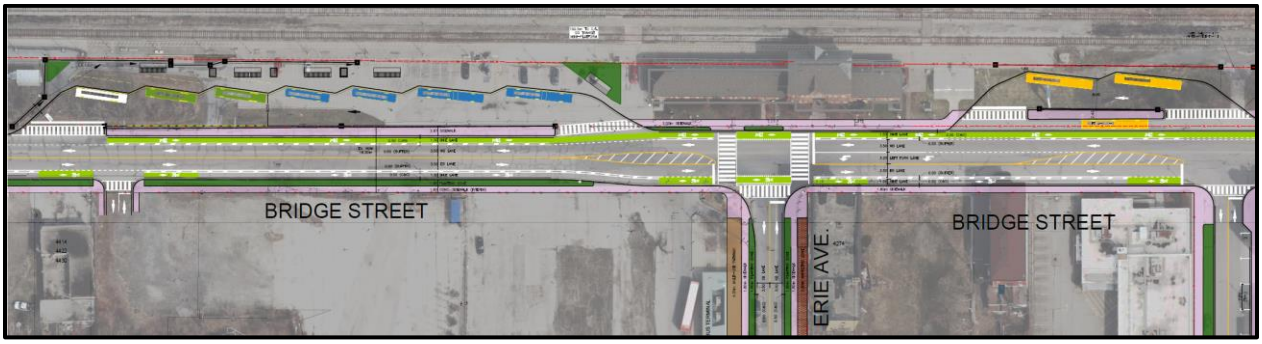
Table 3.6: Future 2041 Transit Demand

Transit Service Provider	Future 2031 Annual Ridership	Future 2041 Annual Ridership	Average Daily 2041 Ridership	Number of Weekday Routes	Ridership per bus
GO Bus	130,952	194,480	748	4	50
City Transit	29,582	44,200	170	3	4
WEGO	101,475	150,800	580	1	39
Total	**262,009**	**389,480**			

Based on transit forecasts and discussions with the Region and transit providers, it is anticipated that bus bay requirements will include: 1 active bay for and one layover for GO Transit, 4 bays for Niagara Falls Local Transit, 3 bays for WEGO and likely a bay for private operators. There are safety and operational benefits to reconfigure the preliminary Precinct Plan to accommodate additional bus bays off-street and to address operational and safety issues.

A preliminary concept plan along Bridge Street, east and west of Erie Avenue, was developed as illustrated in Figure 3.3. It develops off-road bus bays to accommodate future bus demands and the planned conversion of the existing bus terminal site is planned to a parking facility.

Figure 3.3: GO Station Preliminary Precinct Plan

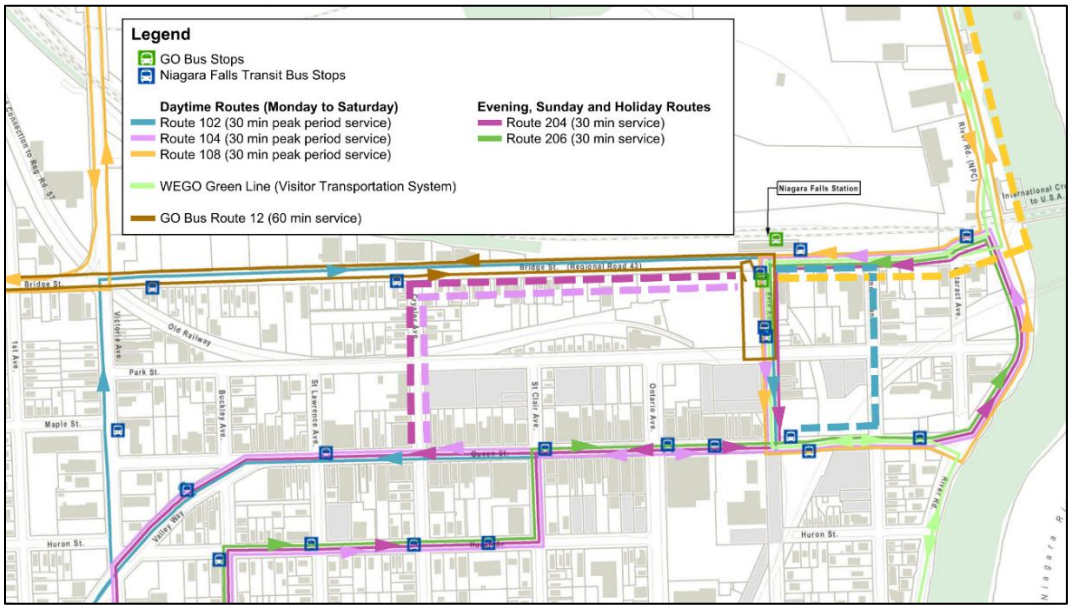


The 2019 Metrolinx IBC that outlines the planned service pattern of 11 trains a day in/out of Niagara Falls station in the near future (Option 2). This level of transit service will result in higher pedestrian and traffic levels.

Erie Avenue between Queen Street and Bridge Street is a key road link that serves as a potential future connection for active transportation from the Olympic Torch Trail to the GO Station and one of three north-south road connections providing circulation for vehicle traffic. The four local transit routes as well as the WEGO Green Line, travel along Erie Street.

Alternative routing was investigated to determine if it was possible to better accommodate alternative other modes of travel on Erie Street. Options would require transit travel along Crysler Avenue or Zimmerman Avenue. The merits of these options would be based on an assessment of the impacts to service levels and operating conditions on those streets. Figure 3.4 illustrates these potential route diversions.

Figure 3.4: Possible Transit Route Changes

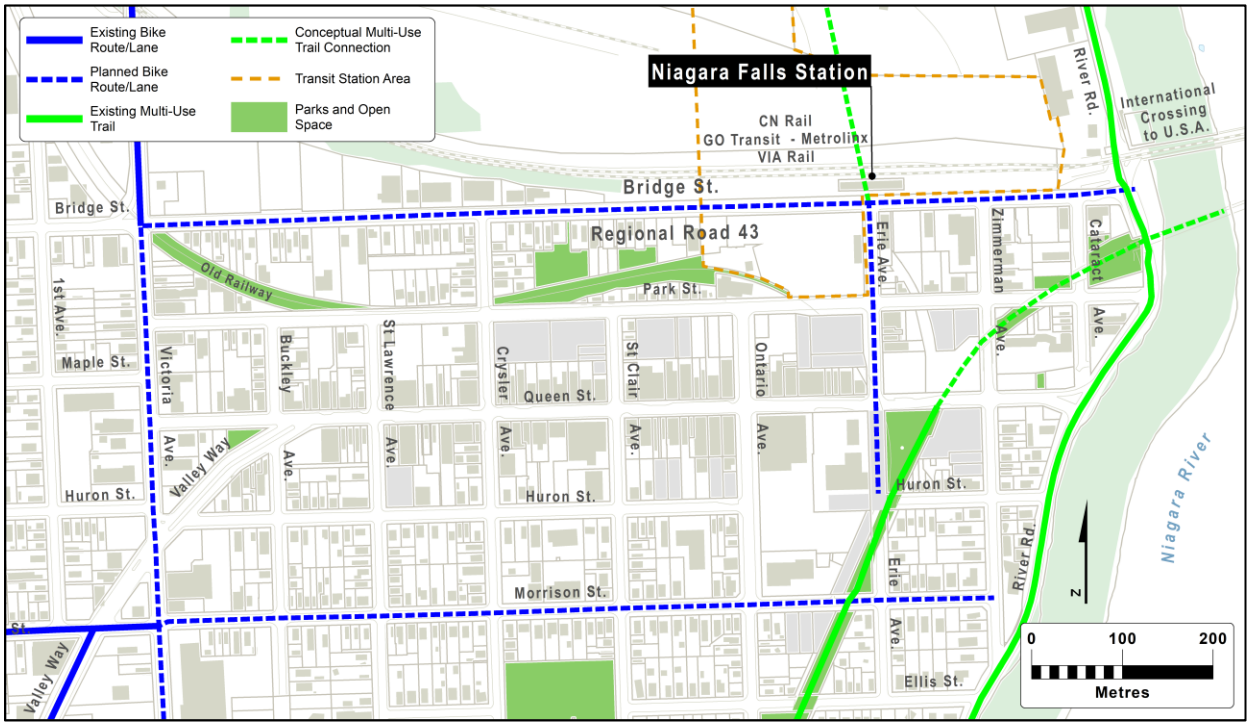


3.6 Future Active Transportation Needs and Opportunities

Previous planning studies, by Niagara Region, City of Niagara Falls, and Metrolinx, have identified opportunities for new pedestrian and cycling connections (see Figure 3.5). Bridge Street has been identified in the Strategic Cycling network in the Niagara Region Transportation Master Plan.

Both Bridge Street and Erie Avenue are identified as a planned bike route in the Downtown Niagara Falls GO Transit Station Draft Secondary Plan. The old railway corridor that extends from the Bridge Street and Victoria Avenue intersection southeast to Park Street has been identified as a park and open space and as such, can accommodate walking and cycling.

Figure 3.5: Planned Active Transportation Routes



As with existing conditions, bus stops are well situated. All bus stops for local transit are within a 450 m walking distance (which is approximately 5 min of walk time) to residential areas. It is recommended that pedestrian volumes be monitored at Bridge Street / Erie Avenue with the implementation of new transit improvements discussed in Section 3.2. A pedestrian crossing may be warranted at this location in the future to facilitate the influx of passengers using the GO Transit.

3.7 Bridge Street / Erie Avenue Intersection Traffic Control

The Bridge Street and Erie Avenue intersection was analysed to assess traffic level of service in the short term and in the longer term with full build out of the secondary plan area. It is recognized that traffic conditions immediately adjacent to Niagara Falls VIA Rail/GO Transit Station has unique traffic control needs. Traffic, and particularly pedestrian traffic, is highly focused on GO train arrivals and departures. There is a need to accommodate pedestrian crossings of Bridge Street and a need to manage the impact of pedestrian flow on vehicular traffic, including bus traffic. Traffic analysis has been undertaken, including the direction provided by OTM Book 15.

Notwithstanding the findings of traffic signal warrants, there are other considerations related to the need for controlled crossings. Traffic signals can be identified as needed based on pedestrian traffic as defined in OTM Book 15 – Pedestrian Crossing Treatments. A review of OTM Book 15 includes references related to pedestrian crossings and controlled crossings including: traffic control signals, intersection pedestrian signals (IPS) and pedestrian crossovers. The following considerations are identified in OTM Book 15:

- “Installation of a pedestrian treatment is warranted if the subject site exceeds both the minimum pedestrian volume and tIhe minimum pedestrian delay criteria for a period of 8-hour”,
- “If a traffic signal (i.e., IPS, MPS, or full traffic signal) is not warranted at a site, the next step as shown in Figure 2 is to check whether a PXO is warranted” and
- “Figure 3 and Figure 4 show the graphs used to determine whether a pedestrian control treatment system is justified under the 8-hour criterion”.

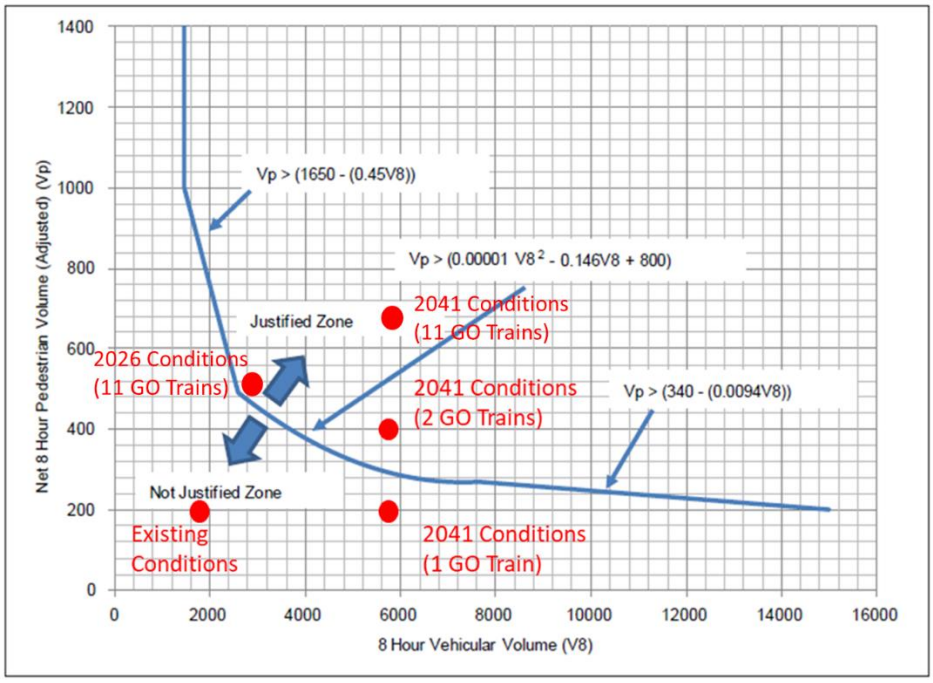
Existing weekday peak hour pedestrian volumes were counted and recorded as 7 pedestrians over 4 hours. We note however, subsequent to those counts, the GO rail station began operations and ridership has been documented at over 200 riders. The majority of riders are anticipated to be pedestrians crossing Bridge Street at Erie Avenue to/from the existing bus terminal and future parking lot on the southwest corner of Bridge Street and Erie Avenue. Other destinations include the commercial area on Queen Street, residential areas to the south and the Olympic Torch Trail. In the future there will be many pedestrians walking between the GO station and to the adjacent developing lands.

GO train operations currently include 1 outbound morning train and inbound evening train during the week and four trains (one every four hours) on weekends. Up to an estimated 200 pedestrians are anticipated to cross Bridge Street per train during regular (non-pandemic periods). A second train within a 4-hour period could accommodate similar demand as the Secondary Plan area develops.

Existing vehicle volumes on Bridge Street at Erie Avenue is 1,821 vehicles over 8 hours and 986 vehicles over 4 hours. The projected 2041 8-hour volume is 5,310 vehicles and projected 4-hour volume is 2,877 vehicles.

A pedestrian control treatment system is not currently justified during weekdays with one train within an 8-hour period as illustrated in Figure 3.6. It is anticipated when GO rail service increases traffic and pedestrian volumes will warrant traffic signals.

Figure 3.6: Pedestrian Control Treatment System Justification



OTM Book 15 also states that “if a traffic signal (i.e., IPS, MPS, or full traffic signal) is not warranted at a site, the next step is to check whether a PXO is warranted”. Four-hour pedestrian and vehicle volumes can be used and compared to recommended minimum thresholds of 65 equivalent adult pedestrians crossing and 395 vehicles in the conflicting traffic stream. Existing traffic levels and estimated pedestrian levels (with a train arrival or departure) will meet the thresholds for a pedestrian crossover.

OTM Book 15 acknowledges that the selection of the appropriate treatment system “should be based on sound engineering judgement” and that “warrants should not be used as a substitute for engineering judgement”. Book 15 includes a decision support tool to help assess the appropriate traffic control treatment.

It is noted that a pedestrian crossover may result in continuous pedestrian flows crossing Bridge Street at train arrival and departure times, which could result in continuous long delays to traffic and bus movements in the GO station area. It is our opinion that a traffic control signal would be more appropriate for implementation, particularly with the parking lot is completed at the southwest corner of the Bridge Street and Erie Avenue intersection.

With signal operations, Region of Niagara policy would be to include an exclusive left turn lane for westbound traffic on Bridge Street at Erie Avenue.

4.0 Policy and Streetscape Objectives

Both the Region of Niagara and the City of Niagara Falls embrace the philosophy of "complete streets" in determining design typologies for street design. Complete street designs support and enhance the local neighbourhood context and character, providing streets that meet travel needs, providing access to businesses and homes to maintain prosperity and fulfilling their placemaking role as public spaces. The goals of complete streets in these overlapping needs is summarized in the following:

- Streets for People's Travel Needs – providing safe, accessible, multi-modal choices; connectivity in a seamless network.
- Streets for Access and Prosperity – providing access to jobs, retail, goods/services; ensuring that the travel options are inclusive of all incomes, races, ages, genders and abilities.
- Streets for Placemaking – creating public spaces that reflect the existing and planned function, scale and character of a neighbourhood.

Street designs should provide sufficient flexibility to change with time, to respond the growth, preferences or technologies. Understanding the roles and relationships of a street with its surrounding context is a critical step in the complete streets' design approach. Street types and key objectives for each type have been identified that may be used to support the design decisions. It is recognized that the street ROW must accommodate different and competing roles including accommodation of motor vehicle travel, pedestrians, cyclists, transit, on-street parking, streetscaping, municipal infrastructure and in some cases a marketing zone.

The space allocation to these varying interests is the challenge in developing complete streets' designs. However, it should be noted that there will be contexts where complete streets may not be the preferred solution, due to ROW constraints or to the overall compatibility of the competing uses. For example, "shared streets (i.e., such as woonerf designs) may be considered in areas where motor vehicle travel is low, or restricted, as a method to enhance the travel by other modes which are more compatible with the adjacent development or environmental opportunities or constraints in such areas.

The Niagara Falls Urban Design Guidelines (2007) provides some planning context for the study area. The vision for the downtown districts in the Urban Design Guideline was intended to encourage revitalization of these areas, protection of heritage buildings and views, and provision of a high degree of walkability, through permeability in the pedestrian routes. A number of buildings have been designated for protection under the *Ontario Heritage Act*, including the Via Station (4267 Bridge Street), the Imperial Bank (4190 Bridge Street) and the Customs House (4582 Zimmerman Avenue). A number of other buildings/blocks have been recognized to be of cultural heritage value, including the Woodruff Block (4238 – 4240 Bridge Street), the Empire Block (4600 – 4610 Erie Avenue, Clark's Hardware (4624 Erie Avenue), and Rosberg's (4624 Erie Avenue).

5.0 Summary of Findings – Needs and Opportunities

5.1 Summary of Findings

A collision analysis within the study area did not indicate any obvious patterns related to location, as collisions were not concentrated at a particular intersection or road segment. There are no obvious causal relationships between collisions and traffic conditions or road geometry.

Under future traffic conditions, during both peak hours, all movements are operating and will operate with excess capacity and a level of service C or better. It is noted that the eastbound left movement at Niagara Parkway / River Road and Bridge Street will operate at LOS C with a two-stage entry analysis (a conservative single movement analysis indicates a LOS of F). It is recommended that future traffic be monitored at Niagara Parkway / River Road and Bridge Street through traffic impact studies for developments in the Secondary Plan Area to determine if traffic signals are warranted in the longer term.

The existing two through traffic lanes on Bridge Street (one lane per direction) is sufficient to accommodate future travel demands including the development traffic associated with the GO Station Secondary Plan. Future traffic volumes will meet the warrants for a left-turn lane on Bridge Street westbound at Erie Avenue by 2041. Depending on the location of accesses on Bridge Street, there may be future warrants for additional left-turn lane locations. It is recommended that traffic signals be installed at the Bridge Street and Erie Avenue intersection given the existing traffic and estimated pedestrian levels, as well as anticipated increases to pedestrian volumes with GO rail service increases.

There are discontinuities in the existing sidewalk network, particularly on the north side of Bridge Street. Existing sidewalks west of Erie Avenue have substandard width; furthermore, there are streetlight and utilities that obstruct the sidewalk east and immediately west of Erie Avenue. There are currently no controlled pedestrian crossing locations for Bridge Street. Bridge Street has lower than average pedestrian LOS compared to other streets due to its narrow and non-continuous sidewalks.

Cyclist LOS determined by BCI is moderately low (LOS of D) for most streets and is very low (LOS of E) for Bridge Street. There are opportunities to improve cycling accommodation on Bridge Street, consistent with recent planning documents. There is also an opportunity to connect the Olympic Torch Trail to the future GO Rail station.

Existing bus stops are well-situated. It is recommended that pedestrian volumes be monitored at Bridge Street / Erie Avenue with the implementation of new transit improvements. Alternatives for the Niagara Falls VIA Rail/GO Transit Station and proposed bus terminal on the north side of Bridge Street could be investigated further to identify alternatives that limit transit operations on Bridge Street for safer and more efficient operations.

5.2 Needs and Opportunities

The alternative solutions will address the following needs and opportunities:

- Continuity of pedestrian network on both sides of streets within the study area, meeting AODA requirements;
- Dedicated cycling connections along Bridge Street and a connection between the Olympic Torch Trail to Bridge Street and the GO Rail Station;
- Features in support of transit operations including bus operational bays and pedestrian boarding areas, passenger pick-up and drop-off and short-term parking in the vicinity of the GO rail station;
- Traffic control signal at the Bridge Street / Erie Avenue intersection;
- Protection for dedicated left turn lanes on Bridge Street; and
- Opportunities for wider boulevard space in support of streetscape and gateway features and in support of ground level commercial development.

R.J. Burnside & Associates Limited

Nansen Feng, E.I.T
Transportation Planner

Xinli Tu, E.I.T.
Transportation Planner

Ray Bacquie, P.Eng., MBA
Project Manager / Senior Vice President
RB:lm

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HCM Unsignalized Intersection Capacity Analysis
1: Niagara Parkway / River Road & Bridge Street

10/04/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	51	27	159	222	48
Future Volume (Veh/h)	42	51	27	159	222	48
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	53	65	34	201	281	61
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	552	283	283			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	552	283	283			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	89	91	97			
cM capacity (veh/h)	482	759	1119			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	53	65	34	201	281	61
Volume Left	53	0	34	0	0	0
Volume Right	0	65	0	0	0	61
cSH	482	759	1119	1700	1700	1700
Volume to Capacity	0.11	0.09	0.03	0.12	0.17	0.04
Queue Length 95th (m)	2.8	2.1	0.7	0.0	0.0	0.0
Control Delay (s)	13.4	10.2	8.3	0.0	0.0	0.0
Lane LOS	B	B	A			
Approach Delay (s)	11.6		1.2		0.0	
Approach LOS	B					

Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	28.5%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Niagara Parkway / River Road & Park Street

10/04/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	6	3	57	89	12
Future Volume (Veh/h)	5	6	3	57	89	12
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)	5	7	3	62	97	13
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	172	104	110			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	172	104	110			
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	99	100			
cM capacity (veh/h)	817	951	1480			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	12	65	110
Volume Left	5	3	0
Volume Right	7	0	13
cSH	890	1480	1700
Volume to Capacity	0.01	0.00	0.06
Queue Length 95th (m)	0.3	0.0	0.0
Control Delay (s)	9.1	0.4	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	0.4	0.0
Approach LOS	A		

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	15.4%	ICU Level of Service		A
Analysis Period (min)	15			

Intersection Sign configuration not allowed in HCM analysis.

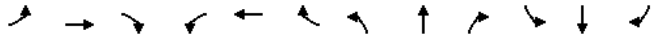
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	93	0	0	75	0	0
Future Volume (Veh/h)	93	0	0	75	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	101	0	0	82	0	0
Pedestrians						
Lane Width (m)						
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			101		183	101
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			101		183	101
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1491		806	954

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	101	82	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1491	1700
Volume to Capacity	0.06	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	0.0
Approach LOS			A

Intersection Summary				
Average Delay		0.0		
Intersection Capacity Utilization		8.2%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
5: Cataract Avenue & Park Street

10/04/2020



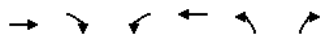
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	13	0	0	15	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	13	0	0	15	0	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	14	0	0	16	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	16			14			30	30	14	30	30	16
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	16			14			30	30	14	30	30	16
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1602			1604			979	863	1066	979	863	1063

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	14	16	0	0
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1604	1700	1700
Volume to Capacity	0.01	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS			A	A
Approach Delay (s)	0.0	0.0	0.0	0.0
Approach LOS			A	A

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	6.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
6: Zimmerman Avenue & Bridge Street

10/04/2020



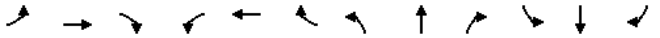
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	86	7	7	68	7	7
Future Volume (Veh/h)	86	7	7	68	7	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	93	8	8	74	8	8
Pedestrians						
Lane Width (m)						
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			101		187	97
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			101		187	97
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1491		798	959

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	101	82	16
Volume Left	0	8	8
Volume Right	8	0	8
cSH	1700	1491	871
Volume to Capacity	0.06	0.01	0.02
Queue Length 95th (m)	0.0	0.1	0.4
Control Delay (s)	0.0	0.8	9.2
Lane LOS		A	A
Approach Delay (s)	0.0	0.8	9.2
Approach LOS			A

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	19.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Zimmerman Avenue & Park Street

10/04/2020



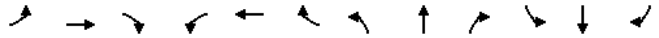
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	10	3	1	12	2	3	9	1	2	8	4
Future Volume (Veh/h)	3	10	3	1	12	2	3	9	1	2	8	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	11	3	1	13	2	3	10	1	2	9	4
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	40	32	11	40	34	10	13			11		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	40	32	11	40	34	10	13			11		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	98	100	100			100		
cM capacity (veh/h)	949	858	1070	950	856	1071	1606			1608		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	17	16	14	15
Volume Left	3	1	3	2
Volume Right	3	2	1	4
cSH	905	884	1606	1608
Volume to Capacity	0.02	0.02	0.00	0.00
Queue Length 95th (m)	0.4	0.4	0.0	0.0
Control Delay (s)	9.1	9.1	1.6	1.0
Lane LOS	A	A	A	A
Approach Delay (s)	9.1	9.1	1.6	1.0
Approach LOS	A	A		

Intersection Summary				
Average Delay			5.4	
Intersection Capacity Utilization			13.3%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
8: Zimmerman Avenue & Queen Street

10/04/2020



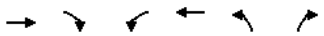
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	20	6	20	30	2	15	8	8	1	5	6
Future Volume (Veh/h)	7	20	6	20	30	2	15	8	8	1	5	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	22	7	22	33	2	16	9	9	1	5	7
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	35			29			129	120	26	133	123	34
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	35			29			129	120	26	133	123	34
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			98	99	99	100	99	99
cM capacity (veh/h)	1576			1584			822	755	1050	812	753	1039

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	37	57	34	13
Volume Left	8	22	16	1
Volume Right	7	2	9	7
cSH	1576	1584	851	890
Volume to Capacity	0.01	0.01	0.04	0.01
Queue Length 95th (m)	0.1	0.3	0.9	0.3
Control Delay (s)	1.6	2.9	9.4	9.1
Lane LOS	A	A	A	A
Approach Delay (s)	1.6	2.9	9.4	9.1
Approach LOS			A	A

Intersection Summary				
Average Delay			4.7	
Intersection Capacity Utilization			17.7%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
9: Erie Avenue & Bridge Street

10/04/2020



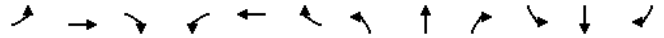
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	117	30	36	30	6	9
Future Volume (Veh/h)	117	30	36	30	6	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	141	36	43	36	7	11
Pedestrians						
Lane Width (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			177		281	159
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			177		281	159
tC, single (s)			4.4		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.3
p0 queue free %			97		99	99
cM capacity (veh/h)			1232		688	892

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	177	79	18
Volume Left	0	43	7
Volume Right	36	0	11
cSH	1700	1232	800
Volume to Capacity	0.10	0.03	0.02
Queue Length 95th (m)	0.0	0.8	0.5
Control Delay (s)	0.0	4.5	9.6
Lane LOS		A	A
Approach Delay (s)	0.0	4.5	9.6
Approach LOS			A

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
10: Erie Avenue & Park Street

10/04/2020



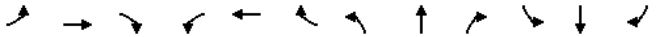
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	6	16	5	2	16	2	5	18	2	7	35	13
Future Volume (vph)	6	16	5	2	16	2	5	18	2	7	35	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	17	5	2	17	2	5	20	2	8	38	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	29	21	27	60
Volume Left (vph)	7	2	5	8
Volume Right (vph)	5	2	2	14
Hadj (s)	-0.02	0.00	0.03	-0.08
Departure Headway (s)	4.1	4.1	4.1	4.0
Degree Utilization, x	0.03	0.02	0.03	0.07
Capacity (veh/h)	857	853	855	893
Control Delay (s)	7.2	7.2	7.2	7.2
Approach Delay (s)	7.2	7.2	7.2	7.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	13.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
11: Erie Avenue & Queen Street

10/04/2020



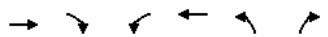
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	18	25	23	15	38	7	0	0	0	10	1	26
Future Volume (vph)	18	25	23	15	38	7	0	0	0	10	1	26
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	23	32	30	19	49	9	0	0	0	13	1	34

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	85	77	48
Volume Left (vph)	23	19	13
Volume Right (vph)	30	9	34
Hadj (s)	-0.06	-0.02	-0.05
Departure Headway (s)	4.0	4.1	4.2
Degree Utilization, x	0.10	0.09	0.06
Capacity (veh/h)	875	868	820
Control Delay (s)	7.4	7.5	7.4
Approach Delay (s)	7.4	7.5	7.4
Approach LOS	A	A	A

Intersection Summary			
Delay		7.4	
Level of Service		A	
Intersection Capacity Utilization	24.7%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
12: Ontario Avenue & Park Street

10/04/2020



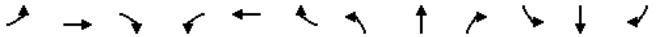
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	23	8	13	35	40	10
Future Volume (Veh/h)	23	8	13	35	40	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	9	14	38	43	11
Pedestrians						
Lane Width (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			34		96	30
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			34		96	30
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		95	99
cM capacity (veh/h)			1578		896	1045

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	34	52	54
Volume Left	0	14	43
Volume Right	9	0	11
cSH	1700	1578	923
Volume to Capacity	0.02	0.01	0.06
Queue Length 95th (m)	0.0	0.2	1.4
Control Delay (s)	0.0	2.0	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	2.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay		4.3	
Intersection Capacity Utilization	19.2%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
13: Ontario Avenue & Queen Street

10/04/2020



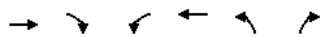
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	30	18	24	40	8	18	26	33	2	8	11
Future Volume (vph)	16	30	18	24	40	8	18	26	33	2	8	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	17	32	19	26	43	9	19	28	35	2	9	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	68	78	82	23
Volume Left (vph)	17	26	19	2
Volume Right (vph)	19	9	35	12
Hadj (s)	-0.07	0.00	-0.21	-0.30
Departure Headway (s)	4.1	4.2	4.0	4.0
Degree Utilization, x	0.08	0.09	0.09	0.03
Capacity (veh/h)	843	833	854	858
Control Delay (s)	7.5	7.6	7.4	7.1
Approach Delay (s)	7.5	7.6	7.4	7.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay		7.5	
Level of Service		A	
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
14: St. Clair Avenue & Park Street

10/04/2020



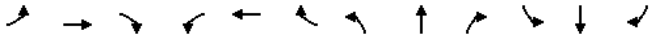
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	35	12	9	74	25	13
Future Volume (Veh/h)	35	12	9	74	25	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	13	10	80	27	14
Pedestrians						
Lane Width (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			51		144	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			51		144	44
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	99
cM capacity (veh/h)			1555		843	1025

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	51	90	41
Volume Left	0	10	27
Volume Right	13	0	14
cSH	1700	1555	897
Volume to Capacity	0.03	0.01	0.05
Queue Length 95th (m)	0.0	0.1	1.1
Control Delay (s)	0.0	0.9	9.2
Lane LOS		A	A
Approach Delay (s)	0.0	0.9	9.2
Approach LOS			A

Intersection Summary			
Average Delay		2.5	
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
15: St. Clair Avenue & Queen Street

10/04/2020



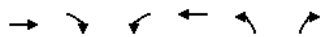
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	68	11	7	52	12	13	10	6	2	11	8
Future Volume (vph)	16	68	11	7	52	12	13	10	6	2	11	8
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	18	76	12	8	58	13	15	11	7	2	12	9

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	106	79	33	23
Volume Left (vph)	18	8	15	2
Volume Right (vph)	12	13	7	9
Hadj (s)	0.02	0.02	-0.04	-0.22
Departure Headway (s)	4.1	4.1	4.3	4.1
Degree Utilization, x	0.12	0.09	0.04	0.03
Capacity (veh/h)	854	849	795	830
Control Delay (s)	7.7	7.6	7.5	7.2
Approach Delay (s)	7.7	7.6	7.5	7.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay		7.6	
Level of Service		A	
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
16: Crysler Avenue & Bridge Street

10/04/2020



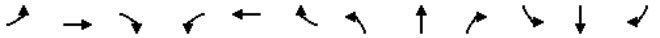
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	105	10	9	35	10	25
Future Volume (Veh/h)	105	10	9	35	10	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	11	10	38	11	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	376					
pX, platoon unblocked						
vC, conflicting volume			125		178	120
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			125		178	120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	97
cM capacity (veh/h)			1462		807	932

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	125	48	38
Volume Left	0	10	11
Volume Right	11	0	27
cSH	1700	1462	892
Volume to Capacity	0.07	0.01	0.04
Queue Length 95th (m)	0.0	0.2	1.0
Control Delay (s)	0.0	1.6	9.2
Lane LOS		A	A
Approach Delay (s)	0.0	1.6	9.2
Approach LOS			A

Intersection Summary			
Average Delay		2.0	
Intersection Capacity Utilization	19.0%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
17: Crysler Avenue & Park Street

10/04/2020



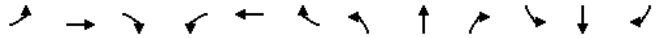
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	48	2	5	71	11	4	10	3	3	10	6
Future Volume (vph)	5	48	2	5	71	11	4	10	3	3	10	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	52	2	5	77	12	4	11	3	3	11	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	59	94	18	21
Volume Left (vph)	5	5	4	3
Volume Right (vph)	2	12	3	7
Hadj (s)	0.03	-0.03	-0.02	-0.14
Departure Headway (s)	4.1	4.0	4.2	4.1
Degree Utilization, x	0.07	0.10	0.02	0.02
Capacity (veh/h)	860	883	813	840
Control Delay (s)	7.4	7.5	7.3	7.2
Approach Delay (s)	7.4	7.5	7.3	7.2
Approach LOS	A	A	A	A

Intersection Summary				
Delay		7.4		
Level of Service		A		
Intersection Capacity Utilization		15.6%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
18: Crysler Avenue & Queen Street

10/04/2020



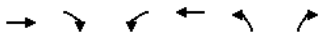
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	85	3	1	71	5	5	5	3	1	7	6
Future Volume (vph)	7	85	3	1	71	5	5	5	3	1	7	6
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	8	91	3	1	76	5	5	5	3	1	8	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	102	82	13	15
Volume Left (vph)	8	1	5	1
Volume Right (vph)	3	5	3	6
Hadj (s)	0.03	-0.02	-0.06	-0.23
Departure Headway (s)	4.1	4.0	4.2	4.1
Degree Utilization, x	0.12	0.09	0.02	0.02
Capacity (veh/h)	871	877	803	839
Control Delay (s)	7.6	7.4	7.3	7.1
Approach Delay (s)	7.6	7.4	7.3	7.1
Approach LOS	A	A	A	A

Intersection Summary				
Delay		7.5		
Level of Service		A		
Intersection Capacity Utilization		20.9%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
19: St. Lawrence Avenue & Park Street

10/04/2020



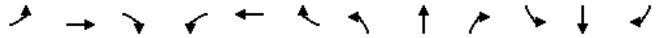
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	48	2	8	63	8	9
Future Volume (Veh/h)	48	2	8	63	8	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	2	9	68	9	10
Pedestrians						
Lane Width (m)						
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			54		139	53
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			54		139	53
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1551		849	1014

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	54	77	19
Volume Left	0	9	9
Volume Right	2	0	10
cSH	1700	1551	929
Volume to Capacity	0.03	0.01	0.02
Queue Length 95th (m)	0.0	0.1	0.5
Control Delay (s)	0.0	0.9	9.0
Lane LOS		A	A
Approach Delay (s)	0.0	0.9	9.0
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
20: St. Lawrence Avenue & Queen Street

10/04/2020



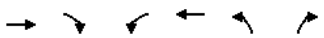
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	96	20	0	82	0	4	3	2	1	0	9
Future Volume (vph)	14	96	20	0	82	0	4	3	2	1	0	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	104	22	0	89	0	4	3	2	1	0	10

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	141	89	9	11
Volume Left (vph)	15	0	4	1
Volume Right (vph)	22	0	2	10
Hadj (s)	-0.05	0.07	-0.04	-0.53
Departure Headway (s)	4.0	4.1	4.4	3.9
Degree Utilization, x	0.16	0.10	0.01	0.01
Capacity (veh/h)	891	856	776	873
Control Delay (s)	7.7	7.6	7.4	6.9
Approach Delay (s)	7.7	7.6	7.4	6.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
Level of Service	A		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
21: Buckley Avenue & Park Street

10/04/2020



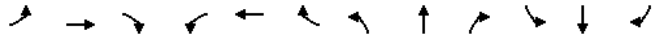
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	50	48	35	40	15	15
Future Volume (Veh/h)	50	48	35	40	15	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	52	38	43	16	16
Pedestrians						
Lane Width (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			106		199	80
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			106		199	80
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		98	98
cM capacity (veh/h)			1485		769	980

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	106	81	32
Volume Left	0	38	16
Volume Right	52	0	16
cSH	1700	1485	862
Volume to Capacity	0.06	0.03	0.04
Queue Length 95th (m)	0.0	0.6	0.9
Control Delay (s)	0.0	3.6	9.3
Lane LOS		A	A
Approach Delay (s)	0.0	3.6	9.3
Approach LOS			A

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	20.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
22: Valley Way/Buckley Avenue & Queen Street

10/04/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	60	0	0	60	20	0	0	0	70	0	10
Future Volume (Veh/h)	10	60	0	0	60	20	0	0	0	70	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	65	0	0	65	22	0	0	0	76	0	11
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	87			65			174	174	65	163	163	76
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	87			65			174	174	65	163	163	76
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	90	100	99
cM capacity (veh/h)	1509			1537			776	714	999	797	724	985

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	76	87	0	87
Volume Left	11	0	0	76
Volume Right	0	22	0	11
cSH	1509	1537	1700	817
Volume to Capacity	0.01	0.00	0.00	0.11
Queue Length 95th (m)	0.2	0.0	0.0	2.7
Control Delay (s)	1.1	0.0	0.0	9.9
Lane LOS	A		A	A
Approach Delay (s)	1.1	0.0	0.0	9.9
Approach LOS			A	A

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	21.5%	ICU Level of Service	A
Analysis Period (min)	15		

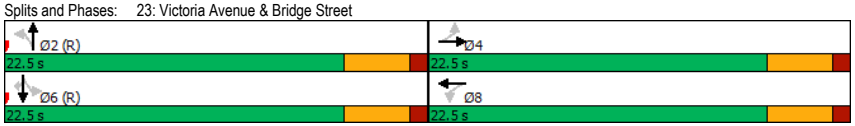
Timings
23: Victoria Avenue & Bridge Street

10/04/2020

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	98	84	11	39	62	87	8	152	52
Future Volume (vph)	98	84	11	39	62	87	8	152	52
Lane Group Flow (vph)	107	154	12	58	67	120	0	174	57
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.20	0.22	0.03	0.09	0.14	0.17		0.24	0.10
Control Delay	10.1	6.7	8.5	7.2	9.6	8.0		10.1	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	10.1	6.7	8.5	7.2	9.6	8.0		10.1	3.7
Queue Length 50th (m)	5.2	4.3	0.5	1.9	3.2	4.5		8.6	0.0
Queue Length 95th (m)	12.6	12.4	2.7	6.7	8.7	11.7		17.9	4.5
Internal Link Dist (m)		66.6		351.5		86.7		152.5	
Turn Bay Length (m)	45.0		30.0		25.0				
Base Capacity (vph)	534	709	427	658	471	698		732	577
Starvation Cap Reductn	0	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0
Reduced v/c Ratio	0.20	0.22	0.03	0.09	0.14	0.17		0.24	0.10

Intersection Summary
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 23: Victoria Avenue & Bridge Street



HCM Signalized Intersection Capacity Analysis
23: Victoria Avenue & Bridge Street

10/04/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	84	58	11	39	15	62	87	23	8	152	52
Future Volume (vph)	98	84	58	11	39	15	62	87	23	8	152	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5			4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99			1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.94		1.00	0.96		1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1764	1677		1540	1622		1730	1708			1850	1359
Flt Permitted	0.72	1.00		0.66	1.00		0.65	1.00			0.99	1.00
Satd. Flow (perm)	1335	1677		1069	1622		1179	1708			1832	1359
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)	107	91	63	12	42	16	67	95	25	9	165	57
RTOR Reduction (vph)	0	38	0	0	10	0	0	15	0	0	0	34
Lane Group Flow (vph)	107	116	0	12	48	0	67	105	0	0	174	23
Confl. Peds. (#/hr)	4		4	4		4	5		9	9		5
Confl. Bikes (#/hr)									1	1		
Heavy Vehicles (%)	3%	6%	7%	18%	10%	20%	5%	8%	9%	13%	3%	17%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	18.0	18.0		18.0	18.0		18.0	18.0			18.0	18.0
Effective Green, g (s)	18.0	18.0		18.0	18.0		18.0	18.0			18.0	18.0
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40			0.40	0.40
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5			4.5	4.5
Lane Grp Cap (vph)	534	670		427	648		471	683			732	543
v/s Ratio Prot		0.07			0.03			0.06				
v/s Ratio Perm	c0.08			0.01			0.06				c0.10	0.02
v/c Ratio	0.20	0.17		0.03	0.07		0.14	0.15			0.24	0.04
Uniform Delay, d1	8.8	8.7		8.2	8.3		8.6	8.6			9.0	8.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	0.8	0.6		0.1	0.2		0.6	0.5			0.8	0.1
Delay (s)	9.6	9.3		8.3	8.6		9.2	9.1			9.7	8.4
Level of Service	A	A		A	A		A	A			A	A
Approach Delay (s)		9.4			8.5			9.1			9.4	
Approach LOS		A			A			A			A	

Intersection Summary					
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.22				
Actuated Cycle Length (s)	45.0	Sum of lost time (s)		9.0	
Intersection Capacity Utilization	56.3%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
24: Victoria Avenue & Park Street

10/04/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	24	24	330	49	49	286
Future Volume (Veh/h)	24	24	330	49	49	286
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)	26	26	359	53	53	311
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			240			111
pX, platoon unblocked	0.98					
vC, conflicting volume	802	386			412	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	789	386			412	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	96			95	
cM capacity (veh/h)	336	662			1147	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	52	412	364
Volume Left	26	0	53
Volume Right	26	53	0
cSH	446	1700	1147
Volume to Capacity	0.12	0.24	0.05
Queue Length 95th (m)	3.0	0.0	1.1
Control Delay (s)	14.1	0.0	1.6
Lane LOS	B		A
Approach Delay (s)	14.1	0.0	1.6
Approach LOS	B		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: Victoria Avenue & Queen Street

10/04/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	20	228	20	46	207
Future Volume (Veh/h)	15	20	228	20	46	207
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	17	23	265	23	53	241
Pedestrians	10		5			11
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.1		1.1			1.1
Percent Blockage	1		0			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			134			218
pX, platoon unblocked						
vC, conflicting volume	638	298			298	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	638	298			298	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	96	97			96	
cM capacity (veh/h)	400	731			1251	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	40	288	294
Volume Left	17	0	53
Volume Right	23	23	0
cSH	541	1700	1251
Volume to Capacity	0.07	0.17	0.04
Queue Length 95th (m)	1.8	0.0	1.0
Control Delay (s)	12.2	0.0	1.8
Lane LOS	B		A
Approach Delay (s)	12.2	0.0	1.8
Approach LOS	B		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
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)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182	170	
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1085	1623			

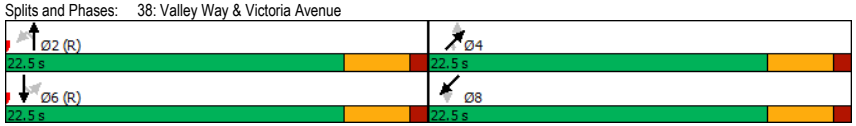
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	Ø2	Ø4	Ø6	Ø8
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	2	4	6	8
Permitted Phases				
Minimum Split (s)	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5
Total Split (%)	50%	50%	50%	50%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
Queue Length 50th (m)				
Queue Length 95th (m)				
Internal Link Dist (m)				
Turn Bay Length (m)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				
Storage Cap Reductn				
Reduced v/c Ratio				

Intersection Summary
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 38: Valley Way & Victoria Avenue



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)												
Lane Util. Factor												
Frt												
Flt Protected												
Satd. Flow (prot)												
Flt Permitted												
Satd. Flow (perm)												
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	0	0	0	0	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type				Perm			Perm		Perm	Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)												
Effective Green, g (s)												
Actuated g/C Ratio												
Clearance Time (s)												
Lane Grp Cap (vph)												
v/s Ratio Prot												
v/s Ratio Perm												
v/c Ratio												
Uniform Delay, d1												
Progression Factor												
Incremental Delay, d2												
Delay (s)												
Level of Service												
Approach Delay (s)		0.0			0.0			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
1: Niagara Parkway / River Road & Bridge Street

10/04/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	27	75	282	183	96
Future Volume (Veh/h)	30	27	75	282	183	96
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)	32	28	79	297	193	101
Pedestrians	3			1		
Lane Width (m)	3.7			3.7		
Walking Speed (m/s)	1.1			1.1		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	651	197	196			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	651	197	196			
tC, single (s)	6.4	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.3			
p0 queue free %	92	97	94			
cM capacity (veh/h)	409	846	1338			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	32	28	79	297	193	101
Volume Left	32	0	79	0	0	0
Volume Right	0	28	0	0	0	101
cSH	409	846	1338	1700	1700	1700
Volume to Capacity	0.08	0.03	0.06	0.17	0.11	0.06
Queue Length 95th (m)	1.9	0.8	1.4	0.0	0.0	0.0
Control Delay (s)	14.5	9.4	7.9	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	12.1		1.7		0.0	
Approach LOS	B					

Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	27.8%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Niagara Parkway / River Road & Park Street

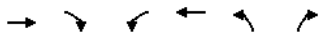
10/04/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	16	5	20	337	200	10
Future Volume (Veh/h)	16	5	20	337	200	10
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)	17	5	22	366	217	11
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	632	222	228			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	632	222	228			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	98			
cM capacity (veh/h)	437	817	1340			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	388	228
Volume Left	17	22	0
Volume Right	5	0	11
cSH	488	1340	1700
Volume to Capacity	0.05	0.02	0.13
Queue Length 95th (m)	1.1	0.4	0.0
Control Delay (s)	12.7	0.6	0.0
Lane LOS	B	A	
Approach Delay (s)	12.7	0.6	0.0
Approach LOS	B		

Intersection Summary				
Average Delay	0.8			
Intersection Capacity Utilization	43.3%	ICU Level of Service		A
Analysis Period (min)	15			

Intersection Sign configuration not allowed in HCM analysis.

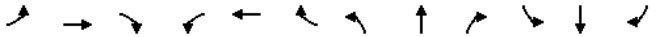


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	80	3	2	165	2	3
Future Volume (Veh/h)	80	3	2	165	2	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	3	2	179	2	3
Pedestrians						
Lane Width (m)						
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			90		272	88
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			90		272	88
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1505		717	970

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	90	181	5
Volume Left	0	2	2
Volume Right	3	0	3
cSH	1700	1505	850
Volume to Capacity	0.05	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.1	9.3
Lane LOS		A	A
Approach Delay (s)	0.0	0.1	9.3
Approach LOS			A

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	20.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
5: Cataract Avenue & Park Street 10/04/2020

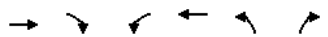


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	21	0	0	30	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	21	0	0	30	0	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	0	0	33	0	0	0	0	0	0	0
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	33			23			56	56	23	56	56	33
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	33			23			56	56	23	56	56	33
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1579			1592			941	835	1054	941	835	1041

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	23	33	0	0
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1592	1700	1700
Volume to Capacity	0.01	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS			A	A
Approach Delay (s)	0.0	0.0	0.0	0.0
Approach LOS			A	A

Intersection Summary				
Average Delay			0.0	
Intersection Capacity Utilization			6.7%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
6: Zimmerman Avenue & Bridge Street 10/04/2020



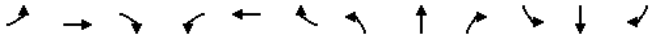
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	90	6	7	150	12	11
Future Volume (Veh/h)	90	6	7	150	12	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	7	8	163	13	12
Pedestrians						
Lane Width (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			105		280	102
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			105		280	102
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	99
cM capacity (veh/h)			1486		706	954

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	105	171	25
Volume Left	0	8	13
Volume Right	7	0	12
cSH	1700	1486	806
Volume to Capacity	0.06	0.01	0.03
Queue Length 95th (m)	0.0	0.1	0.7
Control Delay (s)	0.0	0.4	9.6
Lane LOS		A	A
Approach Delay (s)	0.0	0.4	9.6
Approach LOS			A

Intersection Summary				
Average Delay			1.0	
Intersection Capacity Utilization			23.6%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
7: Zimmerman Avenue & Park Street

10/04/2020



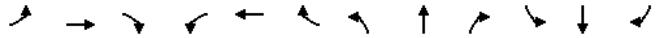
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	21	1	4	18	3	2	10	3	1	9	4
Future Volume (Veh/h)	1	21	1	4	18	3	2	10	3	1	9	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	23	1	4	20	3	2	11	3	1	10	4
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	44	32	12	43	32	12	14			14		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	44	32	12	43	32	12	14			14		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	97	100	100	98	100	100			100		
cM capacity (veh/h)	938	859	1069	938	859	1068	1604			1604		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	25	27	16	15
Volume Left	1	4	2	1
Volume Right	1	3	3	4
cSH	869	889	1604	1604
Volume to Capacity	0.03	0.03	0.00	0.00
Queue Length 95th (m)	0.7	0.7	0.0	0.0
Control Delay (s)	9.3	9.2	0.9	0.5
Lane LOS	A	A	A	A
Approach Delay (s)	9.3	9.2	0.9	0.5
Approach LOS	A	A		

Intersection Summary				
Average Delay			6.0	
Intersection Capacity Utilization			13.3%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
8: Zimmerman Avenue & Queen Street

10/04/2020



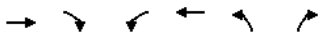
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	40	5	6	40	5	18	4	5	4	5	8
Future Volume (Veh/h)	5	40	5	6	40	5	18	4	5	4	5	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	43	5	7	43	5	20	4	5	4	5	9
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	48			48			126	118	46	122	118	46
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	48			48			126	118	46	122	118	46
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	99	100	100	99	99
cM capacity (veh/h)	1559			1559			831	767	1024	840	767	1024

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	53	55	29	18
Volume Left	5	7	20	4
Volume Right	5	5	5	9
cSH	1559	1559	848	897
Volume to Capacity	0.00	0.00	0.03	0.02
Queue Length 95th (m)	0.1	0.1	0.8	0.5
Control Delay (s)	0.7	1.0	9.4	9.1
Lane LOS	A	A	A	A
Approach Delay (s)	0.7	1.0	9.4	9.1
Approach LOS			A	A

Intersection Summary				
Average Delay			3.4	
Intersection Capacity Utilization			14.1%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
9: Erie Avenue & Bridge Street

10/04/2020



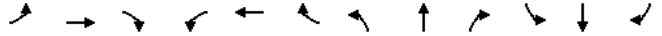
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	90	39	30	108	27	27
Future Volume (Veh/h)	90	39	30	108	27	27
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	107	46	36	129	32	32
Pedestrians	3			1		
Lane Width (m)	3.7			3.7		
Walking Speed (m/s)	1.1			1.1		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			153		334	131
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			153		334	131
tC, single (s)			4.3		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.3
p0 queue free %			97		95	97
cM capacity (veh/h)			1325		645	923

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	153	165	64
Volume Left	0	36	32
Volume Right	46	0	32
cSH	1700	1325	760
Volume to Capacity	0.09	0.03	0.08
Queue Length 95th (m)	0.0	0.6	2.1
Control Delay (s)	0.0	1.9	10.2
Lane LOS		A	B
Approach Delay (s)	0.0	1.9	10.2
Approach LOS			B

Intersection Summary			
Average Delay		2.5	
Intersection Capacity Utilization		28.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
10: Erie Avenue & Park Street

10/04/2020



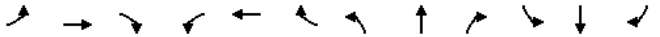
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	9	9	10	5	15	5	9	25	7	6	40	10
Future Volume (vph)	9	9	10	5	15	5	9	25	7	6	40	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	10	11	5	16	5	10	27	8	7	43	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	31	26	45	61
Volume Left (vph)	10	5	10	7
Volume Right (vph)	11	5	8	11
Hadj (s)	-0.11	-0.04	-0.03	-0.05
Departure Headway (s)	4.0	4.1	4.1	4.0
Degree Utilization, x	0.03	0.03	0.05	0.07
Capacity (veh/h)	863	848	862	878
Control Delay (s)	7.2	7.2	7.3	7.3
Approach Delay (s)	7.2	7.2	7.3	7.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay		7.3	
Level of Service		A	
Intersection Capacity Utilization		13.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
11: Erie Avenue & Queen Street

10/04/2020



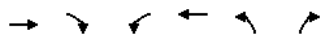
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	45	16	4	43	16	0	2	0	12	6	34
Future Volume (vph)	23	45	16	4	43	16	0	2	0	12	6	34
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	28	56	20	5	53	20	0	2	0	15	7	42

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	104	78	64
Volume Left (vph)	28	5	15
Volume Right (vph)	20	20	42
Hadj (s)	0.02	-0.04	0.03
Departure Headway (s)	4.1	4.1	4.3
Degree Utilization, x	0.12	0.09	0.08
Capacity (veh/h)	848	855	792
Control Delay (s)	7.7	7.5	7.7
Approach Delay (s)	7.7	7.5	7.7
Approach LOS	A	A	A

Intersection Summary				
Delay		Err		
Level of Service		F		
Intersection Capacity Utilization	Err%	ICU Level of Service	H	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
12: Ontario Avenue & Park Street

10/04/2020



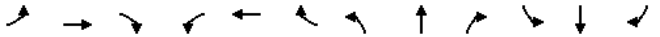
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	20	23	7	35	52	11
Future Volume (Veh/h)	20	23	7	35	52	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	25	8	38	57	12
Pedestrians						
Lane Width (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			47		88	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			47		88	34
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		94	99
cM capacity (veh/h)			1560		908	1039

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	47	46	69
Volume Left	0	8	57
Volume Right	25	0	12
cSH	1700	1560	928
Volume to Capacity	0.03	0.01	0.07
Queue Length 95th (m)	0.0	0.1	1.8
Control Delay (s)	0.0	1.3	9.2
Lane LOS		A	A
Approach Delay (s)	0.0	1.3	9.2
Approach LOS			A

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	18.0%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
13: Ontario Avenue & Queen Street

10/04/2020



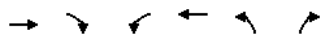
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	64	12	13	73	7	24	30	35	3	13	13
Future Volume (vph)	14	64	12	13	73	7	24	30	35	3	13	13
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	18	81	15	16	92	9	30	38	44	4	16	16

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	114	117	112	36
Volume Left (vph)	18	16	30	4
Volume Right (vph)	15	9	44	16
Hadj (s)	-0.05	0.09	-0.13	-0.18
Departure Headway (s)	4.3	4.5	4.3	4.4
Degree Utilization, x	0.14	0.14	0.14	0.04
Capacity (veh/h)	798	767	783	762
Control Delay (s)	8.0	8.2	8.0	7.6
Approach Delay (s)	8.0	8.2	8.0	7.6
Approach LOS	A	A	A	A

Intersection Summary				
Delay			8.0	
Level of Service			A	
Intersection Capacity Utilization			30.6%	ICU Level of Service
Analysis Period (min)			15	A

HCM Unsignalized Intersection Capacity Analysis
14: St. Clair Avenue & Park Street

10/04/2020



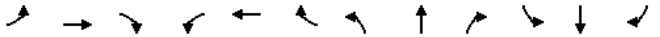
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	42	10	12	90	15	7
Future Volume (Veh/h)	42	10	12	90	15	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	11	13	98	16	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			57		176	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			57		176	52
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	99
cM capacity (veh/h)			1547		807	1016

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	57	111	24
Volume Left	0	13	16
Volume Right	11	0	8
cSH	1700	1547	867
Volume to Capacity	0.03	0.01	0.03
Queue Length 95th (m)	0.0	0.2	0.6
Control Delay (s)	0.0	0.9	9.3
Lane LOS		A	A
Approach Delay (s)	0.0	0.9	9.3
Approach LOS			A

Intersection Summary				
Average Delay			1.7	
Intersection Capacity Utilization			22.1%	ICU Level of Service
Analysis Period (min)			15	A

HCM Unsignalized Intersection Capacity Analysis
15: St. Clair Avenue & Queen Street

10/04/2020



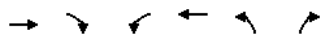
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	92	19	13	89	7	19	13	5	2	7	15
Future Volume (vph)	7	92	19	13	89	7	19	13	5	2	7	15
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	8	107	22	15	103	8	22	15	6	2	8	17

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	137	126	43	27
Volume Left (vph)	8	15	22	2
Volume Right (vph)	22	8	6	17
Hadj (s)	-0.08	0.06	0.02	-0.36
Departure Headway (s)	4.1	4.3	4.5	4.2
Degree Utilization, x	0.16	0.15	0.05	0.03
Capacity (veh/h)	854	826	745	798
Control Delay (s)	7.9	8.0	7.8	7.3
Approach Delay (s)	7.9	8.0	7.8	7.3
Approach LOS	A	A	A	A

Intersection Summary				
Delay			7.9	
Level of Service			A	
Intersection Capacity Utilization			26.9%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
16: Crysler Avenue & Bridge Street

10/04/2020



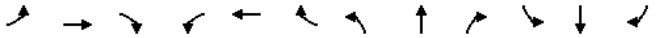
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	100	20	14	121	35	23
Future Volume (Veh/h)	100	20	14	121	35	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	109	22	15	132	38	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	376					
pX, platoon unblocked						
vC, conflicting volume			131		282	120
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			131		282	120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		95	97
cM capacity (veh/h)			1454		701	931

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	131	147	63
Volume Left	0	15	38
Volume Right	22	0	25
cSH	1700	1454	777
Volume to Capacity	0.08	0.01	0.08
Queue Length 95th (m)	0.0	0.2	2.0
Control Delay (s)	0.0	0.8	10.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	10.0
Approach LOS			B

Intersection Summary				
Average Delay			2.2	
Intersection Capacity Utilization			23.8%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
17: Crysler Avenue & Park Street

10/04/2020



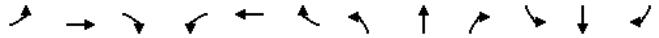
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	20	33	12	10	60	30	11	6	9	10	7	20
Future Volume (vph)	20	33	12	10	60	30	11	6	9	10	7	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	36	13	11	65	33	12	7	10	11	8	22

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	71	109	29	41
Volume Left (vph)	22	11	12	11
Volume Right (vph)	13	33	10	22
Hadj (s)	-0.01	-0.13	-0.09	-0.23
Departure Headway (s)	4.1	4.0	4.2	4.1
Degree Utilization, x	0.08	0.12	0.03	0.05
Capacity (veh/h)	846	880	805	840
Control Delay (s)	7.5	7.5	7.4	7.3
Approach Delay (s)	7.5	7.5	7.4	7.3
Approach LOS	A	A	A	A

Intersection Summary				
Delay		7.5		
Level of Service		A		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
18: Crysler Avenue & Queen Street

10/04/2020



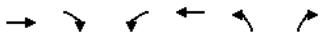
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	15	119	6	9	118	4	3	5	1	2	8	16
Future Volume (vph)	15	119	6	9	118	4	3	5	1	2	8	16
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	17	135	7	10	134	5	3	6	1	2	9	18

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	159	149	10	29
Volume Left (vph)	17	10	3	2
Volume Right (vph)	7	5	1	18
Hadj (s)	-0.01	0.05	0.20	-0.28
Departure Headway (s)	4.1	4.2	4.8	4.3
Degree Utilization, x	0.18	0.17	0.01	0.03
Capacity (veh/h)	854	842	695	770
Control Delay (s)	8.1	8.1	7.9	7.4
Approach Delay (s)	8.1	8.1	7.9	7.4
Approach LOS	A	A	A	A

Intersection Summary				
Delay		8.0		
Level of Service		A		
Intersection Capacity Utilization	27.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
19: St. Lawrence Avenue & Park Street

10/04/2020



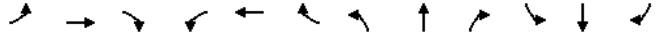
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	35	18	20	80	20	20
Future Volume (Veh/h)	35	18	20	80	20	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	20	22	87	22	22
Pedestrians						
Lane Width (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			58		179	48
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			58		179	48
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	98
cM capacity (veh/h)			1546		799	1021

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	58	109	44
Volume Left	0	22	22
Volume Right	20	0	22
cSH	1700	1546	896
Volume to Capacity	0.03	0.01	0.05
Queue Length 95th (m)	0.0	0.3	1.2
Control Delay (s)	0.0	1.6	9.2
Lane LOS		A	A
Approach Delay (s)	0.0	1.6	9.2
Approach LOS			A

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	22.0%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
20: St. Lawrence Avenue & Queen Street

10/04/2020



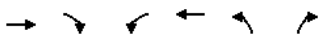
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	19	127	11	3	131	4	10	11	8	3	7	28
Future Volume (vph)	19	127	11	3	131	4	10	11	8	3	7	28
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	21	143	12	3	147	4	11	12	9	3	8	31

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	176	154	32	42
Volume Left (vph)	21	3	11	3
Volume Right (vph)	12	4	9	31
Hadj (s)	-0.02	0.07	-0.10	-0.43
Departure Headway (s)	4.2	4.3	4.6	4.2
Degree Utilization, x	0.21	0.18	0.04	0.05
Capacity (veh/h)	833	813	725	775
Control Delay (s)	8.3	8.3	7.8	7.5
Approach Delay (s)	8.3	8.3	7.8	7.5
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.2			
Level of Service	A			
Intersection Capacity Utilization	32.3%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
21: Buckley Avenue & Park Street

10/04/2020



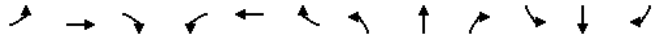
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	45	18	7	107	4	5
Future Volume (Veh/h)	45	18	7	107	4	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	20	8	116	4	5
Pedestrians						
Lane Width (m)						
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			69		191	59
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			69		191	59
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	100
cM capacity (veh/h)			1532		794	1007

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	69	124	9
Volume Left	0	8	4
Volume Right	20	0	5
cSH	1700	1532	899
Volume to Capacity	0.04	0.01	0.01
Queue Length 95th (m)	0.0	0.1	0.2
Control Delay (s)	0.0	0.5	9.0
Lane LOS		A	A
Approach Delay (s)	0.0	0.5	9.0
Approach LOS			A

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	21.4%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
22: Valley Way/Buckley Avenue & Queen Street

10/04/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	90	0	0	100	10	0	0	0	18	0	7
Future Volume (Veh/h)	5	90	0	0	100	10	0	0	0	18	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	98	0	0	109	11	0	0	0	20	0	8
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	120			98			230	228	98	222	222	114
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	120			98			230	228	98	222	222	114
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	97	100	99
cM capacity (veh/h)	1468			1495			716	669	958	731	674	938

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	103	120	0	28
Volume Left	5	0	0	20
Volume Right	0	11	0	8
cSH	1468	1495	1700	780
Volume to Capacity	0.00	0.00	0.00	0.04
Queue Length 95th (m)	0.1	0.0	0.0	0.8
Control Delay (s)	0.4	0.0	0.0	9.8
Lane LOS	A		A	A
Approach Delay (s)	0.4	0.0	0.0	9.8
Approach LOS			A	A

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	18.8%	ICU Level of Service		A
Analysis Period (min)	15			

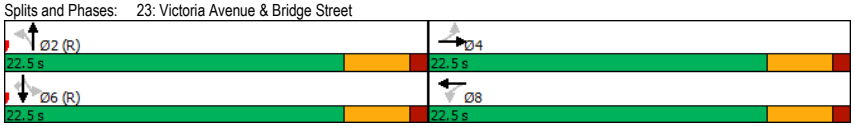
Timings
23: Victoria Avenue & Bridge Street

10/04/2020

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	85	52	30	122	129	195	23	200	165
Future Volume (vph)	85	52	30	122	129	195	23	200	165
Lane Group Flow (vph)	93	137	33	161	142	256	0	245	181
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.20	0.19	0.06	0.22	0.31	0.34		0.34	0.25
Control Delay	10.2	5.3	8.8	8.4	11.7	10.0		11.0	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	10.2	5.3	8.8	8.4	11.7	10.0		11.0	2.9
Queue Length 50th (m)	4.5	2.6	1.5	6.4	7.2	11.7		12.6	0.0
Queue Length 95th (m)	11.4	9.9	5.1	15.1	16.9	23.9		24.9	7.9
Internal Link Dist (m)		66.6		351.5		86.7		152.5	
Turn Bay Length (m)	45.0		30.0		25.0				
Base Capacity (vph)	473	724	509	734	455	750		725	731
Starvation Cap Reductn	0	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0
Reduced v/c Ratio	0.20	0.19	0.06	0.22	0.31	0.34		0.34	0.25

Intersection Summary
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 23: Victoria Avenue & Bridge Street



HCM Signalized Intersection Capacity Analysis
23: Victoria Avenue & Bridge Street

10/04/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	52	73	30	122	25	129	195	38	23	200	165
Future Volume (vph)	85	52	73	30	122	25	129	195	38	23	200	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5			4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00			1.00	0.97
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.91		1.00	0.97		1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1717	1691		1808	1796		1783	1837			1887	1558
Flt Permitted	0.66	1.00		0.67	1.00		0.61	1.00			0.96	1.00
Satd. Flow (perm)	1184	1691		1274	1796		1139	1837			1812	1558
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	93	57	80	33	134	27	142	214	42	25	220	181
RTOR Reduction (vph)	0	48	0	0	16	0	0	16	0	0	0	109
Lane Group Flow (vph)	93	89	0	33	145	0	142	240	0	0	245	72
Confl. Peds. (#/hr)	3		9	9		3	4		1	1		4
Confl. Bikes (#/hr)	3		2	2		3	2		1	1		2
Heavy Vehicles (%)	6%	4%	0%	0%	3%	8%	2%	1%	5%	4%	1%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	18.0	18.0		18.0	18.0		18.0	18.0			18.0	18.0
Effective Green, g (s)	18.0	18.0		18.0	18.0		18.0	18.0			18.0	18.0
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40			0.40	0.40
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5			4.5	4.5
Lane Grp Cap (vph)	473	676		509	718		455	734			724	623
v/s Ratio Prot		0.05			c0.08			0.13				
v/s Ratio Perm	0.08			0.03			0.12				c0.14	0.05
v/c Ratio	0.20	0.13		0.06	0.20		0.31	0.33			0.34	0.12
Uniform Delay, d1	8.8	8.6		8.3	8.8		9.3	9.3			9.4	8.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	0.9	0.4		0.2	0.6		1.8	1.2			1.3	0.4
Delay (s)	9.7	9.0		8.6	9.4		11.0	10.5			10.6	8.9
Level of Service	A	A		A	A		B	B			B	A
Approach Delay (s)		9.3			9.3			10.7			9.9	
Approach LOS		A			A			B			A	

Intersection Summary					
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.27				
Actuated Cycle Length (s)	45.0	Sum of lost time (s)		9.0	
Intersection Capacity Utilization	64.7%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
24: Victoria Avenue & Park Street

10/04/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	54	53	380	31	30	352
Future Volume (Veh/h)	54	53	380	31	30	352
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)	59	58	413	34	33	383
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			240			111
pX, platoon unblocked	0.95					
vC, conflicting volume	879	430			447	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	843	430			447	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	91			97	
cM capacity (veh/h)	306	625			1113	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	117	447	416
Volume Left	59	0	33
Volume Right	58	34	0
cSH	410	1700	1113
Volume to Capacity	0.29	0.26	0.03
Queue Length 95th (m)	8.8	0.0	0.7
Control Delay (s)	17.2	0.0	1.0
Lane LOS	C		A
Approach Delay (s)	17.2	0.0	1.0
Approach LOS	C		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: Victoria Avenue & Queen Street

10/04/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	30	50	330	17	41	351
Future Volume (Veh/h)	30	50	330	17	41	351
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	34	56	371	19	46	394
Pedestrians			4			10
Lane Width (m)			3.7			3.7
Walking Speed (m/s)			1.1			1.1
Percent Blockage			0			1
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			134			218
pX, platoon unblocked						
vC, conflicting volume	870	390			390	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	870	390			390	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	91			96	
cM capacity (veh/h)	307	656			1180	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	90	390	440
Volume Left	34	0	46
Volume Right	56	19	0
cSH	459	1700	1180
Volume to Capacity	0.20	0.23	0.04
Queue Length 95th (m)	5.5	0.0	0.9
Control Delay (s)	14.8	0.0	1.2
Lane LOS	B		A
Approach Delay (s)	14.8	0.0	1.2
Approach LOS	B		

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
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)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182	170	
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1085	1623			

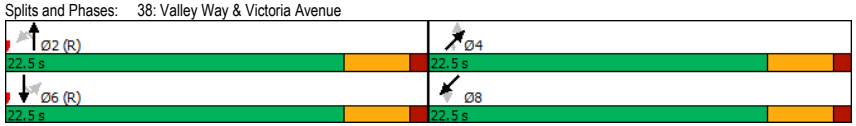
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	Ø2	Ø4	Ø6	Ø8
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	2	4	6	8
Permitted Phases				
Minimum Split (s)	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5
Total Split (%)	50%	50%	50%	50%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
Queue Length 50th (m)				
Queue Length 95th (m)				
Internal Link Dist (m)				
Turn Bay Length (m)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				
Storage Cap Reductn				
Reduced v/c Ratio				

Intersection Summary
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 38: Valley Way & Victoria Avenue



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)												
Lane Util. Factor												
Frt												
Flt Protected												
Satd. Flow (prot)												
Flt Permitted												
Satd. Flow (perm)												
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	0	0	0	0	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type				Perm			Perm		Perm	Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)												
Effective Green, g (s)												
Actuated g/C Ratio												
Clearance Time (s)												
Lane Grp Cap (vph)												
v/s Ratio Prot												
v/s Ratio Perm												
v/c Ratio												
Uniform Delay, d1												
Progression Factor												
Incremental Delay, d2												
Delay (s)												
Level of Service												
Approach Delay (s)		0.0			0.0			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
1: Niagara Parkway / River Road & Bridge Street

10/06/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	188	131	91	215	252	138
Future Volume (Veh/h)	188	131	91	215	252	138
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	238	166	115	272	319	175
Pedestrians				25	25	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.1	1.1	
Percent Blockage				2	2	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	846	344	319			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	846	344	319			
tC, single (s)	6.4	6.2	4.4			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.5			
p0 queue free %	19	76	89			
cM capacity (veh/h)	292	686	1085			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	238	166	115	272	319	175
Volume Left	238	0	115	0	0	0
Volume Right	0	166	0	0	0	175
cSH	292	686	1085	1700	1700	1700
Volume to Capacity	0.81	0.24	0.11	0.16	0.19	0.10
Queue Length 95th (m)	50.4	7.2	2.7	0.0	0.0	0.0
Control Delay (s)	54.5	11.9	8.7	0.0	0.0	0.0
Lane LOS	F	B	A			
Approach Delay (s)	37.0		2.6		0.0	
Approach LOS	E					

Intersection Summary				
Average Delay	12.4			
Intersection Capacity Utilization	40.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
2: Niagara Parkway / River Road & Park Street

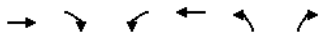
10/06/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	61	56	12	121	169	42
Future Volume (Veh/h)	61	56	12	121	169	42
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)	66	61	13	132	184	46
Pedestrians				24	24	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.1	1.1	
Percent Blockage				2	2	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	389	231	230			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	389	231	230			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	92	99			
cM capacity (veh/h)	594	789	1338			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	127	145	230
Volume Left	66	13	0
Volume Right	61	0	46
cSH	674	1338	1700
Volume to Capacity	0.19	0.01	0.14
Queue Length 95th (m)	5.2	0.2	0.0
Control Delay (s)	11.6	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	11.6	0.8	0.0
Approach LOS	B		

Intersection Summary				
Average Delay	3.1			
Intersection Capacity Utilization	33.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection Sign configuration not allowed in HCM analysis.



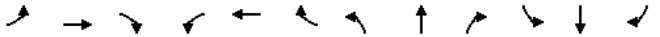
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	318	1	11	223	1	0
Future Volume (Veh/h)	318	1	11	223	1	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	346	1	12	242	1	0
Pedestrians					25	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			372		638	372
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			372		638	372
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1157		426	658

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	347	254	1
Volume Left	0	12	1
Volume Right	1	0	0
cSH	1700	1157	426
Volume to Capacity	0.20	0.01	0.00
Queue Length 95th (m)	0.0	0.2	0.1
Control Delay (s)	0.0	0.5	13.5
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	13.5
Approach LOS			B

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	30.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
5: Cataract Avenue & Park Street

10/06/2020



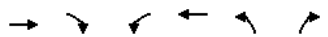
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	88	1	8	51	0	1	0	0	0	0	0
Future Volume (Veh/h)	0	88	1	8	51	0	1	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	96	1	9	55	0	1	0	0	0	0	0
Pedestrians								24			24	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								2			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	79			121			194	218	120	194	218	79
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	79			121			194	218	120	194	218	79
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	100	100	100
cM capacity (veh/h)	1483			1432			718	645	909	718	644	958

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	97	64	1	0
Volume Left	0	9	1	0
Volume Right	1	0	0	0
cSH	1700	1432	718	1700
Volume to Capacity	0.06	0.01	0.00	0.00
Queue Length 95th (m)	0.0	0.1	0.0	0.0
Control Delay (s)	0.0	1.1	10.0	0.0
Lane LOS		A	B	A
Approach Delay (s)	0.0	1.1	10.0	0.0
Approach LOS			B	A

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	21.6%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
6: Zimmerman Avenue & Bridge Street

10/06/2020



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	309	10	16	231	13	7
Future Volume (Veh/h)	309	10	16	231	13	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	336	11	17	251	14	8
Pedestrians					25	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			372		652	366
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			372		652	366
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	99
cM capacity (veh/h)			1157		416	662

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	347	268	22
Volume Left	0	17	14
Volume Right	11	0	8
cSH	1700	1157	481
Volume to Capacity	0.20	0.01	0.05
Queue Length 95th (m)	0.0	0.3	1.1
Control Delay (s)	0.0	0.6	12.8
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	12.8
Approach LOS			B

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	35.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
7: Zimmerman Avenue & Park Street

10/06/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	80	6	7	70	2	11	9	1	2	8	4
Future Volume (Veh/h)	3	80	6	7	70	2	11	9	1	2	8	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	87	7	8	76	2	12	10	1	2	9	4
Pedestrians								24			24	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								2			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	114	50	35	124	52	34	13			11		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	114	50	35	124	52	34	13			11		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	90	99	99	91	100	99			100		
cM capacity (veh/h)	778	834	1014	754	833	1014	1606			1608		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	97	86	23	15
Volume Left	3	8	12	2
Volume Right	7	2	1	4
cSH	843	828	1606	1608
Volume to Capacity	0.12	0.10	0.01	0.00
Queue Length 95th (m)	3.0	2.6	0.2	0.0
Control Delay (s)	9.8	9.9	3.8	1.0
Lane LOS	A	A	A	A
Approach Delay (s)	9.8	9.9	3.8	1.0
Approach LOS	A	A		

Intersection Summary				
Average Delay	8.6			
Intersection Capacity Utilization	20.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: Zimmerman Avenue & Queen Street

10/06/2020

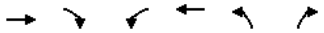
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	20	6	20	30	2	15	8	8	1	5	6
Future Volume (Veh/h)	7	20	6	20	30	2	15	8	8	1	5	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	22	7	22	33	2	16	9	9	1	5	7
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	35			29			129	120	26	133	123	34
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	35			29			129	120	26	133	123	34
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			98	99	99	100	99	99
cM capacity (veh/h)	1576			1584			822	755	1050	812	753	1039

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	37	57	34	13
Volume Left	8	22	16	1
Volume Right	7	2	9	7
cSH	1576	1584	851	890
Volume to Capacity	0.01	0.01	0.04	0.01
Queue Length 95th (m)	0.1	0.3	0.9	0.3
Control Delay (s)	1.6	2.9	9.4	9.1
Lane LOS	A	A	A	A
Approach Delay (s)	1.6	2.9	9.4	9.1
Approach LOS			A	A

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	17.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Erie Avenue & Bridge Street

10/06/2020



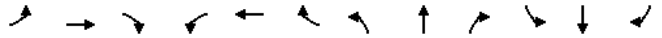
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	337	40	42	225	24	9
Future Volume (Veh/h)	337	40	42	225	24	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	406	48	51	271	29	11
Pedestrians					25	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			479		828	455
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			479		828	455
tC, single (s)			4.4		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.3
p0 queue free %			94		91	98
cM capacity (veh/h)			917		317	594

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	454	322	40
Volume Left	0	51	29
Volume Right	48	0	11
cSH	1700	917	363
Volume to Capacity	0.27	0.06	0.11
Queue Length 95th (m)	0.0	1.3	2.8
Control Delay (s)	0.0	2.0	16.1
Lane LOS		A	C
Approach Delay (s)	0.0	2.0	16.1
Approach LOS			C

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	47.9%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
10: Erie Avenue & Park Street

10/06/2020



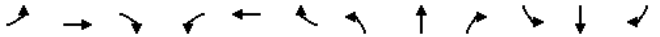
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	6	89	14	5	102	2	23	18	2	7	35	13
Future Volume (vph)	6	89	14	5	102	2	23	18	2	7	35	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	97	15	5	111	2	25	20	2	8	38	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	119	118	47	60
Volume Left (vph)	7	5	25	8
Volume Right (vph)	15	2	2	14
Hadj (s)	-0.03	0.03	0.11	-0.08
Departure Headway (s)	4.3	4.3	4.6	4.4
Degree Utilization, x	0.14	0.14	0.06	0.07
Capacity (veh/h)	819	799	732	762
Control Delay (s)	7.9	8.0	7.9	7.8
Approach Delay (s)	7.9	8.0	7.9	7.8
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.9			
Level of Service	A			
Intersection Capacity Utilization	24.6%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
11: Erie Avenue & Queen Street

10/06/2020



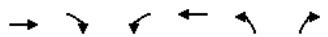
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	18	25	23	15	38	7	0	0	0	10	1	26
Future Volume (vph)	18	25	23	15	38	7	0	0	0	10	1	26
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	23	32	30	19	49	9	0	0	0	13	1	34

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	85	77	48
Volume Left (vph)	23	19	13
Volume Right (vph)	30	9	34
Hadj (s)	-0.06	-0.02	-0.05
Departure Headway (s)	4.0	4.1	4.2
Degree Utilization, x	0.10	0.09	0.06
Capacity (veh/h)	875	868	820
Control Delay (s)	7.4	7.5	7.4
Approach Delay (s)	7.4	7.5	7.4
Approach LOS	A	A	A

Intersection Summary				
Delay	7.4			
Level of Service	A			
Intersection Capacity Utilization	15.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
12: Ontario Avenue & Park Street

10/06/2020



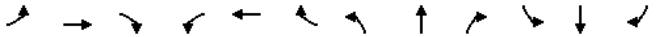
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	96	19	15	127	60	10
Future Volume (Veh/h)	96	19	15	127	60	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	21	16	138	65	11
Pedestrians					24	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			149		308	138
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			149		308	138
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		90	99
cM capacity (veh/h)			1399		660	888

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	125	154	76
Volume Left	0	16	65
Volume Right	21	0	11
cSH	1700	1399	686
Volume to Capacity	0.07	0.01	0.11
Queue Length 95th (m)	0.0	0.3	2.8
Control Delay (s)	0.0	0.9	10.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.9	10.9
Approach LOS			B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	24.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
13: Ontario Avenue & Queen Street

10/06/2020



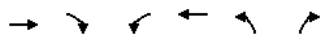
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	30	18	24	40	8	18	26	33	2	8	11
Future Volume (vph)	16	30	18	24	40	8	18	26	33	2	8	11
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	17	32	19	26	43	9	19	28	35	2	9	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	68	78	82	23
Volume Left (vph)	17	26	19	2
Volume Right (vph)	19	9	35	12
Hadj (s)	-0.07	0.00	-0.21	-0.30
Departure Headway (s)	4.1	4.2	4.0	4.0
Degree Utilization, x	0.08	0.09	0.09	0.03
Capacity (veh/h)	843	833	854	858
Control Delay (s)	7.5	7.6	7.4	7.1
Approach Delay (s)	7.5	7.6	7.4	7.1
Approach LOS	A	A	A	A

Intersection Summary				
Delay			7.5	
Level of Service			A	
Intersection Capacity Utilization			20.9%	ICU Level of Service
Analysis Period (min)			15	A

HCM Unsignalized Intersection Capacity Analysis
14: St. Clair Avenue & Park Street

10/06/2020



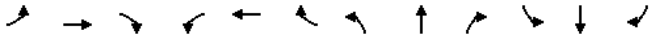
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	106	24	11	174	48	13
Future Volume (Veh/h)	106	24	11	174	48	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	115	26	12	189	52	14
Pedestrians					24	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			165		365	152
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			165		365	152
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		92	98
cM capacity (veh/h)			1380		614	873

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	141	201	66
Volume Left	0	12	52
Volume Right	26	0	14
cSH	1700	1380	655
Volume to Capacity	0.08	0.01	0.10
Queue Length 95th (m)	0.0	0.2	2.5
Control Delay (s)	0.0	0.5	11.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	11.1
Approach LOS			B

Intersection Summary				
Average Delay			2.1	
Intersection Capacity Utilization			28.3%	ICU Level of Service
Analysis Period (min)			15	A

HCM Unsignalized Intersection Capacity Analysis
15: St. Clair Avenue & Queen Street

10/06/2020



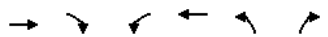
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	68	11	7	52	12	13	10	6	2	11	8
Future Volume (vph)	16	68	11	7	52	12	13	10	6	2	11	8
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	18	76	12	8	58	13	15	11	7	2	12	9

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	106	79	33	23
Volume Left (vph)	18	8	15	2
Volume Right (vph)	12	13	7	9
Hadj (s)	0.02	0.02	-0.04	-0.22
Departure Headway (s)	4.1	4.1	4.3	4.1
Degree Utilization, x	0.12	0.09	0.04	0.03
Capacity (veh/h)	854	849	795	830
Control Delay (s)	7.7	7.6	7.5	7.2
Approach Delay (s)	7.7	7.6	7.5	7.2
Approach LOS	A	A	A	A

Intersection Summary				
Delay			7.6	
Level of Service			A	
Intersection Capacity Utilization			19.8%	ICU Level of Service
Analysis Period (min)			15	A

HCM Unsignalized Intersection Capacity Analysis
16: Crysler Avenue & Bridge Street

10/06/2020



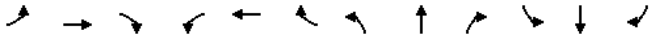
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	308	26	12	282	44	25
Future Volume (Veh/h)	308	26	12	282	44	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	335	28	13	307	48	27
Pedestrians					25	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	376					
pX, platoon unblocked						
vC, conflicting volume			388		707	374
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			388		707	374
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		88	96
cM capacity (veh/h)			1142		387	656

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	363	320	75
Volume Left	0	13	48
Volume Right	28	0	27
cSH	1700	1142	454
Volume to Capacity	0.21	0.01	0.17
Queue Length 95th (m)	0.0	0.3	4.5
Control Delay (s)	0.0	0.4	14.5
Lane LOS		A	B
Approach Delay (s)	0.0	0.4	14.5
Approach LOS			B

Intersection Summary				
Average Delay			1.6	
Intersection Capacity Utilization			35.2%	ICU Level of Service
Analysis Period (min)			15	A

HCM Unsignalized Intersection Capacity Analysis
17: Crysler Avenue & Park Street

10/06/2020



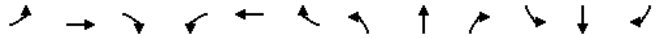
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	114	16	6	184	11	31	10	3	3	10	6
Future Volume (vph)	5	114	16	6	184	11	31	10	3	3	10	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	124	17	7	200	12	34	11	3	3	11	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	146	219	48	21
Volume Left (vph)	5	7	34	3
Volume Right (vph)	17	12	3	7
Hadj (s)	-0.03	0.01	0.14	-0.14
Departure Headway (s)	4.3	4.2	4.9	4.6
Degree Utilization, x	0.17	0.26	0.06	0.03
Capacity (veh/h)	819	833	683	706
Control Delay (s)	8.2	8.7	8.2	7.8
Approach Delay (s)	8.2	8.7	8.2	7.8
Approach LOS	A	A	A	A

Intersection Summary				
Delay			8.4	
Level of Service			A	
Intersection Capacity Utilization			27.8%	ICU Level of Service
Analysis Period (min)			15	
				A

HCM Unsignalized Intersection Capacity Analysis
18: Crysler Avenue & Queen Street

10/06/2020



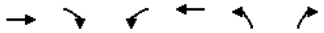
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	85	3	1	71	5	5	5	3	1	7	6
Future Volume (vph)	7	85	3	1	71	5	5	5	3	1	7	6
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	8	91	3	1	76	5	5	5	3	1	8	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	102	82	13	15
Volume Left (vph)	8	1	5	1
Volume Right (vph)	3	5	3	6
Hadj (s)	0.03	-0.02	-0.06	-0.23
Departure Headway (s)	4.1	4.0	4.2	4.1
Degree Utilization, x	0.12	0.09	0.02	0.02
Capacity (veh/h)	871	877	803	839
Control Delay (s)	7.6	7.4	7.3	7.1
Approach Delay (s)	7.6	7.4	7.3	7.1
Approach LOS	A	A	A	A

Intersection Summary				
Delay			7.5	
Level of Service			A	
Intersection Capacity Utilization			18.9%	ICU Level of Service
Analysis Period (min)			15	
				A

HCM Unsignalized Intersection Capacity Analysis
19: St. Lawrence Avenue & Park Street

10/06/2020



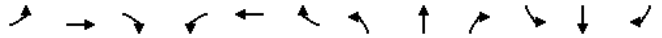
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	112	17	8	183	38	9
Future Volume (Veh/h)	112	17	8	183	38	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	122	18	9	199	41	10
Pedestrians					24	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			164		372	155
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			164		372	155
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	99
cM capacity (veh/h)			1381		610	870

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	140	208	51
Volume Left	0	9	41
Volume Right	18	0	10
cSH	1700	1381	648
Volume to Capacity	0.08	0.01	0.08
Queue Length 95th (m)	0.0	0.1	1.9
Control Delay (s)	0.0	0.4	11.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.4	11.0
Approach LOS			B

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	26.1%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
20: St. Lawrence Avenue & Queen Street

10/06/2020



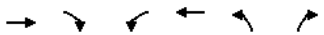
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	96	20	0	82	0	4	3	2	1	0	9
Future Volume (vph)	14	96	20	0	82	0	4	3	2	1	0	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	104	22	0	89	0	4	3	2	1	0	10

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	141	89	9	11
Volume Left (vph)	15	0	4	1
Volume Right (vph)	22	0	2	10
Hadj (s)	-0.05	0.07	-0.04	-0.53
Departure Headway (s)	4.0	4.1	4.4	3.9
Degree Utilization, x	0.16	0.10	0.01	0.01
Capacity (veh/h)	891	856	776	873
Control Delay (s)	7.7	7.6	7.4	6.9
Approach Delay (s)	7.7	7.6	7.4	6.9
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.6			
Level of Service	A			
Intersection Capacity Utilization	23.7%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
21: Buckley Avenue & Park Street

10/06/2020



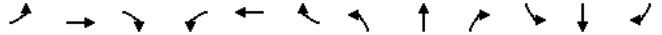
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	112	64	35	166	46	15
Future Volume (Veh/h)	112	64	35	166	46	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	122	70	38	180	50	16
Pedestrians					24	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			216		437	181
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			216		437	181
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		91	98
cM capacity (veh/h)			1322		547	841

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	192	218	66
Volume Left	0	38	50
Volume Right	70	0	16
cSH	1700	1322	598
Volume to Capacity	0.11	0.03	0.11
Queue Length 95th (m)	0.0	0.7	2.8
Control Delay (s)	0.0	1.6	11.8
Lane LOS		A	B
Approach Delay (s)	0.0	1.6	11.8
Approach LOS			B

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	36.2%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
22: Valley Way/Buckley Avenue & Queen Street

10/06/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	60	0	0	60	20	0	0	0	70	0	10
Future Volume (Veh/h)	10	60	0	0	60	20	0	0	0	70	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	65	0	0	65	22	0	0	0	76	0	11
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	87			65			174	174	65	163	163	76
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	87			65			174	174	65	163	163	76
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	90	100	99
cM capacity (veh/h)	1509			1537			776	714	999	797	724	985

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	76	87	0	87
Volume Left	11	0	0	76
Volume Right	0	22	0	11
cSH	1509	1537	1700	817
Volume to Capacity	0.01	0.00	0.00	0.11
Queue Length 95th (m)	0.2	0.0	0.0	2.7
Control Delay (s)	1.1	0.0	0.0	9.9
Lane LOS	A		A	A
Approach Delay (s)	1.1	0.0	0.0	9.9
Approach LOS			A	A

Intersection Summary				
Average Delay	3.8			
Intersection Capacity Utilization	21.5%	ICU Level of Service		A
Analysis Period (min)	15			

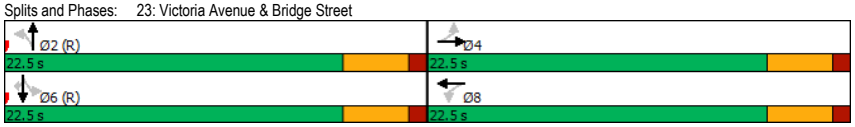
Timings
23: Victoria Avenue & Bridge Street

10/06/2020

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	98	217	105	214	108	140	42	175	52
Future Volume (vph)	98	217	105	214	108	140	42	175	52
Lane Group Flow (vph)	107	326	114	336	117	219	0	236	57
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag									
Lead-Lag Optimize?									
v/c Ratio	0.29	0.46	0.35	0.50	0.26	0.31		0.35	0.10
Control Delay	11.9	10.8	13.2	11.4	11.1	8.2		11.4	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	11.9	10.8	13.2	11.4	11.1	8.2		11.4	3.6
Queue Length 50th (m)	5.4	14.5	5.9	14.9	5.8	7.9		12.2	0.0
Queue Length 95th (m)	13.8	30.1	15.4	31.7	14.1	18.5		24.6	4.5
Internal Link Dist (m)		66.6		351.5		86.7		152.5	
Turn Bay Length (m)	45.0		30.0		25.0				
Base Capacity (vph)	370	713	330	673	448	712		667	592
Starvation Cap Reductn	0	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0
Reduced v/c Ratio	0.29	0.46	0.35	0.50	0.26	0.31		0.35	0.10

Intersection Summary
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 23: Victoria Avenue & Bridge Street



HCM Signalized Intersection Capacity Analysis
23: Victoria Avenue & Bridge Street

10/06/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	217	83	105	214	95	108	140	62	42	175	52
Future Volume (vph)	98	217	83	105	214	95	108	140	62	42	175	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5			4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.98		1.00	1.00			1.00	1.00
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.96		1.00	0.95		1.00	0.95			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (prot)	1739	1707		1517	1594		1738	1692			1813	1396
Flt Permitted	0.51	1.00		0.52	1.00		0.61	1.00			0.91	1.00
Satd. Flow (perm)	926	1707		826	1594		1119	1692			1669	1396
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)	107	236	90	114	233	103	117	152	67	46	190	57
RTOR Reduction (vph)	0	31	0	0	35	0	0	35	0	0	0	34
Lane Group Flow (vph)	107	295	0	114	301	0	117	184	0	0	236	23
Confl. Peds. (#/hr)	25		25	25		25						
Confl. Bikes (#/hr)	3		3	3		3						
Heavy Vehicles (%)	3%	6%	7%	18%	10%	20%	5%	8%	9%	13%	3%	17%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	18.0	18.0		18.0	18.0		18.0	18.0			18.0	18.0
Effective Green, g (s)	18.0	18.0		18.0	18.0		18.0	18.0			18.0	18.0
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40			0.40	0.40
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5			4.5	4.5
Lane Grp Cap (vph)	370	682		330	637		447	676			667	558
v/s Ratio Prot		0.17			c0.19			0.11				
v/s Ratio Perm	0.12			0.14			0.10				c0.14	0.02
v/c Ratio	0.29	0.43		0.35	0.47		0.26	0.27			0.35	0.04
Uniform Delay, d1	9.2	9.8		9.4	10.0		9.0	9.1			9.4	8.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.0	2.0		2.9	2.5		1.4	1.0			1.5	0.1
Delay (s)	11.1	11.8		12.2	12.5		10.5	10.1			10.9	8.4
Level of Service	B	B		B	B		B	B			B	A
Approach Delay (s)		11.6			12.4			10.2			10.4	
Approach LOS		B			B			B			B	

Intersection Summary					
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.41				
Actuated Cycle Length (s)	45.0	Sum of lost time (s)		9.0	
Intersection Capacity Utilization	60.9%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
24: Victoria Avenue & Park Street

10/06/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	82	123	369	79	97	380
Future Volume (Veh/h)	82	123	369	79	97	380
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)	89	134	401	86	105	413
Pedestrians			24			24
Lane Width (m)			3.7			3.7
Walking Speed (m/s)			1.1			1.1
Percent Blockage			2			2
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			240			111
pX, platoon unblocked	0.97					
vC, conflicting volume	1091	468			487	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1079	468			487	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	57	77			90	
cM capacity (veh/h)	207	581			1076	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	223	487	518
Volume Left	89	0	105
Volume Right	134	86	0
cSH	338	1700	1076
Volume to Capacity	0.66	0.29	0.10
Queue Length 95th (m)	33.8	0.0	2.5
Control Delay (s)	34.2	0.0	2.7
Lane LOS	D		A
Approach Delay (s)	34.2	0.0	2.7
Approach LOS	D		

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: Victoria Avenue & Queen Street

10/06/2020

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	20	297	20	46	359
Future Volume (Veh/h)	15	20	297	20	46	359
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	17	23	345	23	53	417
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			134			218
pX, platoon unblocked						
vC, conflicting volume	880	356			368	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	880	356			368	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	94	97			96	
cM capacity (veh/h)	291	692			1191	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	40	368	470
Volume Left	17	0	53
Volume Right	23	23	0
cSH	436	1700	1191
Volume to Capacity	0.09	0.22	0.04
Queue Length 95th (m)	2.3	0.0	1.1
Control Delay (s)	14.1	0.0	1.3
Lane LOS	B		A
Approach Delay (s)	14.1	0.0	1.3
Approach LOS	B		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: Victoria Avenue & Maple Street 10/06/2020

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
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)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182	170	
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1085	1623			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

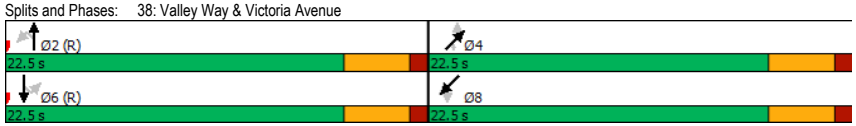
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Timings
38: Valley Way & Victoria Avenue 10/06/2020

Lane Group	Ø2	Ø4	Ø6	Ø8
Lane Configurations				
Traffic Volume (vph)				
Future Volume (vph)				
Lane Group Flow (vph)				
Turn Type				
Protected Phases	2	4	6	8
Permitted Phases				
Minimum Split (s)	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5
Total Split (%)	50%	50%	50%	50%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)				
Total Lost Time (s)				
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio				
Control Delay				
Queue Delay				
Total Delay				
Queue Length 50th (m)				
Queue Length 95th (m)				
Internal Link Dist (m)				
Turn Bay Length (m)				
Base Capacity (vph)				
Starvation Cap Reductn				
Spillback Cap Reductn				
Storage Cap Reductn				
Reduced v/c Ratio				

Intersection Summary
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 38: Valley Way & Victoria Avenue



Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)												
Lane Util. Factor												
Frt												
Flt Protected												
Satd. Flow (prot)												
Flt Permitted												
Satd. Flow (perm)												
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	0	0	0	0	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type				Perm			Perm		Perm	Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)												
Effective Green, g (s)												
Actuated g/C Ratio												
Clearance Time (s)												
Lane Grp Cap (vph)												
v/s Ratio Prot												
v/s Ratio Perm												
v/c Ratio												
Uniform Delay, d1												
Progression Factor												
Incremental Delay, d2												
Delay (s)												
Level of Service												
Approach Delay (s)		0.0			0.0			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Timings
9: Erie Avenue & Bridge Street

11/25/2021

Lane Group	EBT	WBL	WBT	NBL
Lane Configurations				
Traffic Volume (vph)	337	42	225	24
Future Volume (vph)	337	42	225	24
Lane Group Flow (vph)	454	0	322	40
Turn Type	NA	Perm	NA	Prot
Protected Phases	4		8	2
Permitted Phases		8		
Detector Phase	4	8	8	2
Switch Phase				
Minimum Initial (s)	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5
Total Split (s)	62.0	62.0	62.0	28.0
Total Split (%)	68.9%	68.9%	68.9%	31.1%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	None	Max
v/c Ratio	0.72		0.73	0.05
Control Delay	20.6		24.7	7.6
Queue Delay	0.0		0.0	0.0
Total Delay	20.6		24.7	7.6
Queue Length 50th (m)	32.8		24.1	1.3
Queue Length 95th (m)	50.0		40.4	5.7
Internal Link Dist (m)	399.6		101.0	90.3
Turn Bay Length (m)				
Base Capacity (vph)	1803		1274	787
Starvation Cap Reductn	0		0	0
Spillback Cap Reductn	0		0	0
Storage Cap Reductn	0		0	0
Reduced v/c Ratio	0.25		0.25	0.05

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 50.2
Natural Cycle: 45
Control Type: Semi Act-Uncoord

Splits and Phases: 9: Erie Avenue & Bridge Street

HCM Signalized Intersection Capacity Analysis
9: Erie Avenue & Bridge Street

11/25/2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	337	40	42	225	24	9
Future Volume (vph)	337	40	42	225	24	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5			4.5	4.5	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.98			1.00	0.96	
Flpb, ped/bikes	1.00			0.99	1.00	
Frt	0.99			1.00	0.96	
Flt Protected	1.00			0.99	0.97	
Satd. Flow (prot)	1823			1661	1708	
Flt Permitted	1.00			0.77	0.97	
Satd. Flow (perm)	1823			1283	1708	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	406	48	51	271	29	11
RTOR Reduction (vph)	8	0	0	0	6	0
Lane Group Flow (vph)	446	0	0	322	34	0
Confl. Peds. (#/hr)		100	100		100	100
Confl. Bikes (#/hr)		3	3			
Heavy Vehicles (%)	0%	20%	33%	10%	0%	0%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Actuated Green, G (s)	17.4			17.4	23.7	
Effective Green, g (s)	17.4			17.4	23.7	
Actuated g/C Ratio	0.35			0.35	0.47	
Clearance Time (s)	4.5			4.5	4.5	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	633			445	807	
v/s Ratio Prot	0.24				c0.02	
v/s Ratio Perm				c0.25		
v/c Ratio	0.70			0.72	0.04	
Uniform Delay, d1	14.1			14.3	7.1	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	3.6			5.7	0.1	
Delay (s)	17.7			20.0	7.2	
Level of Service	B			C	A	
Approach Delay (s)	17.7			20.0	7.2	
Approach LOS	B			C	A	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	50.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Timings
9: Erie Avenue & Bridge Street

11/25/2021

Lane Group	EBT	WBL	WBT	NBL
Lane Configurations				
Traffic Volume (vph)	332	47	348	45
Future Volume (vph)	332	47	348	45
Lane Group Flow (vph)	466	0	470	86
Turn Type	NA	Perm	NA	Prot
Protected Phases	4		8	2
Permitted Phases		8		
Detector Phase	4	8	8	2
Switch Phase				
Minimum Initial (s)	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5
Total Split (s)	61.0	61.0	61.0	29.0
Total Split (%)	67.8%	67.8%	67.8%	32.2%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	None	Max
v/c Ratio	0.71		0.86	0.11
Control Delay	20.2		31.4	8.0
Queue Delay	0.0		0.0	0.0
Total Delay	20.2		31.4	8.0
Queue Length 50th (m)	35.3		40.0	2.7
Queue Length 95th (m)	53.8		62.5	10.4
Internal Link Dist (m)	399.6		101.0	90.3
Turn Bay Length (m)				
Base Capacity (vph)	1680		1438	749
Starvation Cap Reductn	0		0	0
Spillback Cap Reductn	0		0	0
Storage Cap Reductn	0		0	0
Reduced v/c Ratio	0.28		0.33	0.11

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 54
Natural Cycle: 50
Control Type: Semi Act-Uncoord

Splits and Phases: 9: Erie Avenue & Bridge Street

HCM Signalized Intersection Capacity Analysis
9: Erie Avenue & Bridge Street

11/25/2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	332	60	47	348	45	27
Future Volume (vph)	332	60	47	348	45	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5			4.5	4.5	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.97			1.00	0.94	
Flpb, ped/bikes	1.00			0.99	1.00	
Frt	0.98			1.00	0.95	
Flt Protected	1.00			0.99	0.97	
Satd. Flow (prot)	1748			1851	1659	
Flt Permitted	1.00			0.79	0.97	
Satd. Flow (perm)	1748			1480	1659	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	395	71	56	414	54	32
RTOR Reduction (vph)	12	0	0	0	17	0
Lane Group Flow (vph)	454	0	0	470	69	0
Confl. Peds. (#/hr)		100	100		100	100
Confl. Bikes (#/hr)		4	4			
Heavy Vehicles (%)	3%	15%	20%	0%	0%	0%
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Actuated Green, G (s)	20.1			20.1	24.8	
Effective Green, g (s)	20.1			20.1	24.8	
Actuated g/C Ratio	0.37			0.37	0.46	
Clearance Time (s)	4.5			4.5	4.5	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	651			551	763	
v/s Ratio Prot	0.26				c0.04	
v/s Ratio Perm				c0.32		
v/c Ratio	0.70			0.85	0.09	
Uniform Delay, d1	14.3			15.5	8.2	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	3.3			12.2	0.2	
Delay (s)	17.6			27.7	8.4	
Level of Service	B			C	A	
Approach Delay (s)	17.6			27.7	8.4	
Approach LOS	B			C	A	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	53.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			