Ontario Line

Integrated Transit Oriented Communities - Corktown

Preliminary Rezoning Transportation Impact Study

North Site: 383 KING STREET EAST
39 BERKELEY STREET
250-260 FRONT STREET EAST
68-70 PARLIAMENT STREET
TORONTO, ONTARIO, M5A 2W3

South Site: 265-271 FRONT STREET EAST
3-25 BERKELEY STREET
TORONTO, ONTARIO, M5A 2W3

Contract RFS-2019-NAFC-110

PO 214244

HDR Project 10206938

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1 Introduction

HDR Corporation was retained by Metrolinx to undertake a Transportation Impact Study and Parking Assessment for a proposed mixed-use development to be located on the future Ontario Line Corktown Station site, and on the block immediately to the south.

The subject properties currently contain an office supply store, two car dealerships, a carwash, and a parking lot. The proposed redevelopment consists of two separate sites:

- **North Site** (383 King Street E, 39 Berkely Street E, 250-260 Front Street E, 68-70 Parliament Street, Toronto, Ontario, M5A 2W3)
    - consisting of 840 residential units, 1,738 m^2 of retail space, 27,187 m^2 of office space, and the future Corktown Station on the northwest corner of the site.
- **South Site** (265-271 Front Street E, 3-25 Berkeley Street, Toronto, Ontario, M5A 2W3)
    - consisting of 740 residential units, 2,413 m^2 of retail, 42,306 m^2 of office, and 2,367 m^2 of Library.

Underground parking will be provided for both sites, and the parkade ramps to the underground parking will be provided from within each of the sites, with driveways on Berkeley and Parliament Street connecting the external street network to the on-site parking. **Figure 1** shows the location of the two development sites.

This draft report is an interim progress report on the traffic impact study for the proposed Transit Oriented Community (TOC) Sites B and F, located adjacent to the proposed Ontario Line Corktown Station.

The traffic impact study report includes documentation of the following components:

- Existing Conditions
- Background Traffic Conditions
- Proposed TOC Trip Generation
- Future Total Traffic Conditions with the TOC
- Parking Assessment
- Loading Assessment
- Transportation Demand Management
- Preliminary Findings and Next Steps

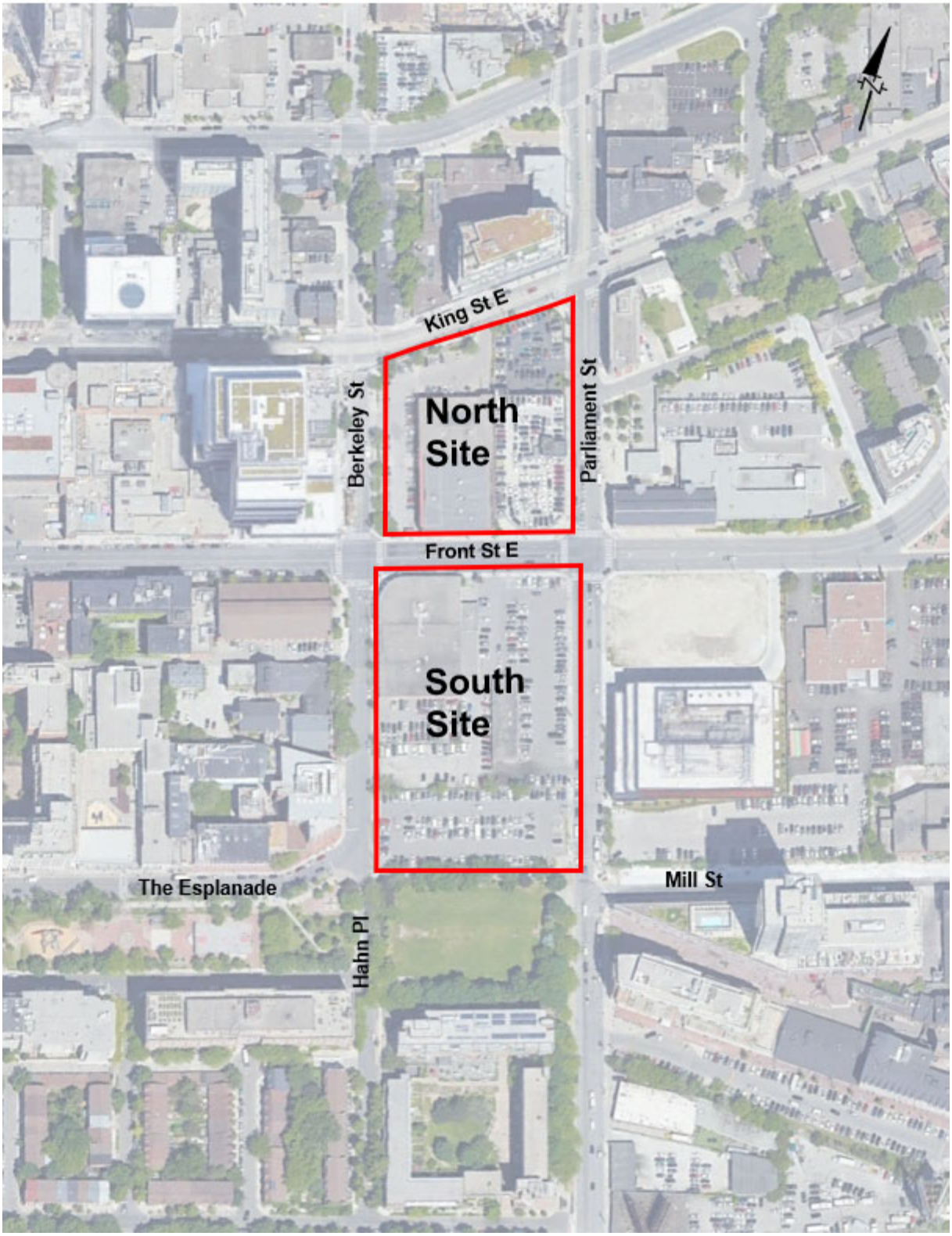


Figure 1: Study Area and Site Context

1.1 Scope of Work

The scope of work has been prepared in accordance with the **City of Toronto Guidelines for the Preparation of Transportation Impact Studies** (2003), and is as follows:

Study Area	• The two blocks bounded by King Street, Berkeley Street, Parliament Street and Parliament Square Park.
Analysis Scenarios	• Existing 2020 Traffic Conditions • Future 2030 Background Traffic Conditions (10-year horizon) *Includes 0.5% annual general background traffic growth, the future Corktown Station plus other new development traffic in the vicinity of the site* • Future 2030 Total Traffic Conditions (10-year horizon) *Includes future background traffic volumes plus traffic resulting from the proposed development, minus traffic from the existing site land uses.*
Analysis Time Periods	The following time periods were analyzed as they represent peak trip generation times for residential developments: • Weekday AM peak hour between 7:00am and 9:00am • Weekday PM peak hour between 3:00pm and 6:00pm
Study Area Intersections for Analysis	The following intersections were analyzed for capacity, level of service, and delays: 1) Berkeley Street & King Street 2) Berkeley Street & Front Street 3) Berkeley Street & The Esplanade / Hahn Place 4) Parliament Street & King Street 5) Parliament Street & Front Street 6) Parliament Street & Mill Street
Parking and Loading Study	A parking and loading assessment was undertaken for the proposed development using the City of Toronto Zoning By-law 569-2013 as the basis of the assessment.

1.2 Intersection Operations and Analysis Methodology

Intersection operations were assessed for the study area intersections and future site driveways using the software program Synchro Traffic Signal Coordination Software Version 9, which employs methodology from the **Highway Capacity Manual** (HCM 2000) published by the Transportation Research Board National Research Council. Synchro can analyze both signalized and unsignalized intersections in a road corridor or network, taking into account the spacing, interaction, queues and operations between intersections.

The signalized and unsignalized intersection analysis considers three separate measures of performance:

- The capacity of all intersection movements, represented by the volume to capacity (v/c) ratio;
- the level of service (LOS) for all intersection turning movements as well as for the overall intersection. The overall intersection LOS is based on the average control delay per vehicle (weighted) for the various movements through the intersection; and
- the forecasted queue lengths (95th percentile queue length) and storage requirements.

LOS is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between 'A' and 'F', with 'F' being the longest delay. The volume to capacity (v/c) ratio is a measure of the degree of capacity utilized at an intersection. HCM definitions are summarized in **Table 1**.

Table 1: Highway Capacity Manual Level of Service Definitions

Level of Service (LOS)	Signalized Control Delay per Vehicle (s)	Unsignalized Control Delay per Vehicle (s)	Description
A	≤ 10	≤ 10	Ideal
B	> 10 and ≤ 20	> 10 and ≤ 15	Acceptable
C	> 20 and ≤ 35	> 15 and ≤ 25	Acceptable
D	> 35 and ≤ 55	> 25 and ≤ 35	Somewhat undesirable
E	> 55 and ≤ 80	> 35 and ≤ 50	Undesirable
F	> 80	> 50	Unacceptable

The analysis undertaken in this study also follows the **City of Toronto Guidelines for Using Synchro 9 (Including SimTraffic 9[1])** (March 18, 2016), City of Toronto **'Guidelines for the Preparation of Transportation Impact Studies**[2]', and City of Toronto **'Traffic Signal Operations Policies and Strategies**' (May 2015)[3].

[1] https://www.toronto.ca/wp-content/uploads/2017/11/99bc-0_2016-04-28_Guidelines-for-Using-Synchro-9-Including-SimTraffic-9_Final-a.pdf

[2] http://arris.ca/~arris2/ARCHIVE/traffic-impact-study-guidelines.pdf

[3] https://www.toronto.ca/wp-content/uploads/2017/11/91d6-0_2015-11-13_Traffic-Signal-Operations-Policies-and-Strategies_Final-a.pdf

2 Existing Conditions

2.1 Site Context

As shown in Figure 1, the study sites are bounded by King Street East to the North, Berkeley Street to the West, Parliament Street to the East, and Parliament Square Park to the south, with Front Street running east-west between the two sites.

The site is situated in an area with good surface transit service on King Street. The closest existing subway station is King Station, approximately 1.2 kilometres to the west, and the future Corktown Station will be located on the northwest corner of the north site. The sites are currently occupied by a large office supply store car, car dealerships, carwash, and a parking lot. Vehicular access to the sites is currently provided from all bounding streets.

2.2 Existing Road Network

The existing road network is shown in Figure 2**,** including existing traffic controls and lane configurations. While east and westbound left turns are permitted on King Street within the study area, they are banned at both study intersections during the AM and PM peak hours for general traffic. All study roadways are under the jurisdiction of the City of Toronto.

The sites are well-served by the surrounding road network with direct access to all bounding streets. The existing road network is described below:

King Street E	King Street is a two-way east-west major arterial street with a speed limit of 40 km/h. It has a four-lane cross section, with sidewalks on both sides of the street.
Front Street E	Front Street is a two-way east-west minor arterial street with a speed limit of 40 km/h. It generally has a four-lane cross section, with up to five lanes at intersections to accommodate left turn lanes. Sidewalks are provided on both sides of the street.
Berkeley Street	Berkeley Street is a two-way local north-south street with a speed limit of 30 km/h, and on-street parking within the study area. Sidewalks are provided on both sides of the street.
Parliament Street	Parliament Street is a two-way minor arterial street with a speed limit of 40 km/h. It has a four-lane cross section, with the outside lanes used for on-street parking during the off-peak hours, and as travel lanes during the peak periods. Sidewalks are provided on both sides of the street.
The Esplanade	The Esplanade is a two-way local east-west street with a speed limit of 40 km/h. It has on-street parking on the north side near the study area, and sidewalks are provided on both sides.
Hahn Place	Hahn Place is a narrow two-way local north-south street with a speed limit of 30 km/h. The street passes between Parliament Square Park and the linear Quadra De Basquete De Toronto Park. Sidewalks are provided on both sides of the street.
Mill Street	Mill Street is a two-way local east-west street with a 40 km/h speed limit. It generally has a two-lane cross section, with a westbound left turn lane provided at Parliament Street, and on-street parking provided on the south side of the street near the study area. Sidewalks are provided on both sides of the street.

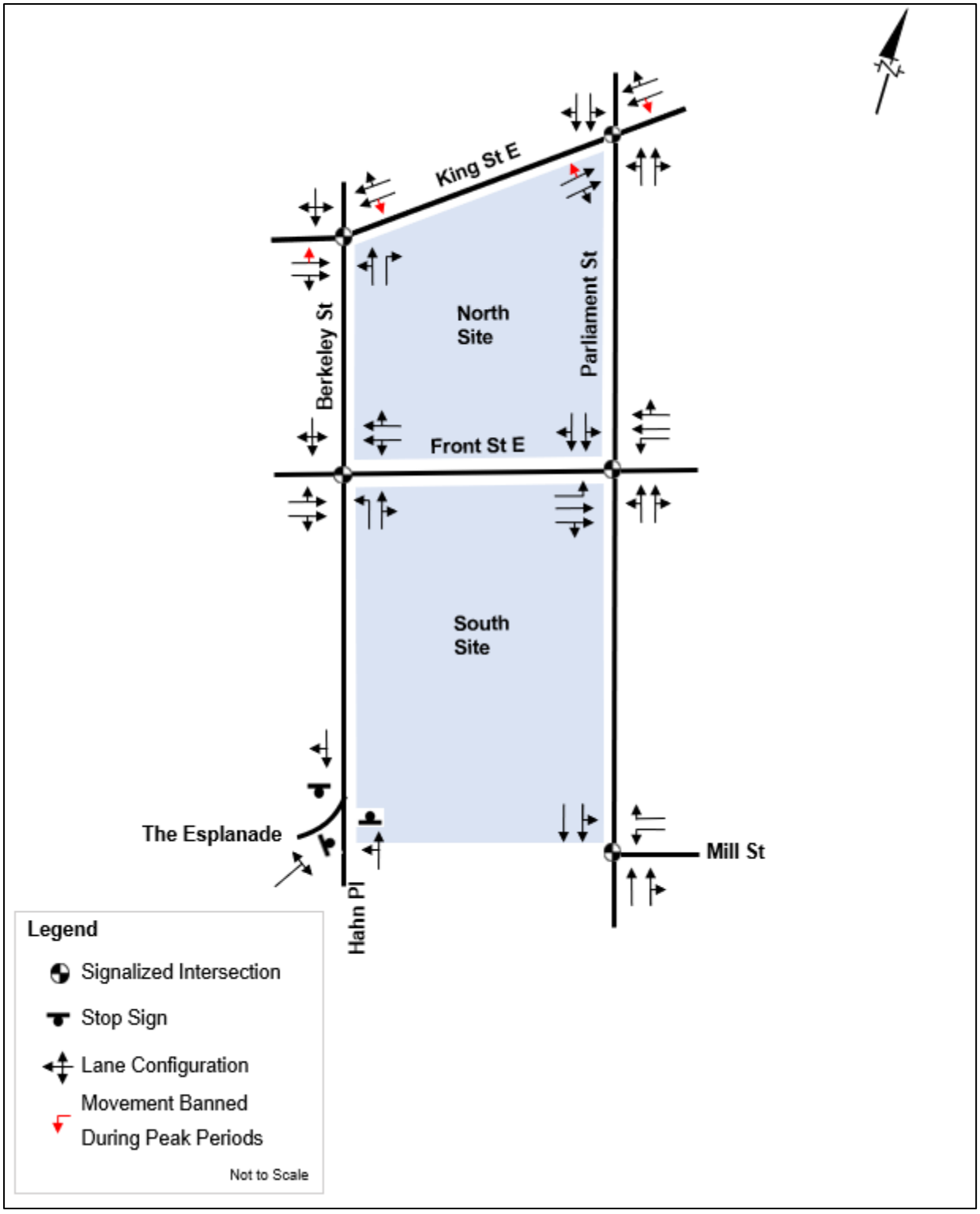


Figure 2: Existing Lane Configuration and Traffic Control

2.3 Existing Transit Services

The TTC operates bus services along all streets in the study area except for Hahn Place. The surface transit routes provide connections to downtown and to the Toronto Subway System, Line 1 at King Station. Existing transit services are summarized in **Table 2**, and an excerpt from the TTC system map[4] is also shown in Figure 3**.** The TTC also provides a night bus service on Parliament Street.

The Stouffville and Lakeshore East GO lines are located approximately 0.4 kilometres south of the site, and the site is approximately 1.5 kilometers away from the nearest GO stations at Union Station and Don Yard Station.

Table 2: Transit Service Summary

Route #	Route Name	Route Description	Peak Hour Headways	Nearest Stops & Walking Distance
65	Parliament	North-south route between Castle Frank Station and The Esplanade	12 minutes	Berkeley & Front (0 m)
121A	Fort York-Esplanade	Operates between Exhibition Place, Fort York and the Distillery neighbourhoods	30 minutes	Front & Parliament (0 m)
142	Downtown / Avenue Rd Express	Express route to downtown	NA due to COVID	Berkeley & King (0 m)
143	Downtown / Beach Express	Express route to downtown	NA due to COVID	Parliament & King (0 m)
145	Downtown / Humber Bay Express	Express route to downtown	NA due to COVID	King & Berkeley (0m)
365	Parliament	Night route for 65.	30 minutes	Parliament & King (0 m)
503	Kingston Road	East-west route between Kingston Road and Victoria Park Avenue	< 10 minutes	Parliament & King (0 m)
504A/B/S	King	Operates between Dundas West Station and Broadview Station	< 3 minutes	Parliament & King (0 m)
508	Lake Shore	Operates between Long Branch Loop and the King / Parliament area	NA due to COVID	Parliament & King (0 m)

Overall, there is good transit network availability in the broader study area.

[4] TTC System Map for November 2020, https://www.ttc.ca/PDF/Maps/TTC_SystemMap.pdf

Subway

1 2 3 4

Subway lines

Regular station

Interchange station

Intermodal station
Connects with other transit agencies

Accessible station

Washroom

Streetcars and buses

Direction of travel
Routing details
Route number
Branches
No letters denotes all branches.
Additional fare required
Terminus point
Seasonal service
Operates at limited times of the year. For details on periods of operation, refer to route page on ttc.ca.

after 3pm
27BC
27BC
Seasonal

Local service

Ten-Minute Network (501)
10-minute or better service from 6 a.m. to 1 a.m. Monday to Saturday; operates from 8 a.m. to 1 a.m. on Sundays.

Regular service (30)
Operates all day, every day, until 1 a.m.

Limited service (119)
Operates at limited times of day. Frequency of service varies by route. Some service does not operate during all periods.

Network service

Express Network (905)
Express bus service, serving select stops. Frequency of service varies by route. Some service does not operate during all periods.

Community Bus (404)
Neighbourhood midday service, Monday to Friday, connecting seniors' residences with local points of interest. Flag down anywhere along route.

Blue Night Network (310)
30-minute or better service, from approximately 1:30 a.m. to the start of subway service (approximately 6 a.m. on weekdays and Saturdays; 8 a.m. on Sundays).

Map symbols

- Streetcar loop
- Commuter rail station
- Airport
- Hospital — *24-hour emergency services*
- Toronto Public Library
- Health care
- Point of interest
- Transportation/government
- Post-secondary school
- Park
- Access Hub — *Accessible transit stop with a more comfortable shelter, served by Wheel-Trans*
- Additional fare required — *For more information on TTC fares, visit ttc.ca/fares*

Figure 3: Existing Transit Service

2.4 Existing Cycling and Pedestrian Facilities

Pedestrian connectivity within the study area is good in terms of sidewalks, paths, and pedestrian crossings. All major streets have sidewalks on both sides. Ladder crosswalks are typically located on all legs of the signalized intersections within the study area.

There is a protected on-street eastbound cycle track on King Street E, and no other dedicated cycling faculties in the study area. The existing active transportation network is depicted in Figure 5. Generally, the sidewalks in the study area are 1.8m wide or wider, but due to objects such as power poles, traffic signals, waste bins and street trees, the clear pedestrian zone may be narrower in many locations, as illustrated in Figure 4.

The highest pedestrian activity area is generally at the intersection of King Street and Parliament Street, likely due to the high number of bus and streetcar stops at this location.

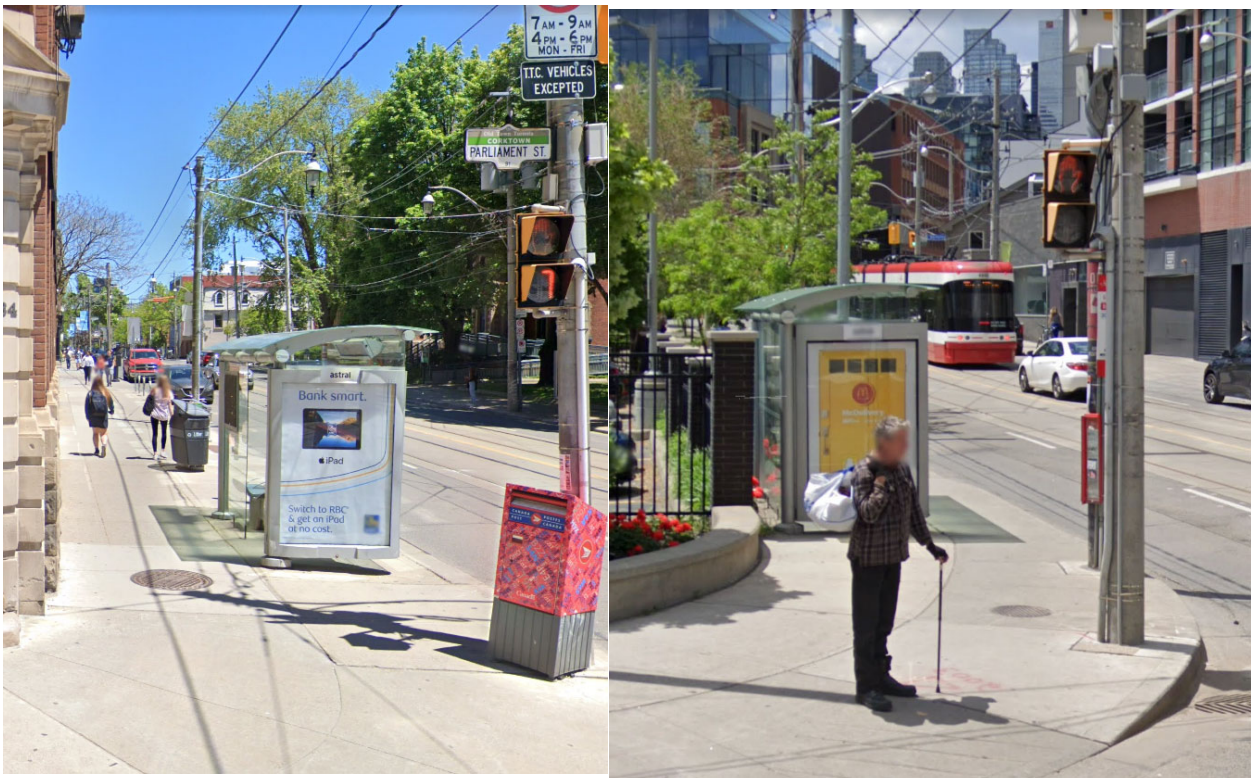


Figure 4: Sidewalks on King Street (Left - north side of King, looking east of Parliament Street, Right - South side of King, looking west of Parliament Street)

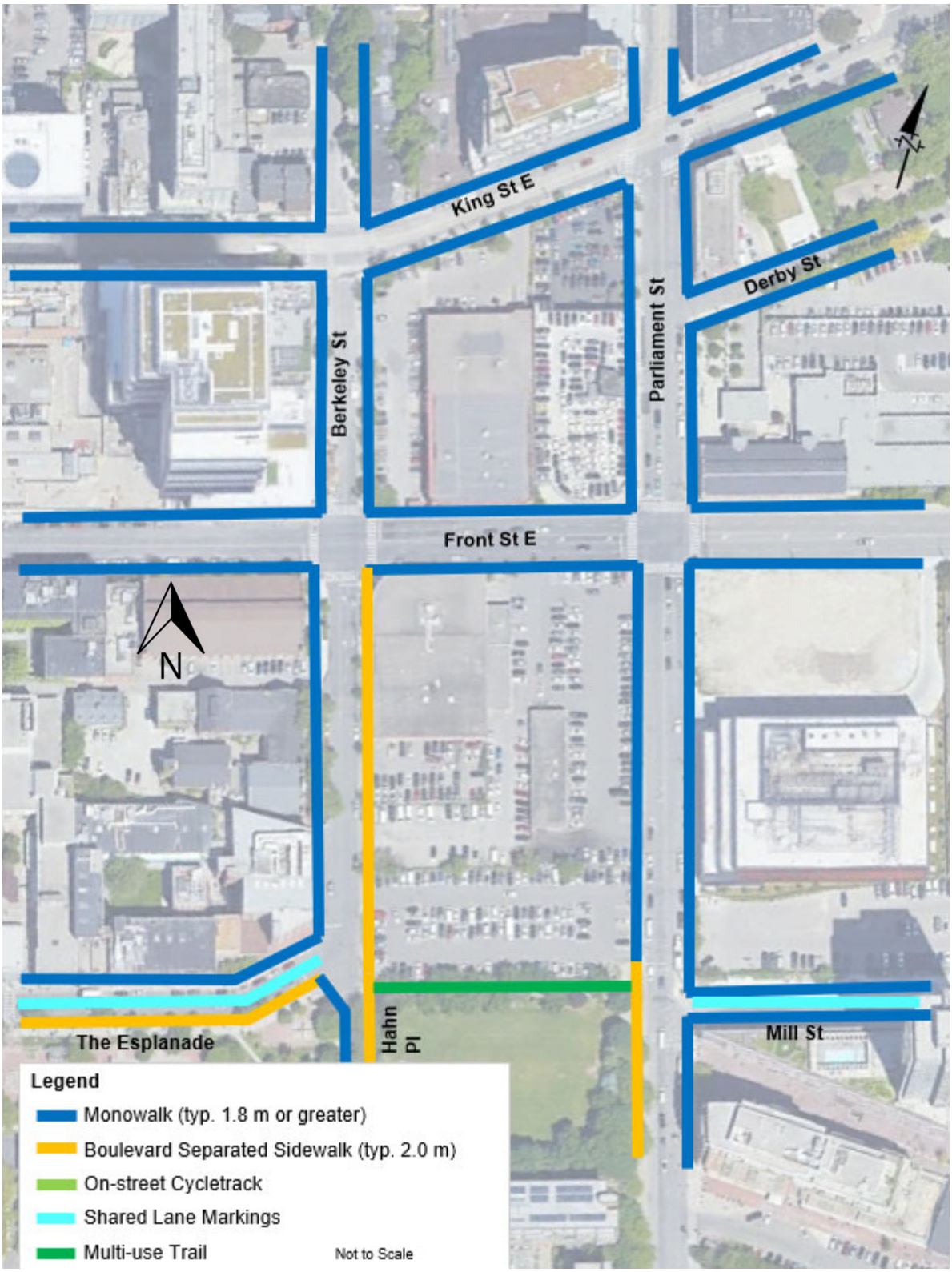


Figure 5: Active Transportation Network

2.5 Existing Traffic Volumes

A summary of the intersections and their sources are provided in Table 3 below. HDR used counts from the Ontario Line Project, Draft Environmental Conditions Report - Traffic and Transportation Report, Appendix B7 to maintain consistency with this study where possible and supplemented these counts with additional counts from the City's database.

Table 3: Traffic Count Source

Intersection	Count Source / Date
King Street E & Berkeley Street	OL Environmental Conditions Report - 2020
King Street E & Parliament Street	City of Toronto Traffic Count Database - 2013
Front Street E & Berkeley Street	City of Toronto Traffic Count Database - 2009
Front Street E & Parliament Street	OL Environmental Conditions Report - 2020
The Esplanade / Hahn Place & Berkeley Street	None – traffic volumes were estimated based on surrounding traffic volumes and context
Mill Street & Parliament Street	OL Environmental Conditions Report - 2020

Individual intersection peak hour traffic volumes are shown and were used in the study analysis, which is more conservative than calculating a global peak hour. Volume balancing between intersections was also reviewed. The AM westbound through volumes on Front Street and Berkeley Street were substantially higher than the traffic that was getting to the intersection from Parliament Street, and a review of the latest volumes from the Ontario Line background study, and the City of Toronto traffic volume database indicated that westbound through volumes at this location have likely decreased since the most recent available count in 2009. Therefore, AM westbound volumes at this intersection were reduced by 350 vph to more closely balance with the adjacent intersection at Front Street and Parliament Street. All other links and intersection volumes were relatively balanced, and any imbalances are likely due to adjacent driveways. No other volumes balancing adjustments were made.

Figure 6 shows the existing traffic volumes at the study area intersections.

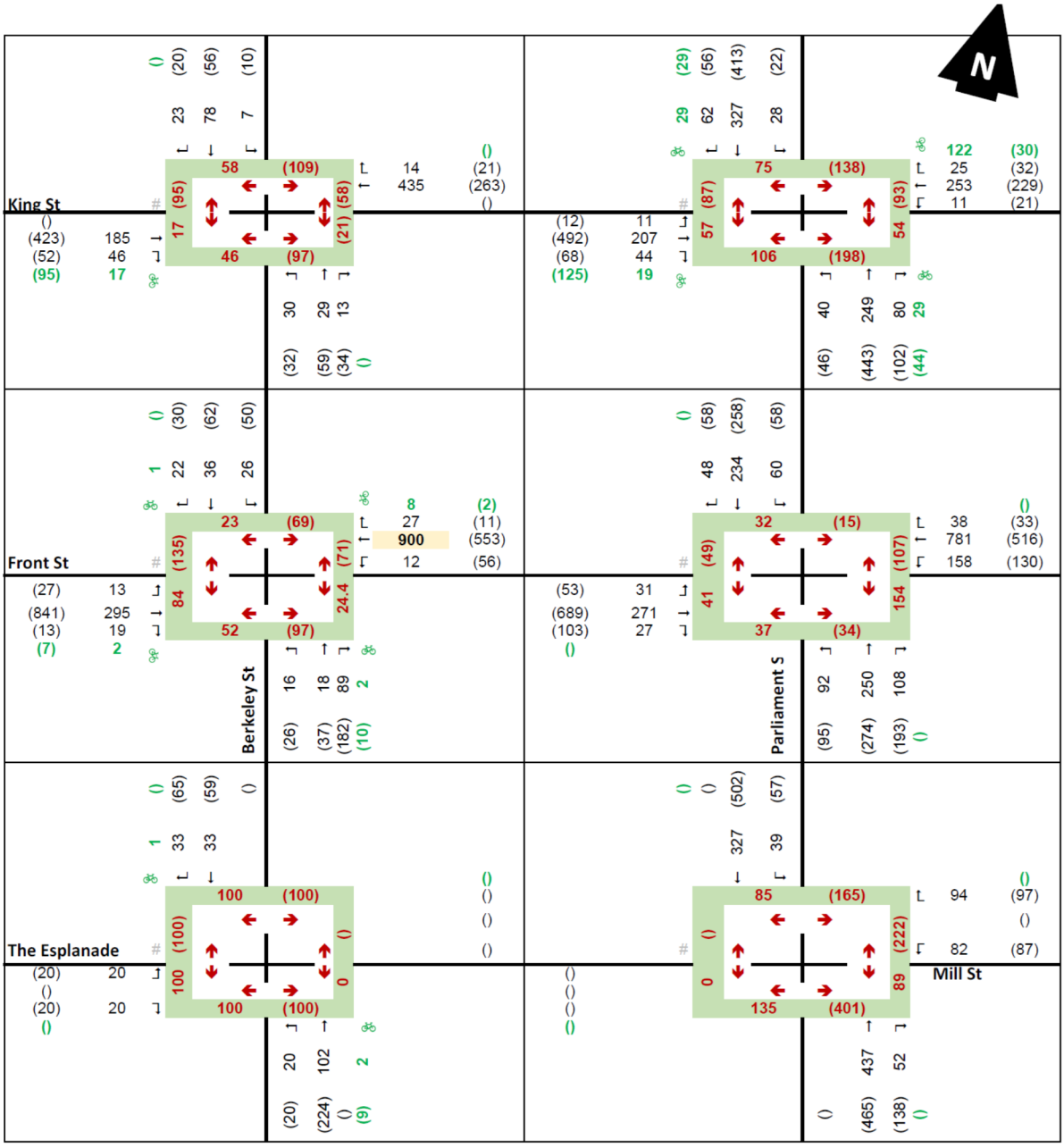


Figure 6: Existing Traffic Volumes

2.6 Existing Operations

Based on the existing traffic volumes and road network, intersection operations were assessed using Synchro 9 traffic analysis software. Existing signal timings used in the analysis are provided in **Appendix A**.

Table 4 summarizes the level-of-service (LOS) and volume/capacity ratio (v/c ratio) for each movement under existing conditions. Detailed Synchro results and reports for all study area intersections are provided in **Appendix B**.

Under existing traffic conditions, all study intersections are operating at LOS D or better, and there are no movements that are operating beyond standard capacity thresholds.

Table 4: Existing Conditions – Summary

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q	LOS	v/c	95th Q
King St & Berkeley St		**-**	**-**	**B**	**0.35**	**-**	**A**	**0.34**	**-**
Eastbound	Through-Right	2	200	A	0.20	11	A	0.34	26
Westbound	Through-Right	2	90	B	0.35	40	A	0.22	10
Northbound	Through-Left	1	70	C	0.19	17	C	0.28	23
	Right	1	25	A	0.04	2	A	0.10	7
Southbound	Left-Through-Right	1	75	C	0.30	24	C	0.24	20
King St & Parliament St		**-**	**-**	**B**	**0.63**	**-**	**B**	**0.72**	**-**
Eastbound	Through-Right	2	90	C	0.59	31	B	0.55	54
Westbound	Through-Right	2	65	C	0.63	30	B	0.29	22
Northbound	Left-Through-Right	2	70	A	0.24	20	C	0.71	50
Southbound	Left-Through-Right	2	70	A	0.24	24	C	0.56	40
Front St & Berkeley St		**-**	**-**	**A**	**0.51**	**-**	**B**	**0.53**	**-**
Eastbound	Left-Through-Right	2	200	A	0.19	19	B	0.53	67
Westbound	Left-Through-Right	2	80	A	0.51	23	C	0.45	66
Northbound	Left	1	25	C	0.05	7	C	0.07	9
	Through-Right	1	110	A	0.23	14	B	0.43	39
Southbound	Left-Through	1	50	C	0.14	18	C	0.26	28
	Right	1	25	A	0.06	4	A	0.07	4
Front St & Parliament St		**-**	**-**	**B**	**0.57**	**-**	**C**	**0.77**	**-**
Eastbound	Left	1	20	B	0.17	5	B	0.15	13
	Through-Right	2	80	B	0.20	12	B	0.45	75
Westbound	Left	1	30	B	0.34	30	B	0.46	29
	Through-Right	2	160	B	0.48	62	A	0.30	33
Northbound	Left-Through-Right	2	130	C	0.57	46	C	0.77	60
Southbound	Left-Through-Right	2	55	C	0.39	34	C	0.57	43
The Esplanade / Hahn Place & Berkeley St		**-**	**-**	**A**	**0.15**	**-**	**A**	**0.30**	**-**
Eastbound	Left-Right	1	210	A	0.15	-	A	0.30	-
Northbound	Left-Through	1	35	A	0.07	-	A	0.14	-
Southbound	Through-Right	1	130	A	0.05	-	A	0.05	-
Mill St & Parliament St		-	-	**B**	**0.35**	**-**	**B**	**0.45**	**-**
Westbound	Left	1	20	B	0.16	18	B	0.17	19
	Right	1	180	A	0.20	9	A	0.22	9
Northbound	Through-Right	2	-	B	0.35	29	B	0.43	35
Southbound	Left-Through	2	130	B	0.28	23	B	0.45	37

Note: LOS = level of service; v/c = volume to capacity ratio; 95th Q = 95th Percentile Queue using HCM 2000, and Pedestrian Crosswalk LOS using HCM 2010. Critical movements are highlighted in **red** as defined by the City's TIS Guidelines. Movements with LOS F are highlighted in **yellow**.

3 Background Traffic Conditions

3.1 Planned Roadway Improvements

Based on the City of Toronto's Ongoing Infrastructure & Construction Projects[5] , the City is planning on installing cycling infrastructure on The Esplanade and Mill Street. The final recommended plans for these improvements have not yet been confirmed. Additionally, any improvements are not anticipated to significantly affect the intersection laning and/or operations at the study area intersections, and therefore no changes were made to the future model based on this project.

3.2 Background Traffic Volumes

Background traffic volumes are comprised of existing traffic volumes plus general background traffic growth, plus traffic associated with nearby developments, and each component is summarized below.

3.2.1 Background Developments

As part of the analysis, nearby background developments were reviewed and accounted for as available in the traffic forecasting process. As shown in Figure 7, a total of 13 development applications were found within a 250m radius of the study site, with seven applications currently under review or being appealed, and 5 approved / closed. No documentation was available for the closed projects, and the projects under review / being appealed have not yet been approved.

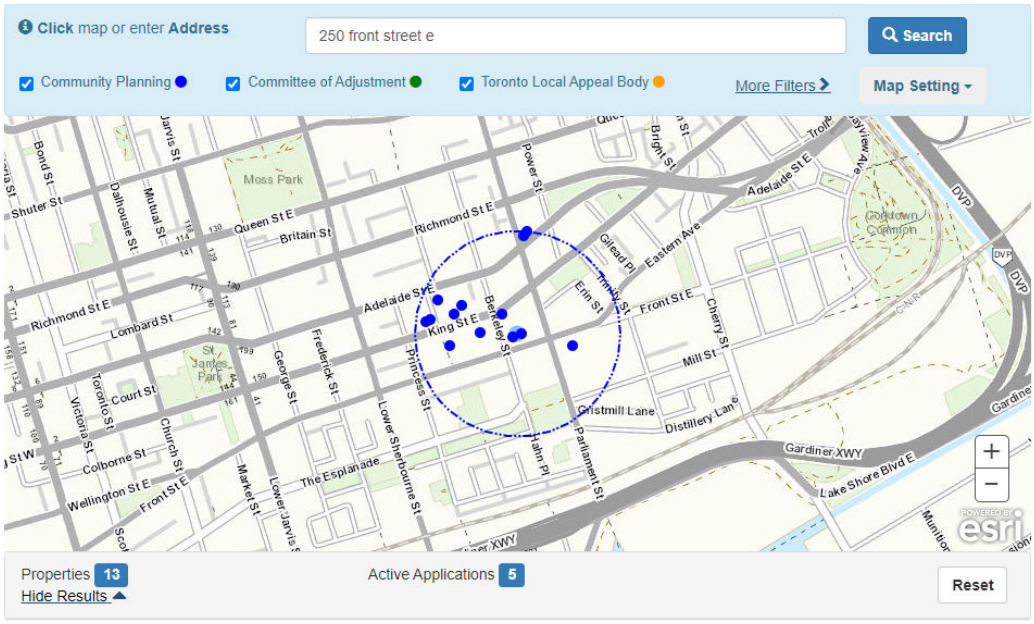


Figure 7: Adjacent Background Developments for Consideration

[5] https://www.toronto.ca/community-people/get-involved/public-consultations/infrastructure-projects/

Therefore, the only background development that was considered is 284 King Street. Online documentation for the project included a traffic memo commenting on a development revision and unit change, but the original TIS was not available. The proposed development will include 218 residential units. As the TIS for the site was not available, trips were generated for the development site using the same methodology as for the proposed development and were distributed and assigned to the street network in a similar fashion. This primarily consisted of assigning the eastbound trips to King Street at the study area intersections.

3.2.2 General Background Growth

A review of the historical traffic counts from various sources, including previous transportation studies, revealed that the magnitude of traffic volumes within the study area has been relatively stable, despite variations in traffic patterns. There may also be some movements that have experienced negative growth. A vehicular growth rate of 0.50% was applied to all through movements, with the exception of driveway movements. This approach was used to assess the worst-case growth conditions of all movements in the study area and is considered a conservative assumption. No growth rate was applied for pedestrians or bicycles. Figure 8 shows the total future background traffic volumes, which include background growth, and the adjacent development traffic volumes.

3.2.3 Ontario Line – Corktown Station

The Corktown Station has been included as a layer of background growth, and walking and transit trips to/from the station were generated. The generated walking and transit trips were for the 2081 horizon, and are therefore conservative. These trips were distributed and assigned to the study area network, and details can be found in the next section. As the station was considered constructed in this scenario, the existing site traffic on both sites was removed.

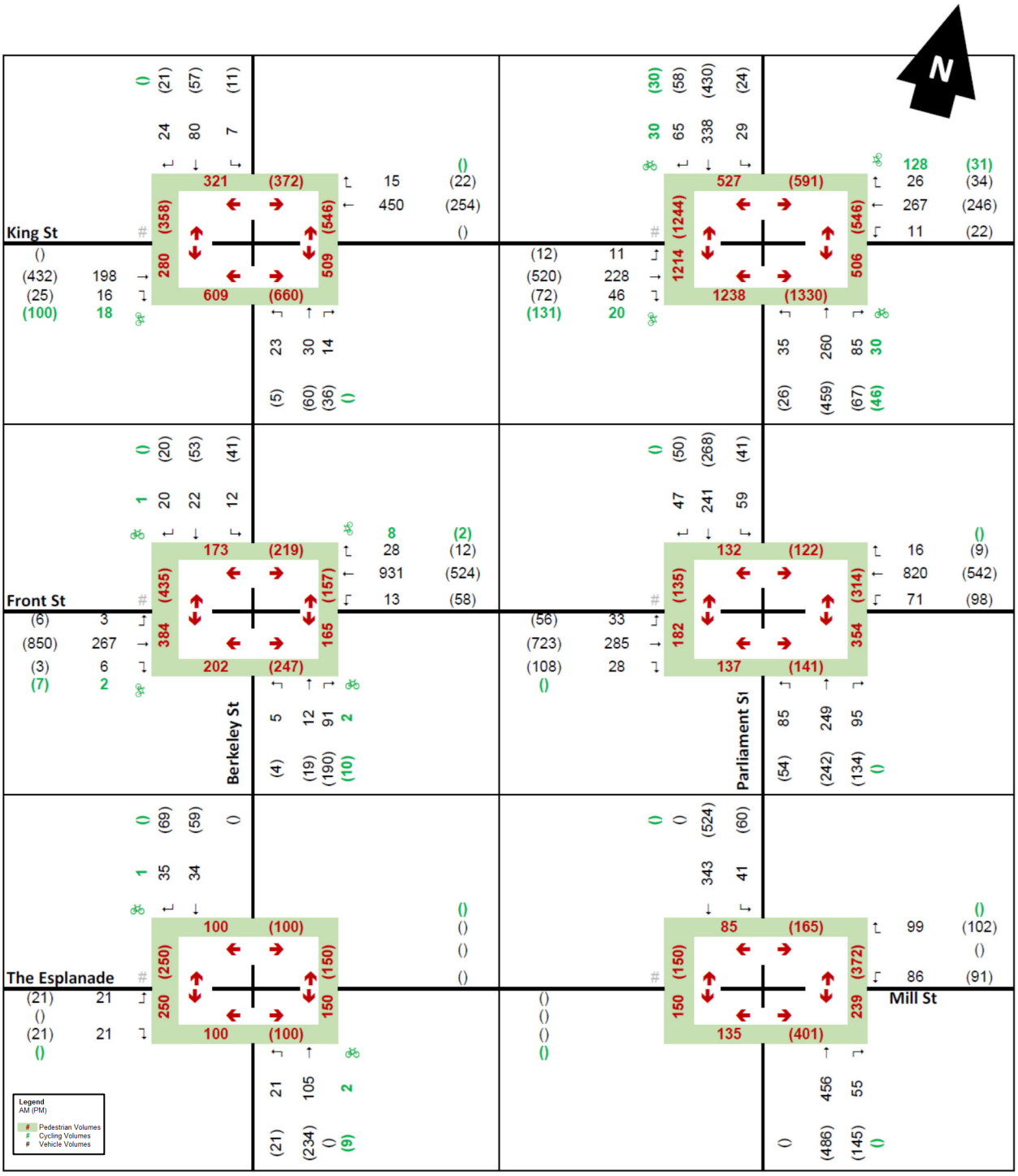


Figure 8: Future Background Traffic Volumes

3.3 Background Traffic Operations

Table 5 summarizes the LOS and v/c ratio for movements under future background conditions based on the forecast traffic volumes. Signal timing split optimization was incorporated if needed into both the AM and PM Synchro models. Detailed Synchro results and reports for all study area intersections are provided in **Appendix B**. Under future background conditions, all movements will still be operating with residual capacity and with LOS 'E' or better, except for:

- Front Street & Parliament Street
    - The eastbound through-right queue in the PM peak period will exceed the available turn lane storage length.

Table 5: 2030 Background Conditions – Summary

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q	LOS	v/c	95th Q
King St & Berkeley St		**-**	**-**	**B**	**0.37**	**-**	**A**	**0.33**	**-**
Eastbound	Through-Right	2	200	A	0.19	11	A	0.33	26
Westbound	Through-Right	2	90	B	0.37	41	A	0.22	9
Northbound	Through-Left	1	70	C	0.18	15	C	0.17	17
	Right	1	25	A	0.06	2	B	0.15	7
Southbound	Left-Through-Right	1	75	C	0.34	25	C	0.26	20
King St & Parliament St		**-**	**-**	**C**	**0.68**	**-**	**C**	**0.69**	**-**
Eastbound	Through-Right	2	90	D	0.68	37	B	0.60	59
Westbound	Through-Right	2	65	C	0.64	31	B	0.32	24
Northbound	Left-Through-Right	2	70	A	0.28	27	C	0.69	50
Southbound	Left-Through-Right	2	70	A	0.29	29	C	0.64	45
Front St & Berkeley St		**-**	**-**	**A**	**0.54**	**-**	**C**	**0.50**	**-**
Eastbound	Left-Through-Right	2	200	A	0.15	16	B	0.50	64
Westbound	Left-Through-Right	2	80	A	0.54	24	C	0.44	0
Northbound	Left	1	25	C	0.02	3	C	0.01	3
	Through-Right	1	110	A	0.28	14	C	0.49	46
Southbound	Left-Through	1	50	C	0.08	11	C	0.22	24
	Right	1	25	A	0.07	3	A	0.06	2
Front St & Parliament St		**-**	**-**	**B**	**0.56**	**-**	**B**	**0.55**	**-**
Eastbound	Left	1	20	B	0.24	11	B	0.20	16
	Through-Right	2	80	B	0.24	29	C	0.55	86
Westbound	Left	1	30	B	0.20	16	C	0.48	28
	Through-Right	2	160	B	0.56	74	B	0.35	42
Northbound	Left-Through-Right	2	130	B	0.48	38	B	0.46	39
Southbound	Left-Through-Right	2	55	B	0.34	30	B	0.38	34
The Esplanade / Hahn Place & Berkeley St		**-**	**-**	**A**	**0.15**	**-**	**A**	**0.31**	**-**
Eastbound	Left-Right	1	210	A	0.15	-	A	0.31	-
Northbound	Left-Through	1	35	A	0.08	-	A	0.15	-
Southbound	Through-Right	1	130	A	0.05	-	**A**	**0.06**	**-**

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q	LOS	v/c	95th Q
Mill St & Parliament St		-	-	B	0.37	-	B	0.47	-
Westbound	Left	1	20	B	0.17	18	B	0.18	19
	Right	1	180	A	0.21	9	A	0.23	10
Northbound	Through-Right	2	-	B	0.37	31	B	0.46	37
Southbound	Left-Through	2	130	B	0.30	24	B	0.47	39

4 Proposed TOC Trip Generation

4.1 Conceptual Site Plan

The proposed development is comprised of two separate sites. The North Site is bordered by Berkeley, Parliament, King and Front, and the South Site is immediately south of the North Site / Front Street. Figure 9 and Figure 10 shows two site plans, and **Table 6** and **Table 7** show the site statistics for both.

Table 6: North Site – Site Plan Statistics

Proposal	Residential Units	Retail Size	Office Size	Transit
North Site Total	**840 units**	**1,738 m² GFA**	**27,187 m² GFA**	**1,351 m² GFA**

Table 7: South Site - Site Plan Statistics

Proposal	Residential Units	Retail Size	Office Size	Institutional (Library)
South Site Total	**740 units**	**2,413 m² GFA**	**42,306 m² GFA**	**2,367 m² GFA**

Vehicular access to the North Site will be provided through the shifting of existing driveways, one on Berkeley Street and the other on Parliament Street (approximately lined up with Derby Street). The existing driveway on King Street E will be closed.

Vehicular access to the South Site will be provided by single accesses on both Berkeley Street and Parliament Streets as well, resulting in an overall reduction of driveways on each street. The existing access on Front Street E will also be closed. All driveway accesses for both sites will be outbound stop controlled.

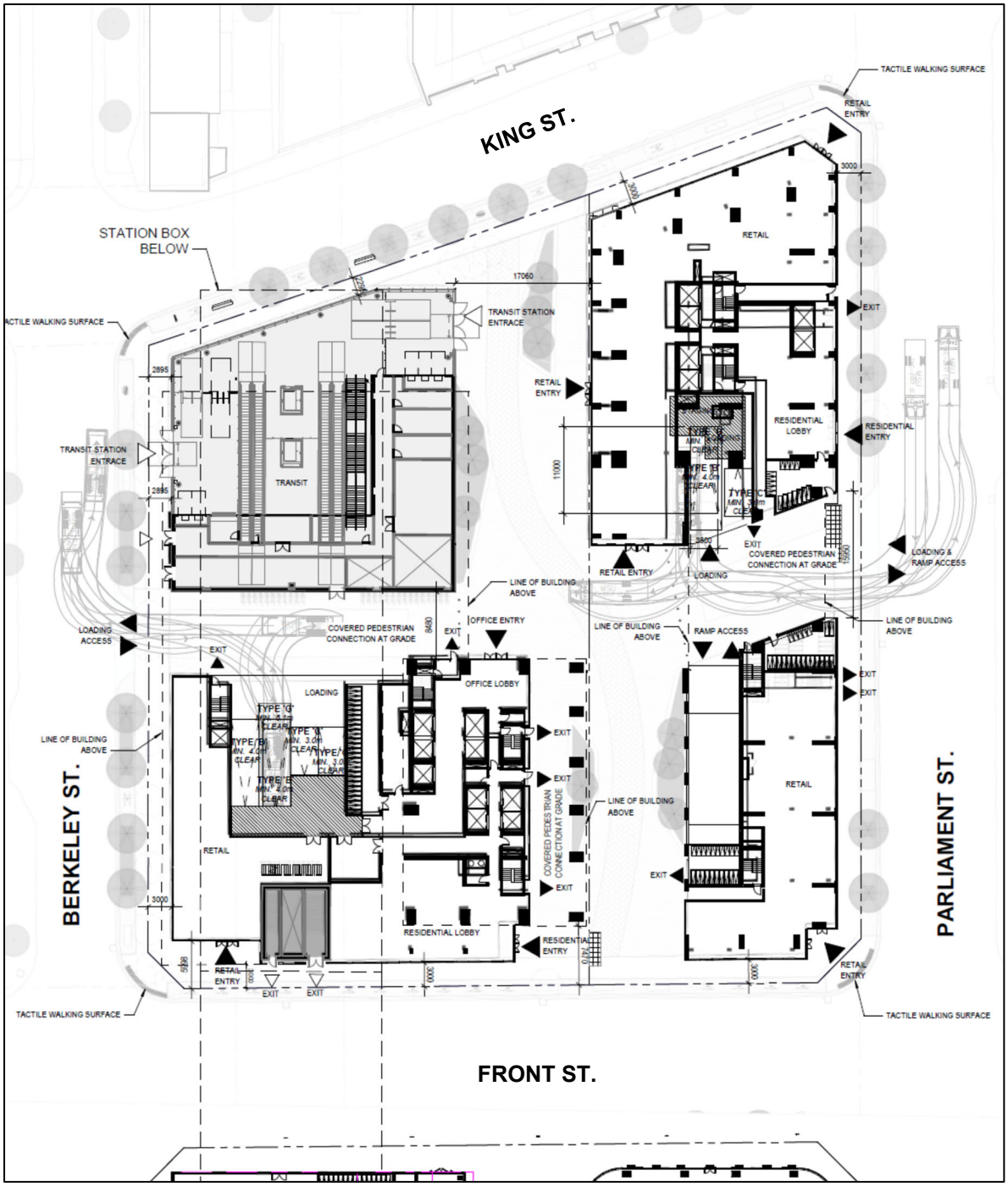


Figure 9: North Site - Site Plan (February 19, 2021)

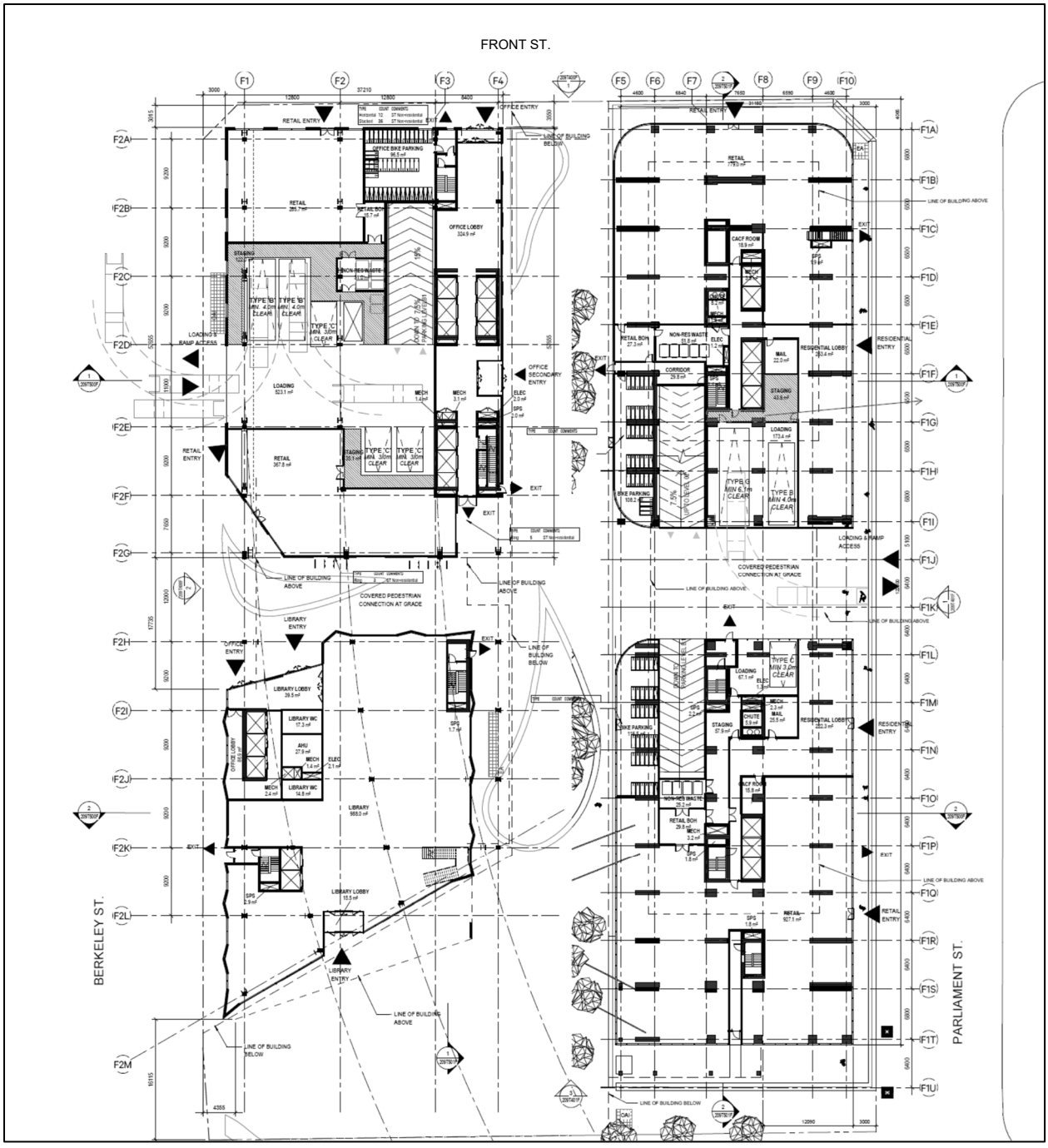


Figure 10: South Site - Site Plan (February 19, 2021)

4.2 Site Trip Generation

4.2.1 Mode Splits

The 2016 Transportation Tomorrow Survey (TTS) was used to inform the future mode split assumptions for the proposed development using existing information. The TTS is a survey of households within the Greater Golden Horseshoe, including the Greater Toronto Area, that summarizes travel patterns and other related transportation information that can be used to aid in planning, such as mode splits. The 2016 TTS divides geographical areas into 'zones' for the purposes of determining trip patterns from one zone to another.

The existing mode splits for the area were obtained through a review of TTS (2006) Zones 15, 16, 25, and 26, which are the zones including and surrounding the subject site. The TTS data and the proposed mode splits are summarized in Table 8.

As the AM Inbound and PM Outbound, and AM Outbound and PM Inbound were very similar, the two were combined to result in two separate mode share splits for the site. The proposed mode splits are considered conservative as they are based on existing mode splits, when in fact, auto trips are anticipated to continue to shift to transit and active transportation as the study area continues to develop and densify, and this change will be further spurred with the addition of the future Ontario Line and Corktown Station below the North Site.

Table 8: Mode Splits

Mode	Existing (TTS)				Proposed	
	AM (In)	AM (Out)	PM (In)	PM (Out)	AM (In) / PM (Out)	AM (Out) / PM (in)
Transit	59%	31%	30%	52%	55%	30%
Walking	10%	37%	32%	15%	12%	35%
Cycling	5%	4%	6%	5%	5%	5%
Auto Passenger	4%	3%	5%	4%	5%	5%
Auto Driver / Taxi	23%	25%	27%	24%	23%	25%
Total	100%	100%	100%	100%	100%	100%

4.2.2 Trip Generation

Trips were generated for the proposed development using the information provided in the Institute of Transportation Engineers (ITE) Trip Generation Informational Report (10th edition). Trip generation rates for Land Use 222 (Multifamily Housing – High-Rise), Land Use 820 (Shopping Centre), Land Use 710 (General Office Building), and Land Use 590 (Institutional) were used.

The land use assumes dense multi-use conditions for Land Use 222, and general urban/suburban conditions were used for the other land uses as a dense multi-use category was not available.

Table 9 shows the ITE trip generation rates used for each site land use, and it includes estimated person trips per vehicle trip. The purpose of generating person trips rather than vehicle trips was to be able to assign pedestrian, cycling and transit trips to the study network.

Table 10 and Table 11 show the resulting trip generation for each site by mode. Due to the density of compatible land uses in close proximity on Sites B and F, an assumed 5% internal capture rate was applied to all trip types, and this is also considered a conservative assumption. Future Ontario Line Corktown Station trips (walk and transit to/from the station) were developed and are also shown in the tables.

Table 9: ITE Trip Generation Rates

Land Use	ITE LUC	Peak Hour	ITE Average Vehicle Trip Rate	Equation*	Entering	Exiting	Person Trips per Vehicle Trip
Residential	222 Multi-family High Rise	AM	0.21	Ln(T) = 0.84 Ln(X) - 0.65	12%	88%	2.81
		PM	0.19	Ln(T) = 0.81 Ln(X) - 0.60	70%	30%	2.17
Retail	820 Shopping Centre	AM	0.94	T = 0.50(X) + 151.78	62%	38%	NA
		PM	3.81	Ln(T) = 0.74 Ln(X) + 2.89	48%	52%	1.43
Office	710 General Office Building	AM	0.83	T = 0.72(X) + 21.64	86%	14%	1.47
		PM	0.87	T = 0.83(X) + 7.99	17%	83%	1.46
Institutional	590 Library	AM	1.00	T=1.75(x)-14.59	71%	29%	1.47
		PM	8.26	T = 9.33(x) -17.13	48%	52%	1.46

Note: The trip generation equation was only used for Residential Land Use, for all other land uses, the total person trips were calculated by multiplying the ITE vehicle trip rate by the person trips per vehicle value to get total person trips.

Table 10: North Site - Trip Generation by Mode

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Residential – LUC 230 Multifamily High Rise						
Total	**420**	**50**	**369**	**278**	**195**	**83**
Transit	138	28	111	104	58	46
Walking	135	6	129	78	68	10
Cycling	21	3	18	14	10	4
Auto Passenger	21	3	18	14	10	4
Auto Driver	104	12	92	68	49	19
Retail – LUC 820 Shopping Centre						
Total	**25**	**16**	**10**	**102**	**49**	**53**
Transit	25	16	10	102	49	53
Walking	11	9	3	44	15	29
Cycling	5	2	3	23	17	6
Auto Passenger	1	1	0	5	2	3
Auto Driver	1	1	0	5	2	3
Office – LUC 710 General Office Building						
Total	342	294	48	366	62	304
Transit	176	162	14	186	19	167
Walking	52	35	17	58	22	36
Cycling	17	15	2	18	3	15
Auto Passenger	17	15	2	18	3	15
Auto Driver	80	68	12	85	16	70
Station Trips						
Total	**6200**	**-**	**-**	**6200**	**-**	**-**
Transit	3200	-	-	3200	-	-
Walking	3000	-	-	3000	-	-
Site Total (excluding Station) – Including 5% Internal Capture						
Total	**747**	**342**	**405**	**709**	**291**	**418**
Transit	310	188	122	317.4	87	230
Walking	183	41	142	152	102	50
Cycling	37	17	20	35	15	21
Auto Passenger	37	17	20	35	15	21
Auto Driver	180	79	101	169	73	96

Table 11: South Site - Trip Generation by Mode

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Residential – LUC 230 Multifamily High Rise						
Total	**377**	**45**	**332**	**251**	**176**	**75**
Transit	124	25	100	94	53	41
Walking	122	5	116	71	62	9
Cycling	19	2	17	13	9	4
Auto Passenger	19	2	17	13	9	4
Auto Driver	93	10	83	61	44	17
Retail – LUC 820 Shopping Centre						
Total	**35**	**22**	**13**	**142**	**68**	**74**
Transit	16	12	4	61	20	40
Walking	7	3	5	33	24	9
Cycling	2	1	1	7	3	4
Auto Passenger	2	1	1	7	3	4
Auto Driver	8	5	3	34	17	17
Office – LUC 710 General Office Building						
Total	**514**	**442**	**72**	**563**	**96**	**468**
Transit	265	243	22	286	29	257
Walking	78	53	25	90	34	56
Cycling	26	22	4	28	5	23
Auto Passenger	26	22	4	28	5	23
Auto Driver	120	102	18	132	24	108
Institutional – LUC 590 Library						
Total	**44**	**31**	**13**	**322**	**155**	**167**
Transit	21	17	4	138	46	92
Walking	8	4	4	74	54	20
Cycling	2	2	1	16	8	8
Auto Passenger	2	2	1	16	8	8
Auto Driver	10	7	3	77	39	39
Site Total						
Total	**921**	**513**	**408**	**1214**	**469**	**745**
Transit	405	282	123	551	141	410
Walking	205	62	143	254	164	89
Cycling	46	26	20	61	23	37
Auto Passenger	46	26	20	61	23	37
Auto Driver	220	118	102	289	117	171

4.2.3 Existing Vehicle Site Trips

As there are a number of existing land uses on the study sites, and existing vehicle trip generation was conducted for these land uses, to subtract from the existing traffic volumes. Existing land uses and areas were estimated based on Google Maps, and were subtracted using the same site distribution / assignment for the proposed developments site trips. Table 12 and Table 13 show the trips generated / subtracted from each site.

Table 12: North Site - Existing Vehicle Trip Generation

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Dealership - LUC 840 Car Sales Centre						
Auto Driver	44	32	12	58	23	35
Retail – LUC 820 Shopping Centre						
Auto Driver	26	16	10	107	51	55
North Site Total						
Auto Driver	71	49	22	164	74	90

Table 13: South Site - Existing Vehicle Trip Generation

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Dealership - LUC 840 Car Sales Centre						
Auto Driver	46	33	12	59	24	36
Car Wash – LUC 820 Shopping Centre						
Auto Driver	86	54	32	136	67	69
Parking Lot – First Principles, 1 trip per parking stall per hour						
Auto Driver	120	103	17	120	20	100
South Site Total						
Auto Driver	252	191	61	315	111	205

4.3 Site Traffic Distribution and Assignment

Future trip distribution was estimated using the information from the 2016 TTS. The trip distribution for the site was based on the existing distribution to TTS zones (TTS 2006 Zones 15, 16, 25, and 26). Trips were distributed based on each mode of transportation, and Google directions were also used to understand the fastest routes, by time of day, which was used to inform trip assignment.

The TTS distributions for walking, cycling and transit (effectively walking trips within the study area) were all very similar across the AM and PM peak periods, and for inbound / outbound, and so a common distribution was used for these modes.

A separate trip distribution was conducted for the station, with different distributions used for the walk trips (to/from the station), and the transit trips to/from the station (applied as walk trips, but destined to/from the nearby surface transit stops). The distribution for these trips is shown in Table 15. They are based on the location of density near the site (related to the walking trips

to/from the station) and based on the location of the nearest transit stops (with most located at the intersection of King Street and Parliament Street).

As many of the future transit trips to/from the future study development will originate / terminate at the future Corktown Station, and are part of the overall station trip total, this overlap of trips was removed from the analysis to avoid “double counting” pedestrian/transit trips between the site and the future station. In total, 80% of all site generated transit trips were assigned to/from the station, with the remainder assigned to access the surface transit network.

Table 14: Assumed Trip Distribution – North and South Sites

Mode	Time Period / Direction	Direction				
		North	East	South	West	Total
Walk	**AM / PM**	10%	5%	2%	83%	100%
Cycle	**AM /PM**	10%	5%	2%	83%	100%
Transit (Walk)	**AM / PM (In)**	3%	50%	2%	45%	100%
	AM / PM (Out)	3%	20%	2%	75%	100%
Auto	**AM (In)**	3%	50%	2%	45%	100%
	AM (Out)	3%	40%	2%	55%	100%
	PM (In)	3%	35%	2%	60%	100%
	PM (Out)	3%	45%	2%	50%	100%

Table 15: Assumed Trip Distribution – Station

Mode	Time Period / Direction	Direction				
		North	East	South	West	Total
Walk	**AM / PM**	30%	20%	20%	30%	100%
Transit (Walk)	**AM / PM**	25%	25%	25%	25%	100%

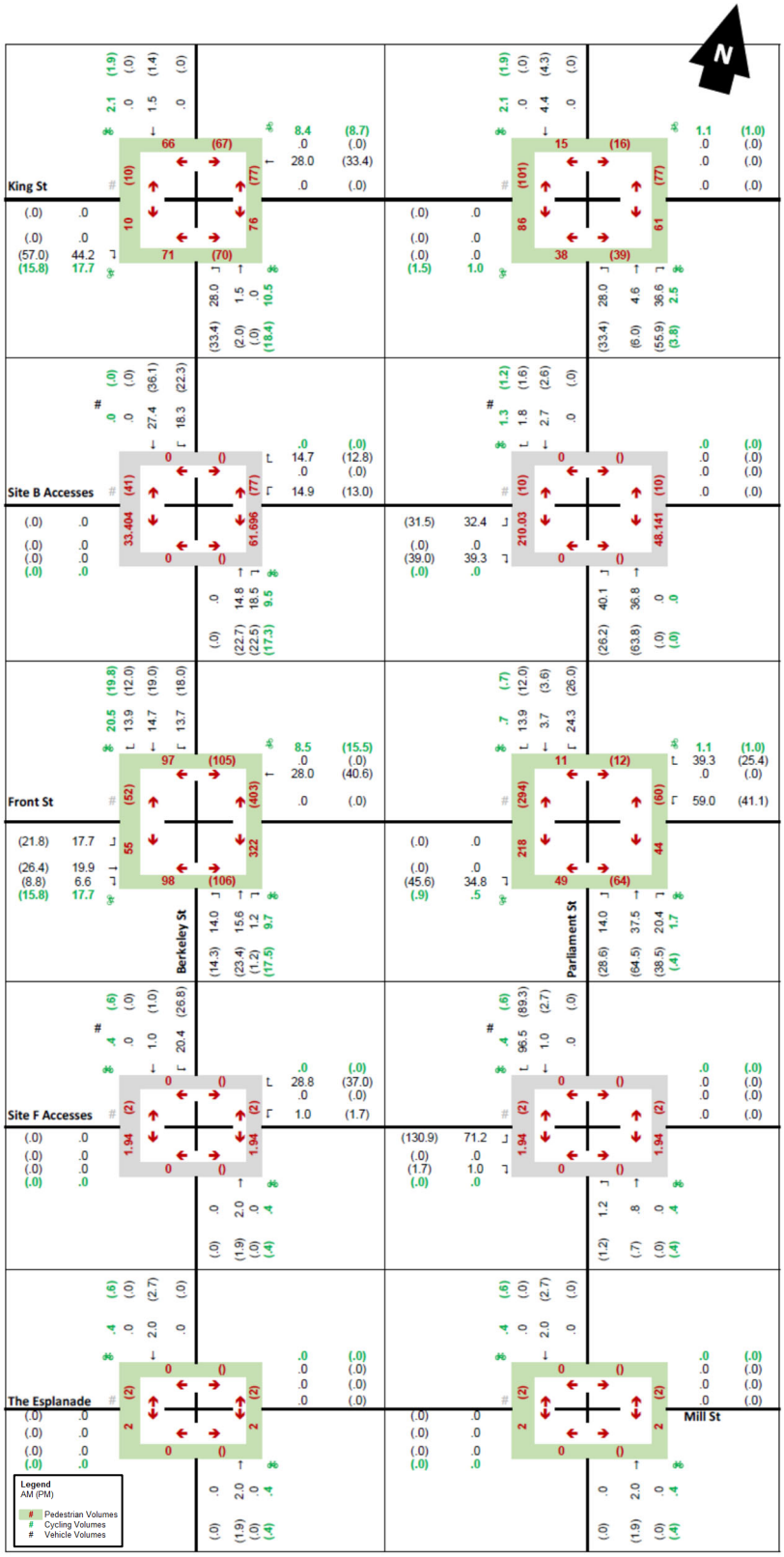


Figure 11: Site Trips

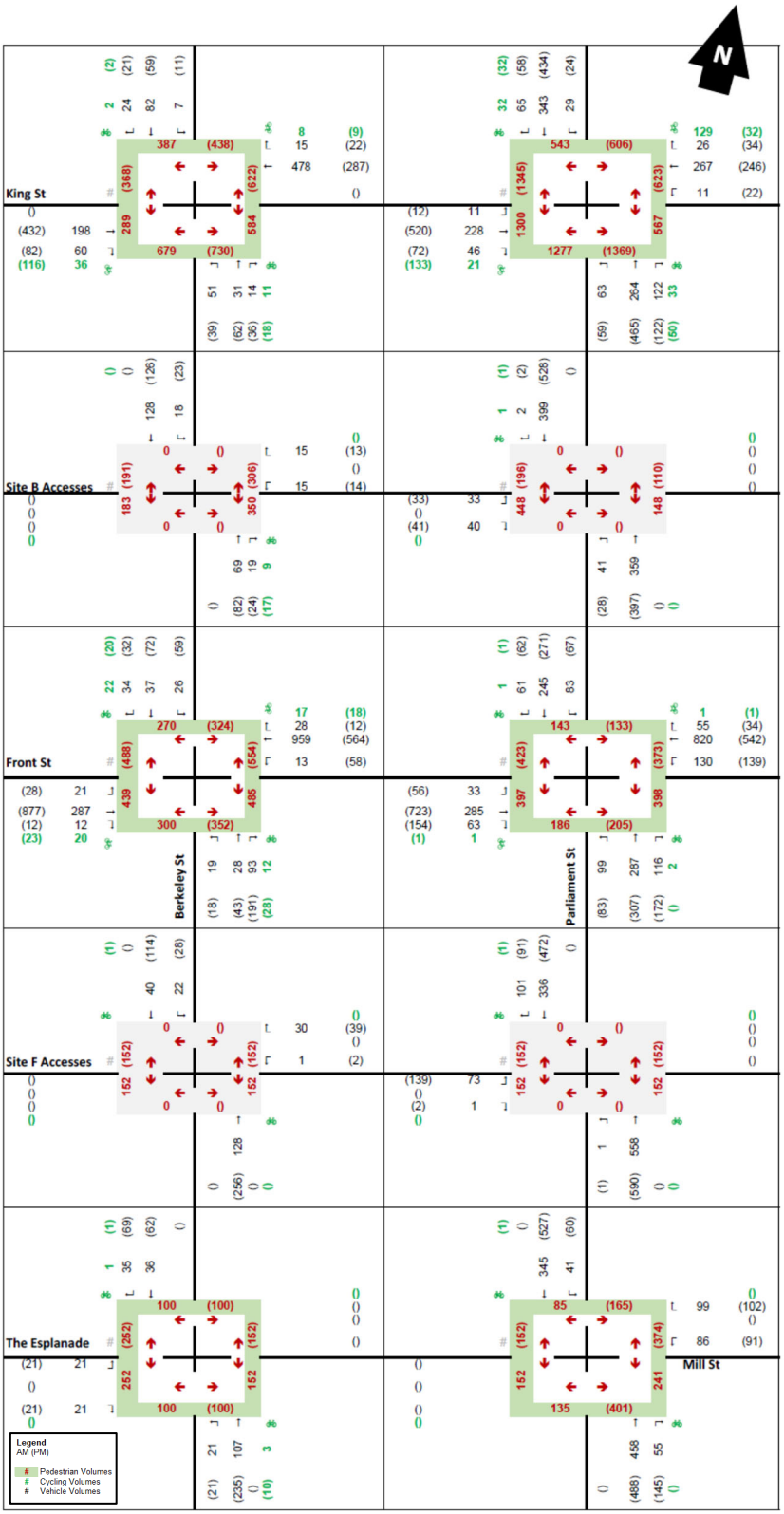


Figure 12: Total Traffic Volumes

5 Future Total Traffic Conditions with TOC

Table 16 summarizes the future total traffic operations at the study area intersections, and **Table 17** presents the future operations at the proposed site accesses. Signal timing split optimization was only performed if needed. There were no assumed geometric improvements. Table 17 presents the analysis of the future site access intersections. Detailed results and reports for all study area intersections are provided in **Appendix B**.

Under future total conditions, all movements will still be operating with LOS 'E' or better, and with residual capacity, except for:

- Front Street & Parliament Street
  - The westbound left turn queue in the PM peak period will exceed the available turn lane storage length.
- North Site East Access – Parliament Street
  - The eastbound movement is forecasted to operate at a LOS E in the AM peak hour
- South Site East Access – Parliament Street
  - The eastbound movement is forecasted to operate at a LOS E in the PM peak hour

Adjusting the signal timing at Parliament and Front Street does materially improve the westbound left turn queue without significantly degrading the north/south movement performance. It is recommended that the westbound left turn lane be extended to 55m to accommodate the future 95th percentile queue.

As LOS E at both the North Site and South Site east access will occur on a private site, the adjacent signals will create gaps in the traffic, and drivers will be able to turn eastbound right instead of eastbound left, and use a different route to exit the site, this future operation is considered acceptable.

Table 16: Future Total Conditions – Summary

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q	LOS	v/c	95th Q
King St & Berkeley St		**-**	**-**	**B**	**0.39**	**-**	**A**	**0.41**	**-**
Eastbound	Through-Right	2	200	A	0.25	14	A	0.41	31
Westbound	Through-Right	2	90	B	0.39	41	A	0.24	10
Northbound	Through-Left	1	70	C	0.33	23	C	0.34	26
	Right	1	25	A	0.06	2	B	0.16	7
Southbound	Left-Through-Right	1	75	C	0.34	26	C	0.27	21
King St & Parliament St		**-**	**-**	**B**	**0.68**	**-**	**C**	**0.74**	**-**
Eastbound	Through-Right	2	90	D	0.68	36	B	0.68	73
Westbound	Through-Right	2	65	C	0.65	30	B	0.37	28
Northbound	Left-Through-Right	2	70	B	0.37	34	C	0.74	57
Southbound	Left-Through-Right	2	70	A	0.29	30	C	0.53	41
Front St & Berkeley St		**-**	**-**	**A**	**0.56**	**-**	**B**	**0.65**	**-**
Eastbound	Left-Through-Right	2	200	A	0.20	19	B	0.56	71

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q	LOS	v/c	95th Q
Westbound	Left-Through-Right	2	80	A	0.56	27	B	0.48	38
Northbound	Left	1	25	C	0.08	8	C	0.07	7
	Through-Right	1	110	B	0.34	17	C	0.65	60
Southbound	Left-Through	1	50	C	0.17	19	C	0.34	33
	Right	1	25	A	0.13	7	A	0.10	5
Front St & Parliament St		**-**	**-**	**B**	**0.59**	**-**	**C**	**0.83**	**-**
Eastbound	Left	1	20	B	0.26	10	A	0.17	13
	Through-Right	2	80	B	0.28	32	B	0.52	88
Westbound	Left	1	30	C	0.39	30	B	0.58	38
	Through-Right	2	160	B	0.59	78	A	0.32	36
Northbound	Left-Through-Right	2	130	C	0.59	48	D	0.83	73
Southbound	Left-Through-Right	2	55	B	0.43	35	D	0.67	48
The Esplanade / Hahn Place & Berkeley St		**-**	**-**	**A**	**0.15**	**-**	**A**	**0.31**	**-**
Eastbound	Left-Right	1	210	A	0.15	-	A	0.31	-
Northbound	Left-Through	1	35	A	0.08	-	A	0.15	-
Southbound	Through-Right	1	130	A	0.05	-	A	0.06	-
Mill St & Parliament St		-	**-**	**B**	**0.37**	**-**	**B**	**0.49**	-
Westbound	Left	1	20	B	0.17	18	B	0.18	19
	Right	1	180	A	0.21	9	A	0.23	10
Northbound	Through-Right	2	-	B	0.37	31	B	0.46	37
Southbound	Left-Through	2	130	B	0.30	24	B	0.48	39

Table 17: Future Total Conditions - Site Access Summary

Intersection and Movement		Lanes	Storage (m)	AM Peak Hour			PM Peak Hour		
				LOS	v/c	95th Q	LOS	v/c	95th Q
North Site West Access & Berkeley St		**-**	**-**	**A**	**0.09**	**-**	**A**	**0.07**	**-**
Westbound	Left-Right	1	-	C	0.09	2	B	0.07	2
Northbound	Through-Right	1	-	A	0.05	0	A	0.07	0
Southbound	Left-Through	1	-	A	0.02	1	A	0.03	1
North Site East Access & Parliament St		**-**	**-**	**A**	**0.47**	**-**	**A**	**0.22**	**-**
Eastbound	Left-Right	1	-	E	0.47	17	C	0.22	6
Northbound	Left-Through	2	-	A	0.15	2	A	0.16	1
Southbound	Through-Right	2	-	A	0.16	0	A	0.22	0
South Site West Access & Berkeley St		**-**	**-**	**A**	**0.08**	**-**	**A**	**0.16**	**-**
Westbound	Left-Through-Right	1	-	B	0.05	1	B	0.08	2
Northbound	Through-Right	1	-	A	0.08	0	A	0.16	0
Southbound	Left-Through	1	-	A	0.02	0	A	0.03	1
South Site East Access & Parliament St		**-**	**-**	**A**	**0.25**	**-**	**A**	**0.61**	**-**
Eastbound	Left-Right	1	-	C	0.25	7	E	0.61	27
Northbound	Left-Through	2	-	A	0.23	0	A	0.24	0
Southbound	Through-Right	2	-	A	0.14	0	A	0.19	0

6 Parking and Loading Assessment

This section of the report reviews the proposed parking supply and the requirements of the new City-wide Zoning By-law 569-2013, as amended (Office Consolidation) Version Date: May 1, 2020. The by-law includes specific requirements for parking (bicycle and vehicle) as well as loading.

6.1 Policy Area Designations and Parking Requirements

The current city-wide Zoning By-law 569-2013 is typically applied to new developments throughout the City. The By-law includes multiple sets of vehicle parking rates with diminishing requirements for some areas that have better transit accessibility. Corktown TOC site falls under Policy Area 1, as shown in Figure 13, and this area has some of the lowest rates.

According to By-law No. 569-2013, within Bicycle Zone 1, if bicycle parking is provided in excess of the required minimums, then the minimum vehicle parking requirements can be reduced by 1 vehicle space for every 5 bicycle parking spaces provided beyond the minimum, to a maximum of 20% of the required minimum vehicle parking. The subject site is located in Bicycle Zone 1, which is defined as the area of the City bounded by the Humber River on the west, Lawrence Ave. on the north, Victoria Park Ave. on the east and Lake Ontario on the south.

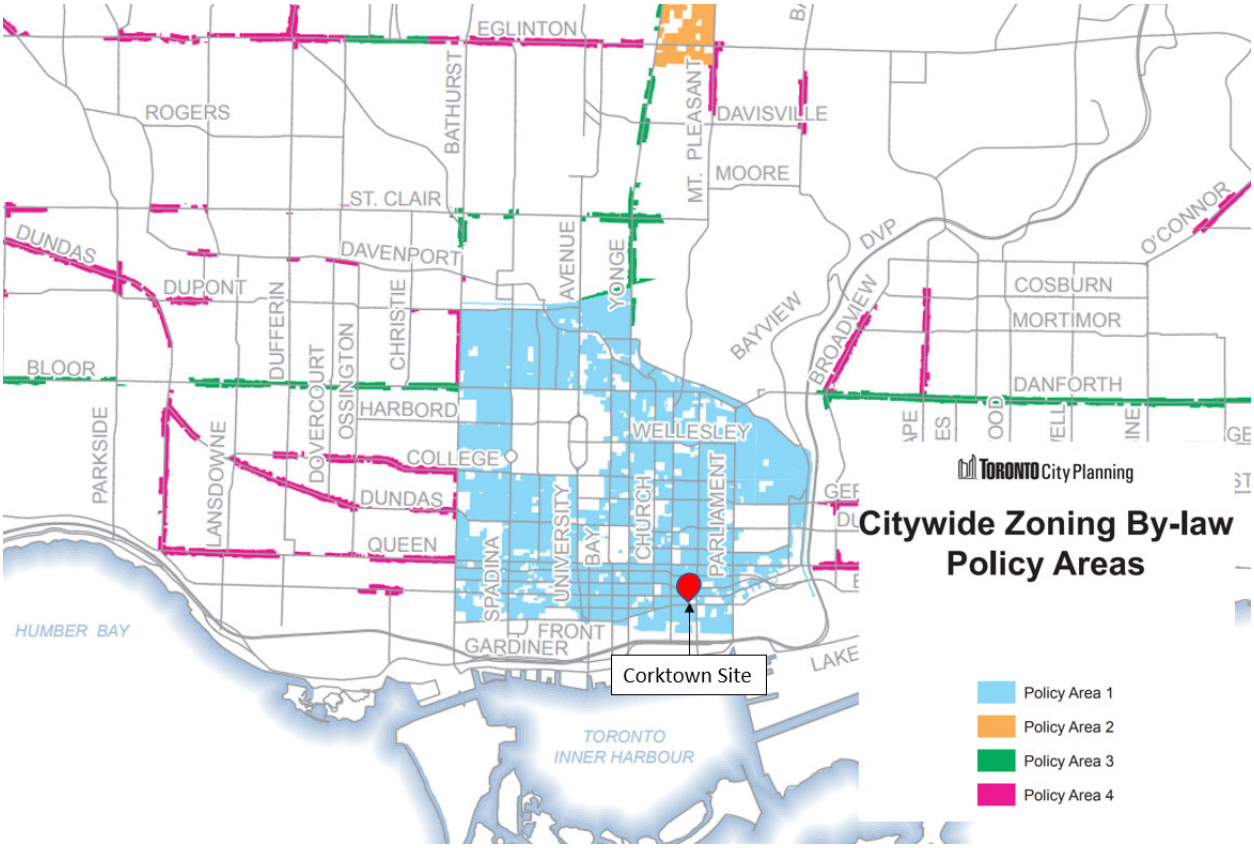


Figure 13: City of Toronto Policy Areas

Source: https://www.toronto.ca/wp-content/uploads/2017/10/96e8-City-Planning-Zoning-city-wide-Policy-Areas-zone-map.pdf

6.2 Vehicular Parking Supply

6.2.1 North Site

The total proposed vehicular parking supply for the North Site is 271 spaces. The parking is comprised of resident tenant parking and visitor parking, commercial parking, office parking, and publicly accessible car-share parking. A four level below-grade parking garage will serve residents, visitors, and commercial patrons, and will be accessible from both the buildings. Visitor parking and publicly accessible areas below grade will be separated from residential parking areas. There is no surface parking.

6.2.2 South Site

The total proposed vehicular parking supply for the South Site is 297 spaces, comprised of resident tenant parking and visitor parking, commercial parking, office parking, and publicly accessible car-share parking. Parking will be provided by a single level below-grade parking garage under the western building and a two level below-grade and two level above-grade (level 2 and 3) within the eastern building. There is no surface parking.

The parking supply for both sites are summarized in **Table 18** and **Table 19.**

Table 18: Vehicle Parking Supply – North Site

Area	Vehicle Parking Space Type			
	Residence	Shared between Visitor, Commercial and office Commercial	Car-Share	TOTAL
Total North Site	**150**	**107**	**14**	**271**

Table 19: Vehicle Parking Supply – South Site

Area	Vehicle Parking Space Type			
	Residence	Shared between Visitor, Commercial and office Commercial	Car-Share	TOTAL
Total South Site	**116**	**169**	**12**	**297**

6.3 Vehicle Parking Requirements

Vehicle parking requirements were reviewed using By-law 569-2013, and the requirements are as shown in **Table 20** and **Table 21.**

Table 20: Vehicle Parking Zoning By-law Requirements – North Site

Building	Land Use	Size (Unit or sqm)	By-law No. 569-2013 (PA1)	
			Rate	# Spaces Req.
North Site	Bachelor	0	0.3 / unit	0
	1-bed	492	0.5 / unit	246
	2-bed	192	0.8 / unit	154
	3-bed	156	1.0 / unit	156
	Visitors	840	0.1 / unit	84
	Retail	1,738	1.0 / 100 sqm	17
	Office	27,187	0.35 / 100 sqm	95
Total Required			-	**752**

Table 21: Vehicle Parking Zoning By-law Requirements - South Site

Building	Land Use	Size (Unit or sqm)	By-law No. 569-2013 (PA1)	
			Rate	# Spaces Req.
South Site	Bachelor	0	0.3 / unit	0
	1-bed	456	0.5 / unit	228
	2-bed	212	0.8 / unit	170
	3-bed	72	1.0 / unit	72
	Visitors	740	0.1 / unit	74
	Retail	2,413	1.0 / 100 sqm	24
	Office	42,306	0.35 / 100 sqm	148
	Library	2,367	0.35 / 100 sqm	8
Total Required			-	**724**

However, considering the urban trends, downtown location and access to transit, it is neither practical nor reasonable to provide the number of parking spaces required by the prevailing Zoning By-law for the proposed development. In recent years, City Council has acknowledged this and has adopted lower standards for approval for new developments in downtown. These actions have been bolstered by Ontario's New Five Year Climate Change Action Plan and numerous other initiatives by the City of Toronto. There has also been a steep decline in residential parking demand and vehicle ownership in the downtown Toronto area. There have been developments with 'zero' parking across North America, including downtown Toronto, where transit accessibility is reasonable. The area is well served by transit, and the North Site will have direct internal access to the Corktown Ontario Line station, and both sites are very close to the streetcar and a number of bus routes. Also, a very high transit-dependency is the fundamental characteristic of Transit Oriented Developments/Communities, as they promote reduced auto-dependency.

Recently approved parking supply ratios for condominium buildings in the downtown area includes rates as low as 0.03 spaces per unit. After reviewing a few similar developments in the

downtown area, it was determined that an effective parking supply rate of 0.15 spaces would be a conservative estimate for a TOC development.

First, the non-residential parking requirements have been estimated through a shared-use parking scheme that is summarized in **Table 22** and **Table 23** below. Shared use parking enables the efficient use of parking spaces, as different uses have higher demands for parking at different times of the day. The percentage of parking demand (as a portion of the overall rate) were from the City of Toronto's Table 200.5.10.1 as recommended in the By-law 569-2013.

Table 22: Shared Parking – North Site

Building	Land Use	Size (Unit or sqm)	By-law No. 569-2013 (PA1)				
			Rate	# Spaces Req.	AM	PM	Eve
North Site	Visitors	840	0.1 / unit	84	9 (10%)	30 (35%)	84 (100%)
	Retail	1,738	1.0 / sqm	17	3 (20%)	17 (100%)	17 (100%)
	Office	27,187	0.35 / sqm	95	95 (100%)	57 (60%)	0 (0%)
	Subtotal			197	107	104	101
	Maximum required				**107**		

Table 23: Shared Parking – South Site

Building	Land Use	Size (Unit or sqm)	By-law No. 569-2013 (PA1)				
			Rate	# Spaces Req.	AM	PM	Eve
South Site	Visitors	740	0.1 / unit	74	8 (10%)	26 (35%)	74 (100%)
	Retail	2,413	1.0 / sqm	24	5 (20%)	24 (100%)	24 (100%)
	Office	44,673	0.35 / sqm	156	156 (100%)	94 (60%)	0 (0%)
	Subtotal			254	169	144	98
	Maximum required				**169**		

It is recommended that the identified 107 spaces are allocated to non-residential use on the North Site, and 169 spaces are allocated to non-residential use on South Site. The balance of the parking supply can be retained for residential uses, and the proposed parking assignment for residential parking is shown in **Table 24** and **Table 25** below. A car-share parking reduction ratio, typically used by The City of Toronto, has also been applied to bring down the overall requirement.

The overall residential parking supply for all three buildings is equal to or over 0.15 spaces per unit when parking is assigned to non-residential uses. So, the proposed residential parking supply is considered adequate.

Alternatively, if the developer and the City agrees, all the supplied parking can be assigned to residential use only, as also shown in Table 26 below, which is typical in many condominium developments in downtown.

Table 24: Parking Allocation – North Site

Building	Parking Assignment	Parking required	# Spaces Supplied
North Site	Total Supply	**-**	**271**
	Non-Residential Shared	107	107
	Car-Share (Residential units / 60)	14	14
	Residential (840 units)	556	150
	Parking per residential unit	-	**0.18**
	Residential (840 units) without non-residential assignment	542	257
	Parking per residential unit without non-residential assignment	-	**0.30**

Table 25: Parking Allocation - South Site

Building	Parking Assignment	Parking required	# Spaces Supplied
South Site	Total Supply	**-**	**297**
	Non-Residential Shared	169	169
	Car-Share (Residential units / 60)	12	12
	Residential (740 units) with non-residential assignment	470	116
	Parking per residential unit	-	**0.16**
	Residential (740 units) without non-residential assignment	458	285
	Parking per residential unit without non-residential assignment	-	**0.39**

6.4 Bicycle Parking Supply

Bicycle parking for the site will be provided in the form of short-term and long-term bicycle parking spaces. Short-term bicycle parking will be provided at-grade (internally or weather protected if outdoors) as well as underground, and will serve residential visitors, commercial patrons, and potentially residents who are making short stops at home. Long-term bicycle parking will be located on the underground parking levels under each building. The bicycle parking supply is summarized in **Table 26** and

Table 27.

Table 26: Bicycle Parking Supply – North Site

Building	Bicycle Parking Space Type					
	Residence Long Term	Residential Short Term	Non-residential Long Term	Non-residential Short Term	Transit	Total
North Site	756	84	57	66	172	**1135**

Table 27: Bicycle Parking Supply – South Site

Area	Bicycle Parking Space Type				
	Residence Long Term	Residential Short Term	Non-residential Long Term	Non-residential Short Term	Total
South Site	666	74	95	106	**940**

6.5 Bicycle Parking Requirements

Bicycle parking requirements were reviewed for By-law 569-2013. For the North Site, the proposed bicycle parking supply matches exactly what is required in the By-law 569-2013, including bicycle spaces for transit. For the South Site, the proposed bicycle parking supply matches exactly what is required in the By-law 569-2013 and will have no surplus. Overall, the proposed bicycle parking supply is anticipated to serve the development well. There are no bicycle parking requirements for transit as per the By-law 569-2013; however, 172 of the North Site bicycle parking spots have been assigned for transit to serve and promote active modes.

Table 28: Bicycle Parking Zoning By-law Requirements – North Site

Land Use		Unit or per 100 sqm	By-law No. 569-2013			
			Long Term		Short Term	
			Rate	# required	Rate	# required
North Site	Residential	840	0.9	756	0.1	84
	Retail	1,738	0.2	3	0.3	8
	Office	27,187	0.2	54	0.2	57
Total Required			-	813	-	150
Proposed			-	813	-	150
Surplus / Deficit			-	0	-	+172

Table 29: Bicycle Parking Zoning By-law Requirements - South Site

Land Use		Unit or per 100 sqm	By-law No. 569-2013			
			Long Term		Short Term	
			Rate	# required	Rate	# required
South Site	Residential	740	0.9	665	0.1	74
	Retail	2,413	0.2	5	0.3	10
	Office	42,306	0.2	85	0.2	88
	Library	2,367	0.2	5	0.2	8

Land Use	Unit or per 100 sqm	By-law No. 569-2013			
		Long Term		Short Term	
		Rate	# required	Rate	# required
Total Required		-	760	-	180
Proposed		-	760	-	194
Surplus / Deficit		-	0	-	0

6.6 Loading Space Requirements

Loading space requirements of Zoning By-law 569-2013 were also reviewed for the proposed site. The loading space requirements as per the By-law, and loading spaces provided, are shown in **Table 30** and **Table 31.**

Table 30: Loading Spaces Required Based on By-Law Rates – North Site

Building	Land Use Type	Unit or sqm	Loading space required	Loading space provided
North Site	Residential	883	1 Type "G" and 1 Type "C"	2 Type "G" and 1 Type "C"
	Retail	1,715	1 Type "B"	1 Type "B"
	Office	26,976	2 Type "B" and 2 Type "C"	2 Type "B" and 2 Type "C"
	Total (Shared)	**-**	**2 Type "B", 3 Type "C" and 1 Type "G"**	**3 Type "B", 3 Type "C" and 2 Type "G"**

Table 31: Loading Spaces Required Based on By-Law Rates – South Site

Building	Land Use Type	Unit or sqm	Loading space required	Loading space provided
South Site	Residential	543	1 Type "G" and 1 Type "C"	2 Type "G" and 1 Type "C"
	Retail	2659	2 Type "B"	1 Type "B"
	Office	35320	2 Type "B" and 3 Type "C"	2 Type "B" and 3 Type "C"
	Total (Shared)	-	**2 Type "B", 4 Type "C" and 1 Type "G"**	**3 Type "B", 4 Type "C" and 2 Type "G"**

The dimensions of the proposed loadings spaces meet the By-law requirements, with the dimesions of each type listed below.

Type “G”

- Minimum Length: 13.0 metres
- Minimum Width: 4.0 metres
- Minimum Clearance: 6.1 metres

Type “B”

- Minimum Length: 11.0 metres
- Minimum Width: 3.5 metres
- Minimum Clearance: 4.0 metres

Type “C”

- Minimum Length: 6.0 metres
- Minimum Width: 3.5 metres
- Minimum Clearance: 3.0 metres

6.6.1 Loading Swept Path Analysis

The loading areas were tested using AutoTURN software (within AutoCAD) to check the loading space accessibility for the anticipated design vehicles entering the site, and for each of the building loading areas. The largest vehicle anticipated to enter the site is a Medium Single-Unit Truck (‘MSU’) style delivery or moving vehicle. A front end load garbage / recycling ruck (Wayne Titan), and smaller LSU were also tested. The design vehicles are shown in **Figure 14.**

Figure 15 and Figure 20 show the design vehicles that were test in each loading stall, and the subsequent drawings show the turning paths to the worst / hardest to access spaces on each site. All loading spaces are accessible with the design vehicles.

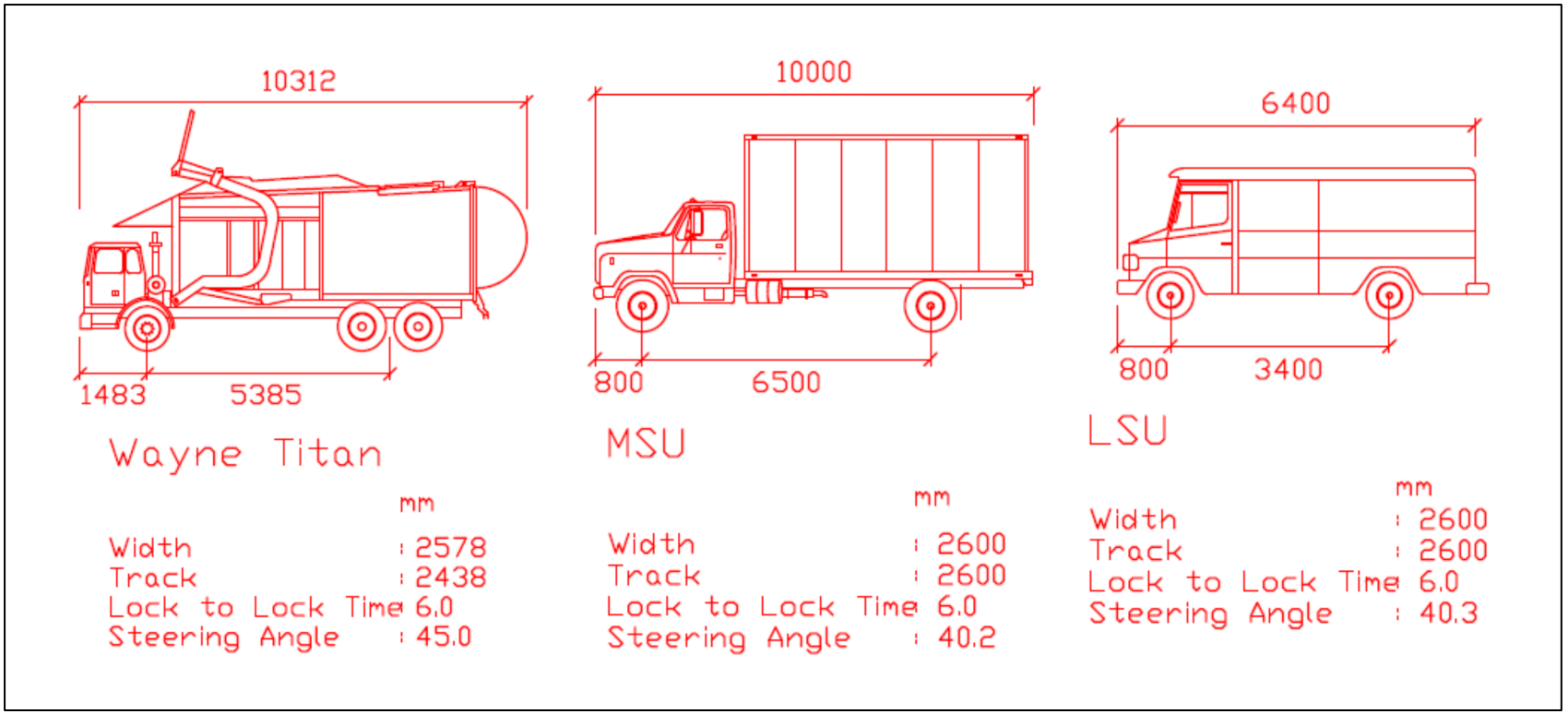


Figure 14: Design Vehicles

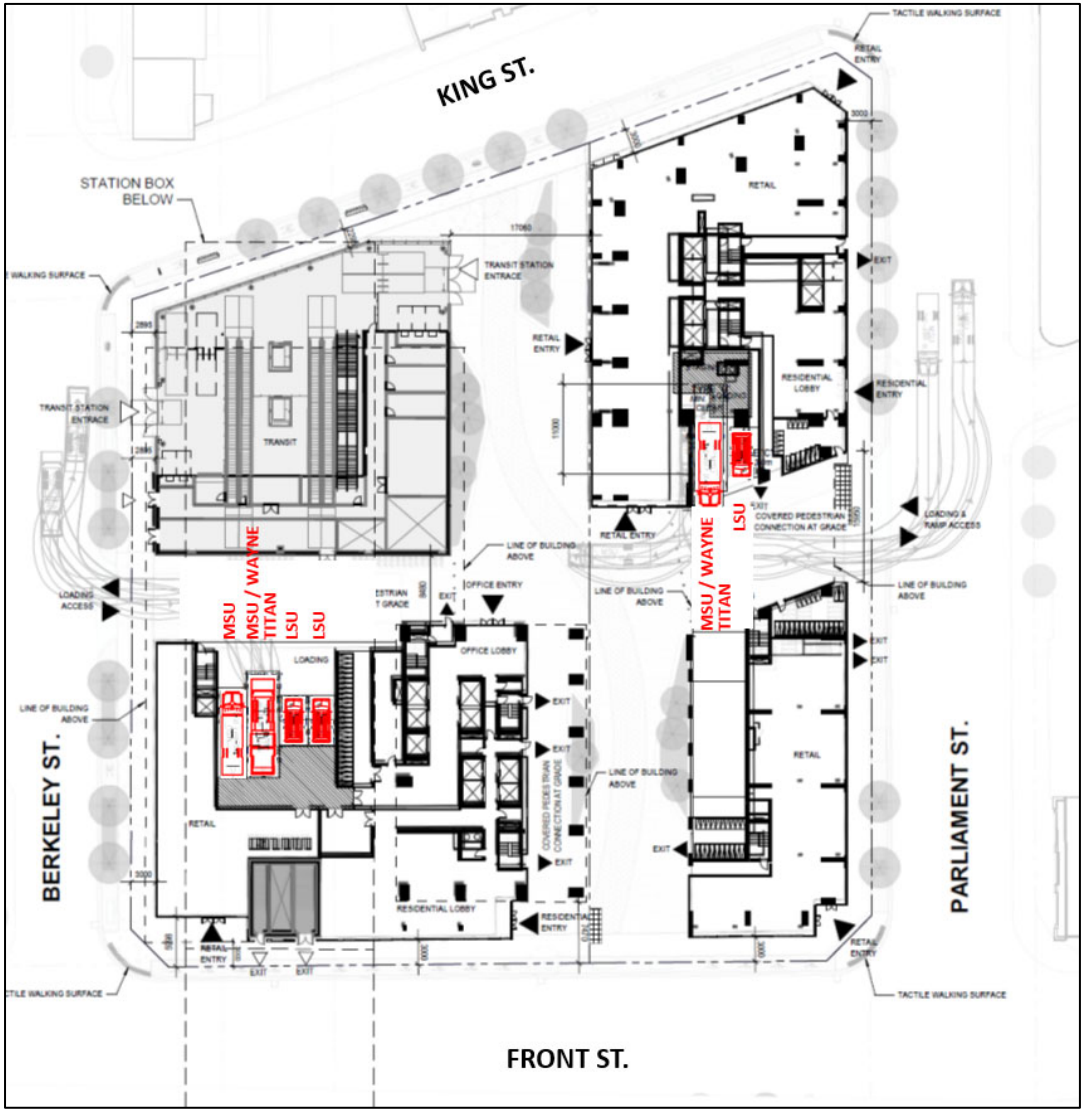


Figure 15: North Site – Design Vehicles

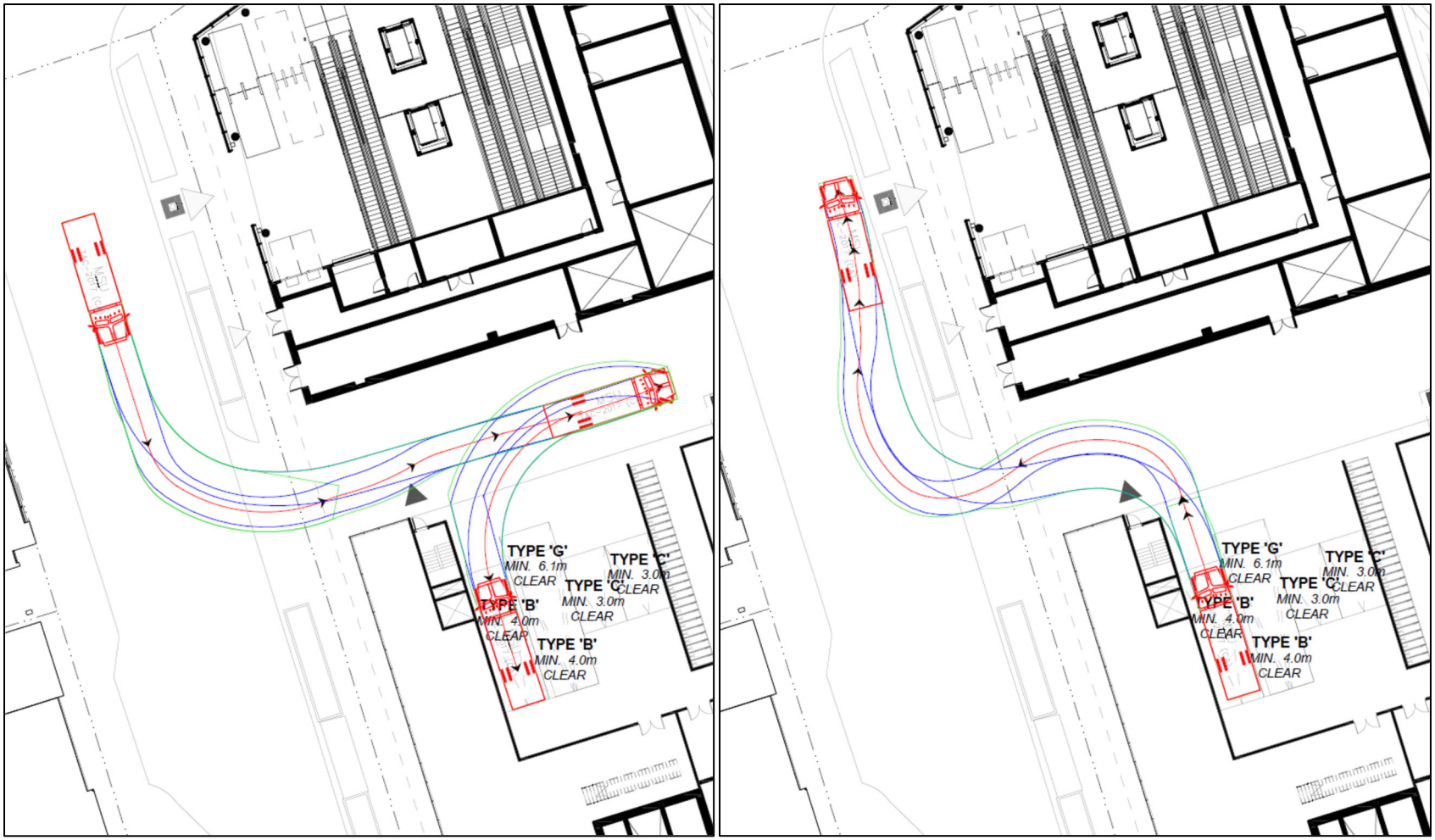


Figure 16: North Site – West Building Worst Movement (MSU)

Figure 17: North Site - West Building Wayne Titan

Figure 18: North Site – East Building Worst Movement (MSU)

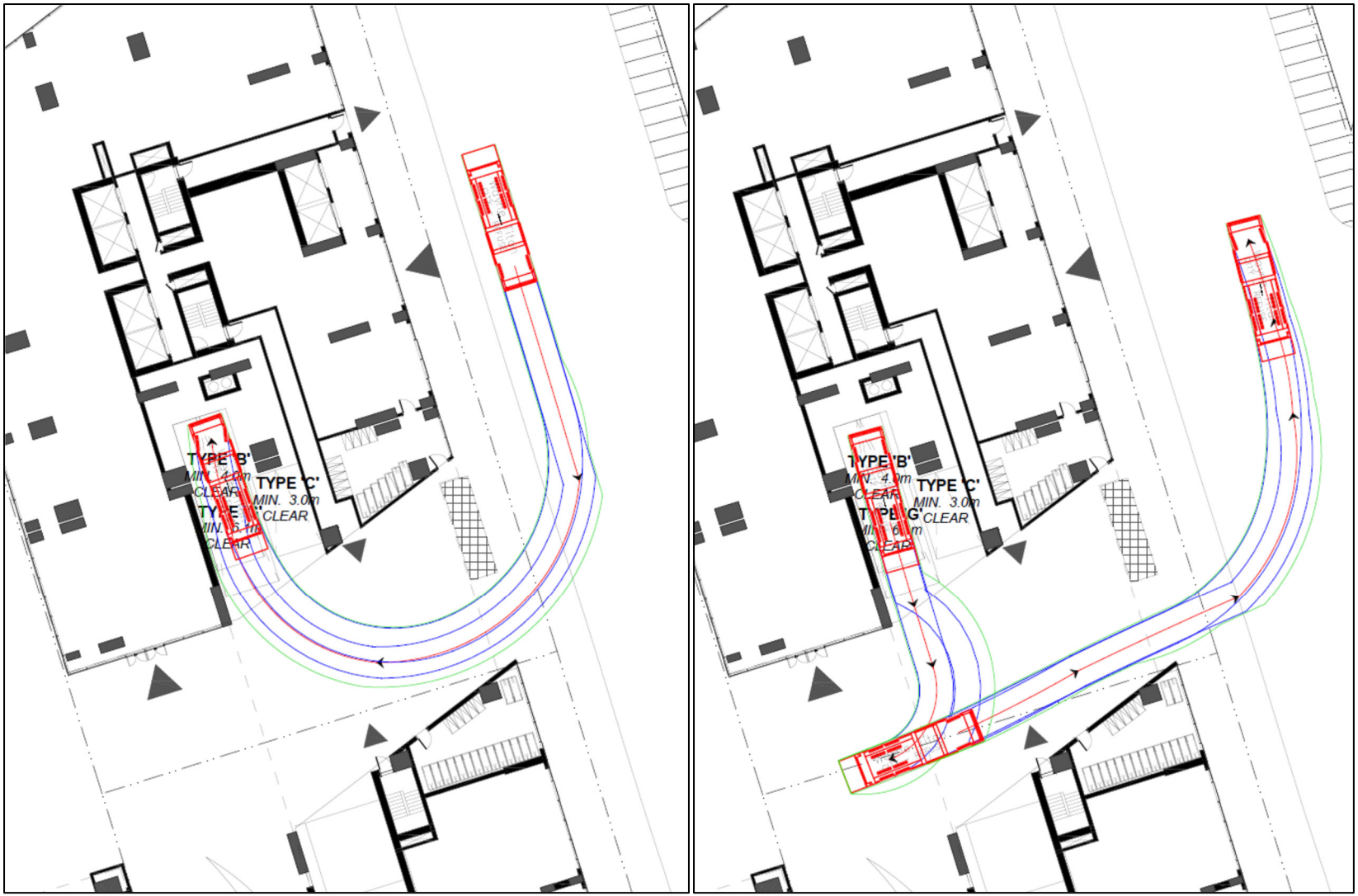


Figure 19: North Site – East Building Wayne Titan

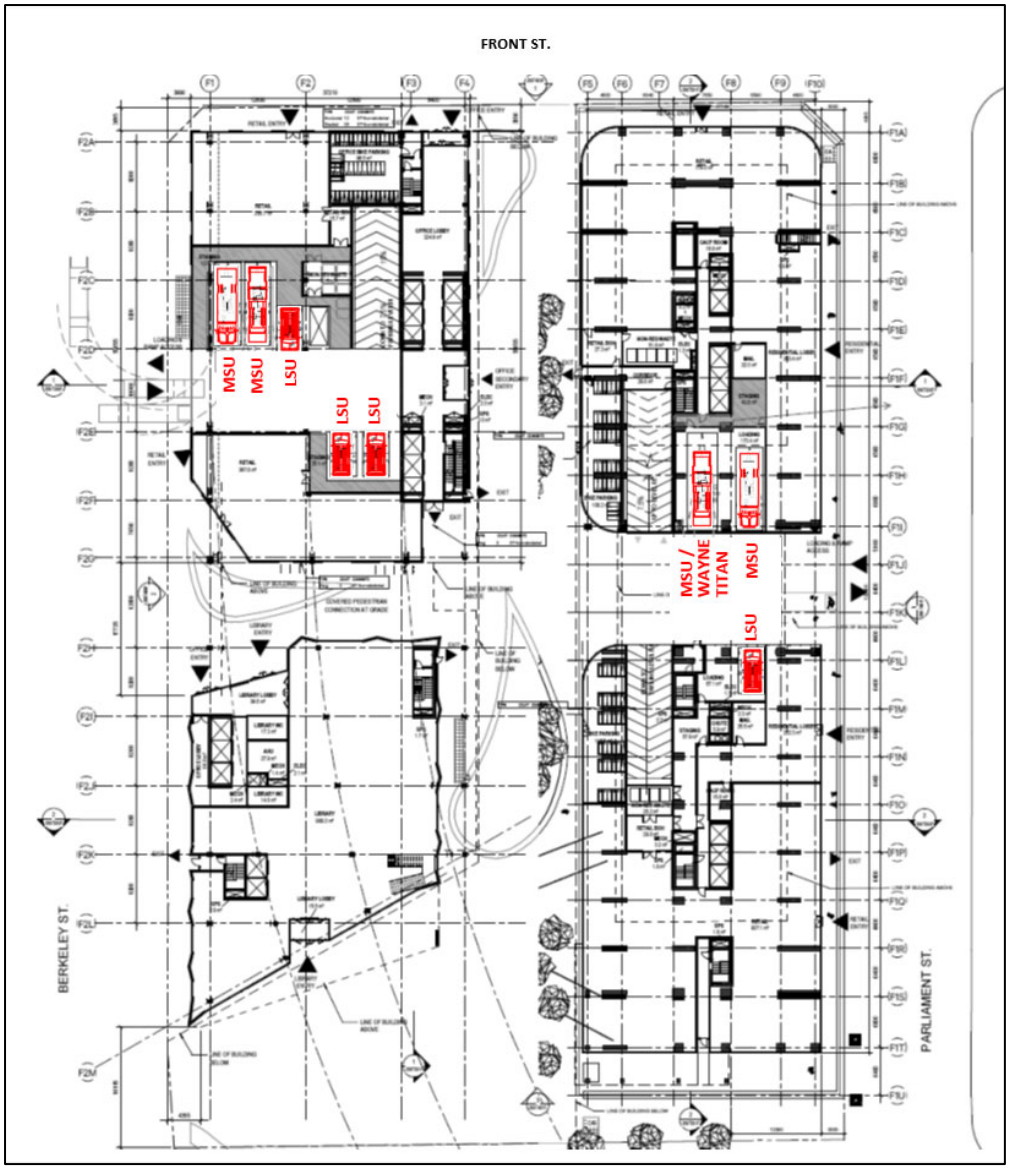


Figure 20: South Site Design Vehicle

Figure 21: South Site - East Building Worst Movement (MSU)

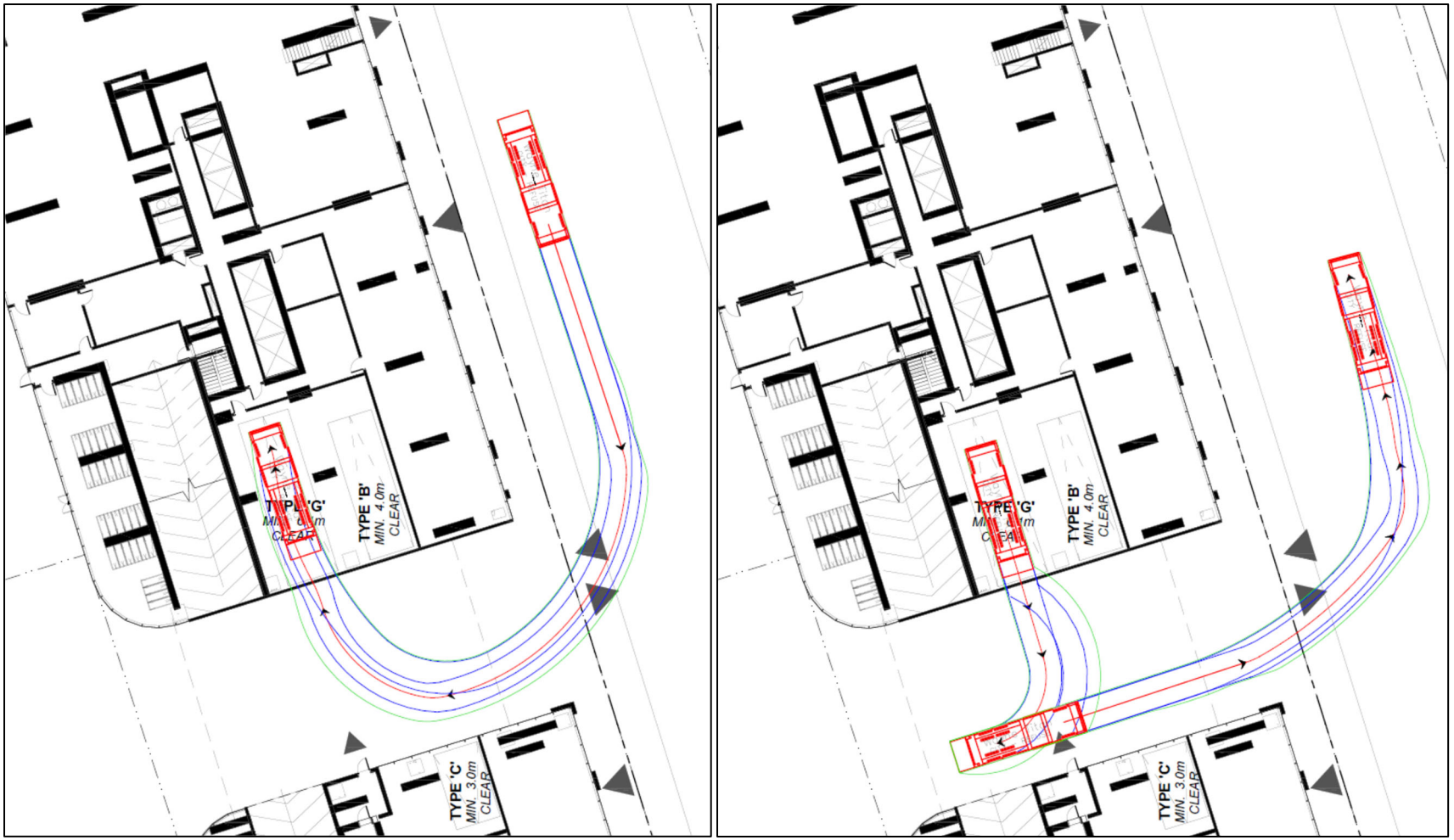


Figure 22: South Site - East Building Wayne Titan

Figure 23: South Site – West Building Worst Movement (MSU)

7 Transportation Demand Management ('TDM')

Transportation Demand Management (TDM) measures are methods employed to reduce the traffic impacts of a development through the reduction of Single-Occupant Vehicle (SOV) trips as well as the encouragement of more sustainable forms of travel and more efficient use of the transportation network for all mods of travel. TDM measures can be 'hard measures', such as infrastructure like bicycle parking, or can be 'soft measures' such as policies that allow for working-from-home or flex hours. TDM measures must also be tied to the surrounding transportation network context of the development. For example, bicycle parking will be ineffective if there is no surrounding bicycle infrastructure like bicycle lanes, multi-use paths, or a lack of bicycle parking at the ultimate destination. For this reason, successful TDM implementation requires a united effort and coordination between the City and developers.

Hard measures are physically infrastructure improvements that encourage alternative modes of travel and mode shifts away from single-occupant vehicles. This can include the provision of bicycle parking or enhanced pedestrian and cyclist facilities on-site including shower and change facilities for employment uses. Soft measures are programs or policies, such as unbundling or condo units to parking spaces, work-from-home policies, transit subsidies, carpooling assistance etc. In many cases, hard and soft measures work together and provide mutual benefit. For instance, transit pass subsidies are soft measures, but when paired with hard measures like improved waiting areas, can have a greater impact on mode choice.

The Toronto Green Standard (Version 3) requires measures that will support a 15% or greater reduction in single occupancy vehicle (SOV) trips.

For the subject site, the general context of the area as a downtown city centre-core, mixed-use environment with excellent transit access and future direct transit access to the Ontario Line, will have an impact on the potential TDM measures. In fact, the inherent nature of the area and the presence of the Ontario Line and streetcar surface transit routes along both roadways adjacent to the development will make this location an excellent candidate to benefit from TDM initiatives.

The mixed use nature of downtown allows for synergy and mixed-use interactions between the proposed residential towers, offices, as well as the ancillary retail at the ground floor, and the surrounding retail-commercial and services that are in the area. Additionally, due to the location near the City's central business district, there is an expectation that many of the residents will work within the general area and will not rely on transit to make their daily trips. Rather, these residents will walk or cycle. The mixed-use, and walkable nature of the area will in itself help to reduce vehicle trips by encouraging walking and linked trips.

Regardless of the ability for the development to leverage TDM initiatives, the strongest TDM measure will be the fact that residential towers will be able to provide limited vehicular parking. A siginificant amount of trips generated by the development will be pick-up/drop-off or taxi/rideshare trips. The occupancy of the buildings will be market-driven, meaning that a lot of residents who decide to purchase units in this building will want to be car-free and many will live and work in close proximity, thus relying on transit, walking, and cycling to get around.

Since the ancillary commercial will primarily serve the surrounding area and the residential condos above, the TDM plan will be geared towards adapting the residential component.

7.1.1 Local and Regional Transit Accessibility

As already discussed, there is excellent transit coverage within the vicinity of the site even without the construction of Ontario Line. TTC surface transit is provided in the form of streetcars along King Street (in mixed traffic). Additionally, the streetcar route provides direct access to the Toronto subway system along Line 1 (westerly to King Station). Bus Transit stops are located directly at the intersection of King St East At Parliament St, adjacent to north building.

With Ontario Line, subway access will be directly accessible by residents from within the building. Residents will not need to leave the building to access the Ontario Line. Ontario Line riders will be able to transfer at Queen Station (Queen Street and Yonge Street).

The study area already has a high non-vehicle modal split of around 70% non-auto, and this is expected to increase in general due to the increase in transit availability. The site itself will further benefit and leverage this proximity and access.

7.1.2 Transit Pass Subsidies

Residents and tenants of the buildings will be given transit pass subsidies or discounts that will further encourage the use of transit as a primary mode, and will attract those who wish to rely on transit and will utilize the transit passes.

7.1.3 Real-Time Transit Information

Real-time transit service updates will be provided in the lobby area of each residential tower. The real-time displays will include arrival time for the nearest transit stops for each of the primary transit services expected to serve the development. The real-time displays will allow residents to time leaving their buildings to reduce the amount of time standing at each transit stop, thus making transit more attractive.

7.1.4 Pedestrian and Cycling Connections

The North building will be directly fronting King Street which has a protected on-street eastbound cycle track. Internally, the residential component of the condo towers will have access to the transit station lobby area, and there will be no need for residents to leave the building if they are destined to Ontario Line.

Bicycles are also allowed on the TTC subway system outside of peak periods. Residents will be able to bring their bicycles on the subway and use them to complete the last leg of their trips, if it is conducive to their needs.

7.1.5 Bicycle Parking

The building will be equipped with long-term bicycle parking that will be available to all residents. Long-term bicycle parking ensures that residents are encouraged to own bicycles in the first place by providing them with easily accessible, secure and sheltered bicycle parking. Short-term bicycle parking will be provided for visitors. The short-term bicycle parking will be placed in safe, well lit, accessible areas at ground level. This will encourage visitors to feel cycling is a viable option.

Bikeshare is also available within the general area. There are 87 bikeshare stations within 200 metres walking distance. These will also be available for use by residents and visitors if they use the bikeshare services. Bikeshare spaces are considered usable if they are occupied or empty, as they can be used by residents or visitors when leaving the site (bicycle is available) or when returning (there is a free "dock").

7.1.6 Car-Share Services

Car-share services are an effective way to reduce auto dependency and parking needs for both residential and non-residential developments, by providing vehicles that can be used by residents and tenants on an as-needed basis. The result is that the development will attract those who do not own vehicles and typically rely on alternative forms of transportation, thus reducing the number of parking spaces required on site and attracting residents and tenants that will generally produce fewer vehicle trips, but will still occasionally require a vehicle.

For some development proposals, the City of Toronto has accepted proposals that suggest that for each car-share parking space provided on site, the development will be able to reduce the parking supply by 4 parking spaces. This is another example of the City accepting TDM measures to reduce the parking supply. The north site has provided 14 car-share spots and the south site has provided 12 car-share spots.

7.1.7 Summary of Transportation Demand Management

The following summarizes the measures that will support a 15% or greater reduction in single occupancy vehicle (SOV) trips as required by the Toronto Green Standard (Version 3):

- **Direct access to Ontario Line** from within the building;
- Transit passes or subsidies provided to all residents of the building including the commercial-retail components;
- Proximity to surface transit routes along King Street E and Parliament Street;
- Real-time transit information;
- Location in a mixed-use city centre core environment to promote walking trips; and
- Carshare services.

8 Preliminary Findings and Next Steps

8.1 Traffic Forecasts

The study network currently operates within standard performance thresholds. The proposed development (North and South Sites), and the proposed Ontario Line Corktown Station will add a combined total of 400 and 458 two-way peak hour vehicle trips (AM/PM) to the street network, and 7,868 and 8,124 total all modes trips, with the majority of these trips being pedestrian and surface transit trips destined to/from the future station.

8.2 Traffic Capacity and Operations

Despite some congestion and some movements operating near-capacity under existing conditions, there is generally residual capacity in the road network to accommodate the projected vehicle auto volumes.

The westbound left turn queue at the intersection of Front Street and Parliament Street will exceed the available storage length of 30 m in the total future horizon. Adjustments to the intersection signal timing did not materially improve this condition. It is recommended that the eastbound left turn lane be increased to 40 m.

8.3 Parking

The vehicular parking requirements based on By-law 569-2013 are 752 and 724 for the North and South Sites respectively. However, due to the location and nature of the site, a total of 271 and 297 parking spaces are provided for the North and South Sites, respectively, based on numerous other similar developments. The provided parking should be adequate.

The bicycle parking requirements based on By-law 569-2013 are 963 and 940 for the North and South Sites, respectively. The parking provided is equal to or surplus than the requirement and will serve all anticipated needs.

8.4 Loading

Application of Zoning By-laws 569-2013 and 438-86 requires various Type ‘G’, Type ‘B’, and two Type ‘C’ loading spaces on all sites. Loading sites provided satisfy all the requirements. The proposed development also accommodates required maneuvering of all truck types, coming in and going out.

Appendix A: Signal Timing

LOCATION:	**King St E & Berkeley St**	*DISTRICT:*	**Toronto & East York**
MODE/COMMENT:	**SA2-VMG with PR and TSP***	*COMPUTER SYSTEM:*	**TransSuite**
TCS:	**1966**	*CONTROLLER/CABINET TYPE:*	**Peek ATC 1000 / TS2 T1**
PREPARED BY / DATE:	***Amir Sufipour / December 05, 2019***	*CONFLICT FLASH:*	**Red & Red**
CHECKED BY/ DATE:	***Toni Hourani / Ameneh Dialameh / January 02, 2020***	*DESIGN WALK SPEED:*	**1.0 m/s (FDW based on full crossing at 1.2 m/s)**
IMPLEMENTATION DATE:	**January 24, 2020**	*CHANNEL/DROP:*	**4003/28**
		CONTROLLER FIRMWARE:	**3.018.1.2976**

N ↑

NEMA Phase		OFF All Other Times	AM 06:30-09:30 M-F	PM 15:00-19:00 M-F	NGHT 23:00-6:30 Daily	WKND 09:00-19:00 Sat-Sun	Phase Mode (Fixed/Demanded or Callable)	Remarks
	Local Plan	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5		
	Split Table	Split 1	Split 2	Split 3	Split 4	Split 5		
1 NOT USED	WLK FDW MIN MAX1 AMB ALR SPLIT							Pedestrian Minimums: EWWK = 7 sec, EWFD = 13 sec NSWK = 7 sec, NSFD = 13 sec
2 King St E	WLK 7 FDW 13 MIN 20 MAX1 37 AMB 3.0 ALR 2.4 SPLIT	43	53	53	43	48	Fixed POZ activated by Request Loop (max extension of 16 secs in Green/SDW)	NS phase is callable by vehicle and/or pedestrian actuation. If a vehicle call is received, the minimum NSG is 7 seconds. If ongoing vehicle demand exists in the Wavetronix detection zone, the NSG is capable of providing vehicle extensions up to the maximum green split. If a pedestrian call is received, the pedestrian minimums will be served. The NSWK & NSFD are only displayed on the pedestrian signal heads if a pedestrian call is received. Extension time is based on vehicle demand. Unused extension time is given to the EWG. Side Street Passage Time = 3 sec. *See back for TSP instructions. **EB & WB TSP re-enabled on July 10, 2019.**
3 NOT USED	WLK FDW MIN MAX1 AMB ALR SPLIT							
4 Berkeley St	WLK 7 FDW 13 MIN 7 MAX1 20 AMB 3.0 ALR 3.5 SPLIT	27	27	27	27	27	Callable by Wavetronix detector and/or pushbutton; Extendable by Wavetronix detector. (TSP Truncations allowable to pedestrian min.)	
5 NOT USED	WLK FDW MIN MAX1 AMB ALR SPLIT							
6 King St E	WLK 7 FDW 13 MIN 20 MAX1 37 AMB 3.0 ALR 2.4 SPLIT	43	53	53	43	48	Fixed POZ activated by Request Loop (max extension of 16 secs in Green/SDW)	
7 NOT USED	WLK FDW MIN MAX1 AMB ALR SPLIT							
8 Berkeley St	WLK 7 FDW 13 MIN 7 MAX1 20 AMB 3.0 ALR 3.5 SPLIT	27	27	27	27	27	Callable by Wavetronix detector and/or pushbutton; Extendable by Wavetronix detector. (TSP Truncations allowable to pedestrian min.)	
	CL	70	80	80	70	75		
	OF	3	69	58	2	66		

Notes:

LOC: King St E & Berkeley St
MODE: SA2-VMG with PR and TSP*
TCS: 1966 **PREPARATION DATE (TIMING CARD):** November 19, 2018

OFFSET CORRECTION PARAMETERS

2.3.4 O.C. Extend / Reduce (Max. time added & subtracted in sec.)

		Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	From page 1 [Cycle]	From page 1 [Slop]	2.3.5 Pct. of Cycle	
OFF												Pattern 1	
Split 1	Ext.	--	26	--	--	--	26	--	--	70	17	18 [25%]	s
	Rdc.	--	17	--	--	--	17	--	--				
AM												Pattern 2	
Split 2	Ext.	--	30	--	--	--	30	--	--	80	27	20 [25%]	s
	Rdc.	--	27	--	--	--	27	--	--				
PM												Pattern 3	
Split 3	Ext.	--	30	--	--	--	30	--	--	80	27	20 [25%]	s
	Rdc.	--	27	--	--	--	27	--	--				
NGHT												Pattern 4	
Split 4	Ext.	--	26	--	--	--	26	--	--	70	17	18 [25%]	s
	Rdc.	--	17	--	--	--	17	--	--				
WKND												Pattern 5	
Split 5	Ext.	--	28	--	--	--	28	--	--	75	22	19 [25%]	s
	Rdc.	--	22	--	--	--	22	--	--				

T.S.P. PARAMETERS

PREPARED: RI

	TSP RUN # 2 EB Thru	TSP RUN # 6 WB Thru
2.8.2 Transit Run Parameters		
ATC Green Extend Mode (Equivalent TTC Algorithm)	Mode 0 **B-2** (SDW)	Mode 0 **B-2** (SDW)
2.8.3 Transit Action Plan 1 (Used for all Patterns)		
Run Enable (X = Yes)	X	X
Run Config = 1	Recovery = 2 (O.C. with delay)	
2.8.4 Transit Run Configuration 1 (Used for all TOD plans)		
Delay / Extend / Fail	-- / -- / 235	4 / -- / 235
CALLS (and Extends)	**Ø 2/6**	**Ø 2/6**
Skips	--	--
Shifts	--	--
Reduces (Truncates)	**Ø 4/8**	**Ø 4/8**
Reserve (when "Shifting")	--	--

2.8.6 TSP Split Table 1,2,3,4 & 5

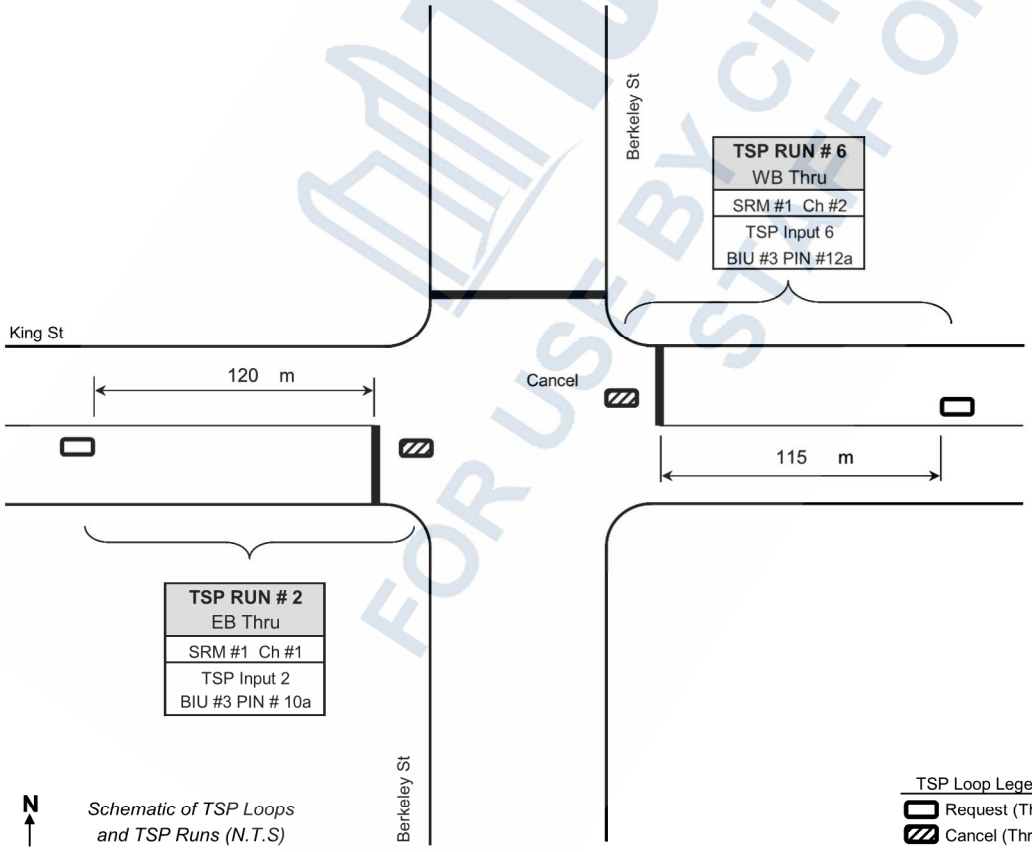
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
GRN EXT (SDW Extension)	--	16	--	--	--	16	--	--
WLK EXT (Walk Extension)	--	--	--	--	--	--	--	--
GRN RDC (Reduction)	--	--	--	--	--	--	--	--

2.1.9.2 Advanced I/O Scripts

Input Script 2 "TSPFilterB"

Script blocks out TSP calls except in Phase2/6 FDW and SDW to mitigate firmware issues in ATC-1000 Version 3.18.1 (2976)

TSP Inputs can be viewed on Screen 1.2.4 at all times.



Schematic of TSP Loops and TSP Runs (N.T.S)

Notes:

ATC Mode	0	2	3	4
TTC Algor'm	**B-2**	**A**	**C**	**D**
Extensions	SDW	Walk	W/SDW	W/SDW

TSP SUMMARY

Maximum Green Extensions:
EWG: 16 s Green/SDW
Truncation of phase 4 and 8

LOCATION:	**Parliament St & Front St E**	*DISTRICT:*	**Toronto & East York**
TCS:	**244**	*COMPUTER SYSTEM:*	**TransSuite**
MODE/COMMENT:	**FXT**	*CONTROLLER/CABINET TYPE:*	**Econolite Cobalt / TS2T1**
PREPARED BY / DATE:	***Petr Emelianov / Oct 9, 2019***	*CONFLICT FLASH:*	**Red & Red**
CHECKED BY / DATE:	**Hao Le / Oct 11, 2019**	*DESIGN WALK SPEED:*	**1.0 m/s** (FDW based on full crossing at 1.2 m/s)
IMPLEMENTATION DATE:	**October 11, 2019**	*CHANNEL/DROP:*	**2013 / 2**
		CONTROLLER FIRMWARE:	**32.63.10**

NEMA Phase		OFF All Other Times	AM 06:30-09:30 M-F	PM 15:30-18:30 M-F	NGHT 23:00-06:00 Daily	WKND 10:00-19:00 Sat & Sun	Phase Mode (Fixed/Demanded/Callable)	Remarks
	Local Plan	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5		
	System Plan	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5		
1 NOT USED	WLK FDW MIN MAX1 AMB ALR SPLIT							Pedestrian Minimums: NSWK = 7 secs; NSFD = 16 secs EWWK = 7 secs; EWFD = 16 secs Timing card developed for Gardiner Rehabilitation project Section 1. 2019-2020
2 Parliament St	WLK 7 FDW 16 MIN 23 MAX1 31 AMB 4 ALR 2 SPLIT	37	40	40	37	37	Fixed	
3 NOT USED								
4 Front St E	WLK 7 FDW 16 MIN 23 MAX1 24 AMB 3 ALR 3 SPLIT	38	50	50	38	47	Fixed	
5 NOT USED	WLK FDW MIN MAX1 AMB ALR SPLIT							
6 Parliament St	WLK 7 FDW 16 MIN 23 MAX1 31 AMB 4 ALR 2 SPLIT	37	40	40	37	37	Fixed	
7 NOT USED	WLK FDW MIN MAX1 AMB ALR SPLIT							
8 Front St E	WLK 7 FDW 16 MIN 23 MAX1 24 AMB 3 ALR 3 SPLIT	38	50	50	38	47	Fixed	
	CL OF	75 47	90 81	90 77	75 48	84 68		

NOTES:

LOCATION:	Parliament St & Mill St	DISTRICT:	Toronto & East York
TCS:	1894	COMPUTER SYSTEM:	TransSuite
MODE/COMMENT:	FXT With 2 Wire Polara APS and LPI	CONTROLLER/CABINET TYPE:	Econolite ASC/3-1000 / TS2T1
PREPARED BY/DATE:	CIMA+/October 2, 2019	CONFLICT FLASH:	Red & Red
CHECKED BY/DATE:	Ranajamil Iftikhar/Ameneh Dialameh/October 15, 2019	DESIGN WALK SPEED:	1.0 m/s (FDW based on full crossing at 1.2 m/s)
IMPLEMENTATION DATE:	October 24, 2019	CHANNEL/DROP:	4051/1
		FIRMWARE VERSION:	2.47.10

N

NEMA Phase		OFF All Other Times	AM 06:45-09:30 M-F	PM 15:30-18:30 M-F	OFF2 09:30-15:30 M-F	Phase Mode (Fixed/Demanded /Callable)	Remarks
	System Plan	Plan 1	Plan 2	Plan 3	Plan 4		
	Local Plan	Pattern 1	Pattern 2	Pattern 3	Pattern 4		
1 NOT USED	WLK FDW MIN MAX AMB ALR SPLIT						Pedestrian Minimums: NSWK = 7 sec., NSFD = 12 sec. EWWK = 7 sec., EWFD = 13 sec. APS on during FULL WALK of NSWK and EWWK when activated by APS pushbuttons Extended Push Activation = 3 seconds EW Leading Pedestrian Interval - EWWK comes up 5 sec before EW vehicle green
2 Parliament St	WLK 7 FDW 12 MIN 19 MAX1 28 AMB 3.0 ALR 3.0 SPLIT	34	44	44	34	Fixed	
3 NOT USED	WLK FDW MIN MAX AMB ALR SPLIT						
4 Mill St	DLY GRN 5 WLK 7 FDW 13 MIN 15 MAX1 21 AMB 3.0 ALR 2.2 SPLIT	26	26	26	26	Fixed Split shown includes 5 sec of EW LPI	
5 NOT USED	WLK FDW MIN MAX AMB ALR SPLIT						
6 Parliament St	WLK 7 FDW 12 MIN 19 MAX1 28 AMB 3.0 ALR 3.0 SPLIT	34	44	44	34	Fixed	
7 NOT USED	WLK FDW MIN MAX AMB ALR SPLIT						
8 Mill St	DLY GRN 5 WLK 7 FDW 13 MIN 15 MAX1 21 AMB 3.0 ALR 2.2 SPLIT	26	26	26	26	Fixed Split shown includes 5 sec of EW LPI	
	CL OFF	60 1	70 1	70 1	60 1		

Note:T-Intersection (no west leg)

Appendix B: Detailed Synchro Results

HCM Signalized Intersection Capacity Analysis
244: Parliment Street & Front Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	271	27	158	781	38	92	250	108	60	234	48
Future Volume (vph)	31	271	27	158	781	38	92	250	108	60	234	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.95			0.99	
Flpb, ped/bikes	0.99	1.00		0.97	1.00			0.99			0.99	
Frt	1.00	0.99		1.00	0.99			0.96			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1393	3005		1577	3449			2752			3073	
Flt Permitted	0.26	1.00		0.56	1.00			0.78			0.80	
Satd. Flow (perm)	385	3005		932	3449			2159			2467	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	285	28	166	822	40	97	263	114	63	246	51
RTOR Reduction (vph)	0	8	0	0	4	0	0	34	0	0	15	0
Lane Group Flow (vph)	33	305	0	166	858	0	0	440	0	0	345	0
Confl. Peds. (#/hr)	32		37	37		32	41		154	154		41
Heavy Vehicles (%)	27%	14%	38%	10%	2%	14%	15%	19%	16%	2%	9%	16%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	46.0	46.0		46.0	46.0			32.0			32.0	
Effective Green, g (s)	47.0	47.0		47.0	47.0			33.0			33.0	
Actuated g/C Ratio	0.52	0.52		0.52	0.52			0.37			0.37	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	201	1569		486	1801			791			904	
v/s Ratio Prot		0.10			c0.25							
v/s Ratio Perm	0.09			0.18				c0.20			0.14	
v/c Ratio	0.16	0.19		0.34	0.48			0.56			0.38	
Uniform Delay, d1	11.2	11.4		12.5	13.7			22.7			21.0	
Progression Factor	0.74	0.66		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.7	0.3		1.9	0.9			2.8			1.2	
Delay (s)	10.0	7.9		14.4	14.6			25.5			22.2	
Level of Service	B	A		B	B			C			C	
Approach Delay (s)		8.1			14.6			25.5			22.2	
Approach LOS		A			B			C			C	

Intersection Summary				
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	97.1%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
245: Parliment Street & King Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	206	43	10	252	24	39	249	80	27	327	62
Future Volume (vph)	10	206	43	10	252	24	39	249	80	27	327	62
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.98			0.98			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.99			0.97			0.98	
Flt Protected		1.00			1.00			0.99			1.00	
Satd. Flow (prot)		1845			1951			2919			3146	
Flt Permitted		0.94			0.94			0.88			0.92	
Satd. Flow (perm)		1729			1833			2571			2889	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	217	45	11	265	25	41	262	84	28	344	65
RTOR Reduction (vph)	0	25	0	0	10	0	0	23	0	0	13	0
Lane Group Flow (vph)	0	248	0	0	291	0	0	364	0	0	424	0
Confl. Peds. (#/hr)	75		106	106		75	57		54	54		57
Confl. Bikes (#/hr)			19			122			29			29
Heavy Vehicles (%)	30%	14%	12%	10%	11%	4%	8%	18%	3%	15%	8%	2%
Bus Blockages (#/hr)	0	26	0	0	26	0	0	6	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		19.3			19.3			48.7			48.7	
Effective Green, g (s)		20.3			20.3			49.7			49.7	
Actuated g/C Ratio		0.25			0.25			0.62			0.62	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		438			465			1597			1794	
v/s Ratio Prot												
v/s Ratio Perm		0.14			c0.16			0.14			c0.15	
v/c Ratio		0.57			0.62			0.23			0.24	
Uniform Delay, d1		26.0			26.5			6.7			6.7	
Progression Factor		1.27			1.00			1.00			1.00	
Incremental Delay, d2		1.7			2.6			0.3			0.3	
Delay (s)		34.7			29.1			7.0			7.0	
Level of Service		C			C			A			A	
Approach Delay (s)		34.7			29.1			7.0			7.0	
Approach LOS		C			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.35			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	69.2%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1894: Parliment Street & Mill Street

02/23/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	82	94	437	52	39	327
Future Volume (vph)	82	94	437	52	39	327
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.2	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.90	0.98			1.00
Flpb, ped/bikes	1.00	1.00	1.00			0.99
Frt	1.00	0.85	0.98			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1716	1399	3036			3244
Flt Permitted	0.95	1.00	1.00			0.86
Satd. Flow (perm)	1716	1399	3036			2820
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	86	99	460	55	41	344
RTOR Reduction (vph)	0	68	13	0	0	0
Lane Group Flow (vph)	86	31	502	0	0	385
Confl. Peds. (#/hr)	135	85		89	89	
Heavy Vehicles (%)	4%	2%	14%	9%	5%	9%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot	Perm	NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	20.8	20.8	33.0			33.0
Effective Green, g (s)	21.8	21.8	34.0			34.0
Actuated g/C Ratio	0.31	0.31	0.49			0.49
Clearance Time (s)	5.2	5.2	6.0			6.0
Lane Grp Cap (vph)	534	435	1474			1369
v/s Ratio Prot	c0.05		c0.17			
v/s Ratio Perm		0.02				0.14
v/c Ratio	0.16	0.07	0.34			0.28
Uniform Delay, d1	17.5	17.0	11.1			10.7
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.6	0.3	0.6			0.5
Delay (s)	18.1	17.3	11.7			11.2
Level of Service	B	B	B			B
Approach Delay (s)	17.7		11.7			11.2
Approach LOS	B		B			B

Intersection Summary				
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.26			
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.2	
Intersection Capacity Utilization	60.2%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1966: Berkley Street & King Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	185	46	0	435	14	30	29	13	7	78	23
Future Volume (vph)	0	185	46	0	435	14	30	29	13	7	78	23
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.4			4.4			5.5	5.5		5.5	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.98			1.00			1.00	0.96		0.99	
Flpb, ped/bikes		1.00			1.00			0.99	1.00		1.00	
Frt		0.97			1.00			1.00	0.85		0.97	
Flt Protected		1.00			1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1898			2081			1689	1508		1594	
Flt Permitted		1.00			1.00			0.82	1.00		0.98	
Satd. Flow (perm)		1898			2081			1419	1508		1573	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	195	48	0	458	15	32	31	14	7	82	24
RTOR Reduction (vph)	0	17	0	0	2	0	0	0	11	0	13	0
Lane Group Flow (vph)	0	226	0	0	471	0	0	63	3	0	100	0
Confl. Peds. (#/hr)	58		46	46		58	17		21	21		17
Confl. Bikes (#/hr)			17									
Heavy Vehicles (%)	10%	20%	6%	2%	12%	8%	13%	2%	2%	2%	16%	7%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)		50.7			50.7			17.4	17.4		17.4	
Effective Green, g (s)		51.7			51.7			18.4	18.4		18.4	
Actuated g/C Ratio		0.65			0.65			0.23	0.23		0.23	
Clearance Time (s)		5.4			5.4			6.5	6.5		6.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		1226			1344			326	346		361	
v/s Ratio Prot		0.12			c0.23							
v/s Ratio Perm								0.04	0.00		c0.06	
v/c Ratio		0.18			0.35			0.19	0.01		0.28	
Uniform Delay, d1		5.7			6.5			24.8	23.8		25.3	
Progression Factor		1.00			1.47			1.00	1.00		1.00	
Incremental Delay, d2		0.3			0.7			0.3	0.0		0.4	
Delay (s)		6.0			10.2			25.1	23.8		25.7	
Level of Service		A			B			C	C		C	
Approach Delay (s)		6.0			10.2			24.9			25.7	
Approach LOS		A			B			C			C	

Intersection Summary				
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.9	
Intersection Capacity Utilization	51.5%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1968: Berkley Street /Berkley Street & Front Street E 02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	295	18	12	899	26	15	17	88	25	35	22
Future Volume (vph)	13	295	18	12	899	26	15	17	88	25	35	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0			5.0	5.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		0.99			1.00		1.00	0.96			1.00	0.86
Flpb, ped/bikes		1.00			1.00		0.88	1.00			0.99	1.00
Frt		0.99			1.00		1.00	0.87			1.00	0.85
Flt Protected		1.00			1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)		3354			3366		1548	1417			1782	1221
Flt Permitted		0.91			0.95		0.72	1.00			0.87	1.00
Satd. Flow (perm)		3050			3197		1167	1417			1586	1221
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	311	19	13	946	27	16	18	93	26	37	23
RTOR Reduction (vph)	0	5	0	0	2	0	0	66	0	0	0	16
Lane Group Flow (vph)	0	339	0	0	984	0	16	45	0	0	63	7
Confl. Peds. (#/hr)	23		52	52		23	84		24	24		84
Confl. Bikes (#/hr)			2			8			2			1
Heavy Vehicles (%)	17%	4%	2%	45%	3%	17%	2%	2%	13%	2%	2%	13%
Bus Blockages (#/hr)	0	0	0	0	6	0	0	0	0	0	0	0
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)		53.0			53.0		25.0	25.0			25.0	25.0
Effective Green, g (s)		54.0			54.0		26.0	26.0			26.0	26.0
Actuated g/C Ratio		0.60			0.60		0.29	0.29			0.29	0.29
Clearance Time (s)		6.0			6.0		6.0	6.0			6.0	6.0
Lane Grp Cap (vph)		1830			1918		337	409			458	352
v/s Ratio Prot								0.03				
v/s Ratio Perm		0.11			c0.31		0.01				c0.04	0.01
v/c Ratio		0.19			0.51		0.05	0.11			0.14	0.02
Uniform Delay, d1		8.1			10.4		23.1	23.5			23.7	22.9
Progression Factor		1.00			0.51		1.00	1.00			1.00	1.00
Incremental Delay, d2		0.2			0.9		0.3	0.5			0.6	0.1
Delay (s)		8.3			6.2		23.3	24.0			24.3	23.0
Level of Service		A			A		C	C			C	C
Approach Delay (s)		8.3			6.2			24.0			24.0	
Approach LOS		A			A			C			C	

Intersection Summary					
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.39				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		10.0	
Intersection Capacity Utilization	68.6%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	20	102	33	33	20	20
Future Volume (vph)	20	102	33	33	20	20
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	107	35	35	21	21

Direction, Lane #	NB 1	SB 1	NE 1
Volume Total (vph)	128	70	42
Volume Left (vph)	21	0	21
Volume Right (vph)	0	35	21
Hadj (s)	0.07	-0.27	-0.17
Departure Headway (s)	4.1	3.8	4.1
Degree Utilization, x	0.15	0.07	0.05
Capacity (veh/h)	852	915	824
Control Delay (s)	7.8	7.2	7.4
Approach Delay (s)	7.8	7.2	7.4
Approach LOS	A	A	A

Intersection Summary				
Delay		7.6		
Level of Service		A		
Intersection Capacity Utilization		32.9%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Signalized Intersection Capacity Analysis
244: Parliment Street & Front Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	689	103	130	516	33	95	274	193	58	258	58
Future Volume (vph)	53	689	103	130	516	33	95	274	193	58	258	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			0.95			0.99	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			0.99			0.99	
Frt	1.00	0.98		1.00	0.99			0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1489	3193		1682	3339			2962			2996	
Flt Permitted	0.41	1.00		0.29	1.00			0.75			0.72	
Satd. Flow (perm)	645	3193		515	3339			2236			2181	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	56	725	108	137	543	35	100	288	203	61	272	61
RTOR Reduction (vph)	0	13	0	0	5	0	0	75	0	0	17	0
Lane Group Flow (vph)	56	820	0	137	573	0	0	516	0	0	377	0
Confl. Peds. (#/hr)	15		34	34		15	49		107	107		49
Heavy Vehicles (%)	19%	2%	10%	5%	6%	2%	24%	5%	3%	11%	9%	27%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	6	0
Parking (#/hr)		0										
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	51.0	51.0		51.0	51.0			27.0			27.0	
Effective Green, g (s)	52.0	52.0		52.0	52.0			28.0			28.0	
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.31			0.31	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	372	1844		297	1929			695			678	
v/s Ratio Prot		0.26			0.17							
v/s Ratio Perm	0.09			c0.27				c0.23			0.17	
v/c Ratio	0.15	0.44		0.46	0.30			0.74			0.56	
Uniform Delay, d1	8.8	10.8		10.9	9.7			27.8			25.8	
Progression Factor	1.17	1.34		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.8	0.7		5.1	0.4			7.0			3.3	
Delay (s)	11.0	15.1		16.0	10.1			34.8			29.1	
Level of Service	B	B		B	B			C			C	
Approach Delay (s)		14.9			11.2			34.8			29.1	
Approach LOS		B			B			C			C	

Intersection Summary				
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	96.9%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
245: Parliment Street & King Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	492	68	21	228	32	46	442	101	22	413	55
Future Volume (vph)	11	492	68	21	228	32	46	442	101	22	413	55
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.97			0.98			0.97			0.98	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.98			0.98			0.97			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		2030			1965			3160			3225	
Flt Permitted		0.95			0.90			0.86			0.91	
Satd. Flow (perm)		1925			1769			2734			2934	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	518	72	22	240	34	48	465	106	23	435	58
RTOR Reduction (vph)	0	10	0	0	10	0	0	27	0	0	15	0
Lane Group Flow (vph)	0	592	0	0	286	0	0	592	0	0	501	0
Confl. Peds. (#/hr)	138		198	198		138	87		93	93		97
Confl. Bikes (#/hr)			125			30			44			29
Heavy Vehicles (%)	2%	4%	3%	15%	8%	2%	5%	6%	2%	2%	6%	2%
Bus Blockages (#/hr)	0	26	0	0	26	0	0	6	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		44.3			44.3			23.7			23.7	
Effective Green, g (s)		45.3			45.3			24.7			24.7	
Actuated g/C Ratio		0.57			0.57			0.31			0.31	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1090			1001			844			905	
v/s Ratio Prot												
v/s Ratio Perm		c0.31			0.16			c0.22			0.17	
v/c Ratio		0.54			0.29			0.70			0.55	
Uniform Delay, d1		10.9			9.0			24.4			23.1	
Progression Factor		0.66			1.00			1.00			1.00	
Incremental Delay, d2		1.9			0.7			2.7			0.7	
Delay (s)		9.1			9.7			27.1			23.8	
Level of Service		A			A			C			C	
Approach Delay (s)		9.1			9.7			27.1			23.8	
Approach LOS		A			A			C			C	

Intersection Summary				
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	83.9%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1894: Parliment Street & Mill Street

02/23/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	87	97	465	138	57	502
Future Volume (vph)	87	97	465	138	57	502
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.2	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.82	0.90			1.00
Flpb, ped/bikes	1.00	1.00	1.00			0.98
Frt	1.00	0.85	0.97			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1716	1271	2987			3243
Flt Permitted	0.95	1.00	1.00			0.83
Satd. Flow (perm)	1716	1271	2987			2715
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	92	102	489	145	60	528
RTOR Reduction (vph)	0	70	40	0	0	0
Lane Group Flow (vph)	92	32	594	0	0	588
Confl. Peds. (#/hr)	401	165		222	222	
Heavy Vehicles (%)	4%	2%	5%	2%	6%	8%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot	Perm	NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	20.8	20.8	33.0			33.0
Effective Green, g (s)	21.8	21.8	34.0			34.0
Actuated g/C Ratio	0.31	0.31	0.49			0.49
Clearance Time (s)	5.2	5.2	6.0			6.0
Lane Grp Cap (vph)	534	395	1450			1318
v/s Ratio Prot	c0.05		0.20			
v/s Ratio Perm		0.02				c0.22
v/c Ratio	0.17	0.08	0.41			0.45
Uniform Delay, d1	17.5	17.0	11.6			11.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.7	0.4	0.9			1.1
Delay (s)	18.2	17.4	12.4			12.9
Level of Service	B	B	B			B
Approach Delay (s)	17.8		12.4			12.9
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1966: Berkley Street & King Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	423	52	0	263	21	32	59	34	10	56	20
Future Volume (vph)	0	423	52	0	263	21	32	59	34	10	56	20
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.4			4.4			5.5	5.5		5.5	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.97			0.98			1.00	0.92		0.97	
Flpb, ped/bikes		1.00			1.00			0.97	1.00		0.99	
Frt		0.98			0.99			1.00	0.85		0.97	
Flt Protected		1.00			1.00			0.98	1.00		0.99	
Satd. Flow (prot)		2092			1982			1719	1440		1679	
Flt Permitted		1.00			1.00			0.87	1.00		0.96	
Satd. Flow (perm)		2092			1982			1515	1440		1622	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	445	55	0	277	22	34	62	36	11	59	21
RTOR Reduction (vph)	0	10	0	0	6	0	0	0	28	0	14	0
Lane Group Flow (vph)	0	490	0	0	293	0	0	96	8	0	77	0
Confl. Peds. (#/hr)	109		97	97		109	95		58	58		95
Confl. Bikes (#/hr)			95									
Heavy Vehicles (%)	68%	8%	2%	2%	16%	5%	5%	3%	2%	2%	5%	2%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)		52.1			52.1			16.0	16.0		16.0	
Effective Green, g (s)		53.1			53.1			17.0	17.0		17.0	
Actuated g/C Ratio		0.66			0.66			0.21	0.21		0.21	
Clearance Time (s)		5.4			5.4			6.5	6.5		6.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		1388			1315			321	306		344	
v/s Ratio Prot		c0.23			0.15							
v/s Ratio Perm								c0.06	0.01		0.05	
v/c Ratio		0.35			0.22			0.30	0.02		0.22	
Uniform Delay, d1		5.9			5.3			26.5	24.9		26.0	
Progression Factor		1.00			0.69			1.00	1.00		1.00	
Incremental Delay, d2		0.7			0.4			0.5	0.0		0.3	
Delay (s)		6.6			4.0			27.0	25.0		26.4	
Level of Service		A			A			C	C		C	
Approach Delay (s)		6.6			4.0			26.5			26.4	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1968: Berkley Street /Berkley Street & Front Street E 02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	841	13	55	552	11	25	36	182	49	62	29
Future Volume (vph)	26	841	13	55	552	11	25	36	182	49	62	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		5.0	5.0			5.0	5.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00			1.00		1.00	0.91			1.00	0.82
Flpb, ped/bikes		1.00			1.00		0.85	1.00			0.97	1.00
Frt		1.00			1.00		1.00	0.87			1.00	0.85
Flt Protected		1.00			1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)		3456			3363		1492	1467			1688	1221
Flt Permitted		0.92			0.79		0.68	1.00			0.80	1.00
Satd. Flow (perm)		3186			2656		1071	1467			1372	1221
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	27	885	14	58	581	12	26	38	192	52	65	31
RTOR Reduction (vph)	0	1	0	0	1	0	0	51	0	0	0	21
Lane Group Flow (vph)	0	925	0	0	650	0	26	179	0	0	117	10
Confl. Peds. (#/hr)	69		97	97		69	135		71	71		135
Confl. Bikes (#/hr)			7			2			10			
Heavy Vehicles (%)	17%	2%	2%	8%	3%	2%	2%	2%	2%	11%	2%	7%
Bus Blockages (#/hr)	0	0	0	0	6	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)		48.0			48.0		29.0	29.0			29.0	29.0
Effective Green, g (s)		49.0			49.0		30.0	30.0			30.0	30.0
Actuated g/C Ratio		0.54			0.54		0.33	0.33			0.33	0.33
Clearance Time (s)		7.0			7.0		6.0	6.0			6.0	6.0
Lane Grp Cap (vph)		1734			1446		357	489			457	407
v/s Ratio Prot								c0.12				
v/s Ratio Perm		c0.29			0.24		0.02				0.09	0.01
v/c Ratio		0.53			0.45		0.07	0.37			0.26	0.03
Uniform Delay, d1		13.2			12.4		20.5	22.8			21.9	20.2
Progression Factor		1.00			1.08		1.00	1.00			1.00	1.00
Incremental Delay, d2		1.2			0.9		0.4	2.1			1.3	0.1
Delay (s)		14.3			14.3		20.9	24.9			23.2	20.3
Level of Service		B			B		C	C			C	C
Approach Delay (s)		14.3			14.3			24.5			22.6	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	20	224	59	65	20	20
Future Volume (vph)	20	224	59	65	20	20
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	236	62	68	21	21

Direction, Lane #	NB 1	SB 1	NE 1
Volume Total (vph)	257	130	42
Volume Left (vph)	21	0	21
Volume Right (vph)	0	68	21
Hadj (s)	0.05	-0.28	-0.17
Departure Headway (s)	4.2	4.0	4.6
Degree Utilization, x	0.30	0.14	0.05
Capacity (veh/h)	844	884	720
Control Delay (s)	8.9	7.6	7.8
Approach Delay (s)	8.9	7.6	7.8
Approach LOS	A	A	A

Intersection Summary				
Delay	8.4			
Level of Service	A			
Intersection Capacity Utilization	48.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
244: Parliment Street & Front Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	285	28	71	820	16	85	249	95	59	241	47
Future Volume (vph)	33	285	28	71	820	16	85	249	95	59	241	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			0.93			0.97	
Flpb, ped/bikes	0.97	1.00		0.90	1.00			0.98			0.97	
Frt	1.00	0.99		1.00	1.00			0.97			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1358	2976		1458	3471			2629			2973	
Flt Permitted	0.23	1.00		0.55	1.00			0.79			0.81	
Satd. Flow (perm)	327	2976		844	3471			2109			2424	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	35	300	29	75	863	17	89	262	100	62	254	49
RTOR Reduction (vph)	0	8	0	0	2	0	0	29	0	0	14	0
Lane Group Flow (vph)	35	321	0	75	878	0	0	422	0	0	351	0
Confl. Peds. (#/hr)	132		137	137		132	182		354	354		182
Heavy Vehicles (%)	27%	14%	38%	10%	2%	14%	15%	19%	16%	2%	9%	16%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	40.0	40.0		40.0	40.0			38.0			38.0	
Effective Green, g (s)	41.0	41.0		41.0	41.0			39.0			39.0	
Actuated g/C Ratio	0.46	0.46		0.46	0.46			0.43			0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	148	1355		384	1581			913			1050	
v/s Ratio Prot		0.11			c0.25							
v/s Ratio Perm	0.11			0.09				c0.20			0.14	
v/c Ratio	0.24	0.24		0.20	0.56			0.46			0.33	
Uniform Delay, d1	14.9	15.0		14.6	17.9			18.1			16.9	
Progression Factor	0.81	0.73		1.00	1.00			1.00			1.00	
Incremental Delay, d2	3.7	0.4		1.1	1.4			1.7			0.9	
Delay (s)	15.8	11.4		15.8	19.3			19.7			17.8	
Level of Service	B	B		B	B			B			B	
Approach Delay (s)		11.8			19.0			19.7			17.8	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	97.5%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
245: Parliment Street & King Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	228	46	11	267	26	35	260	85	29	338	65
Future Volume (vph)	11	228	46	11	267	26	35	260	85	29	338	65
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.91			0.97			0.92			0.92	
Flpb, ped/bikes		0.99			0.99			0.97			0.99	
Frt		0.98			0.99			0.97			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1717			1899			2666			2898	
Flt Permitted		0.93			0.94			0.89			0.91	
Satd. Flow (perm)		1608			1782			2371			2645	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	240	48	12	281	27	37	274	89	31	356	68
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	300	0	0	310	0	0	400	0	0	451	0
Confl. Peds. (#/hr)	527		1238	1238		527	1214		506	506		1214
Confl. Bikes (#/hr)			20			31			30			30
Heavy Vehicles (%)	30%	14%	12%	10%	11%	4%	8%	18%	3%	15%	8%	2%
Bus Blockages (#/hr)	0	26	0	0	26	0	0	6	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.9			20.9			47.1			47.1	
Effective Green, g (s)		21.9			21.9			48.1			48.1	
Actuated g/C Ratio		0.27			0.27			0.60			0.60	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		440			487			1425			1590	
v/s Ratio Prot												
v/s Ratio Perm		c0.19			0.17			0.17			c0.17	
v/c Ratio		0.68			0.64			0.28			0.28	
Uniform Delay, d1		25.9			25.5			7.7			7.7	
Progression Factor		1.31			1.00			1.00			1.00	
Incremental Delay, d2		4.3			2.7			0.5			0.4	
Delay (s)		38.4			28.3			8.1			8.1	
Level of Service		D			C			A			A	
Approach Delay (s)		38.4			28.3			8.1			8.1	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.41			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	72.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1894: Parliment Street & Mill Street

02/23/2021

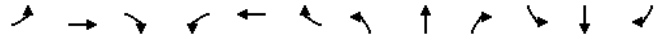
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	86	99	456	55	41	343
Future Volume (vph)	86	99	456	55	41	343
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.2	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.90	0.95			1.00
Flpb, ped/bikes	1.00	1.00	1.00			0.98
Frt	1.00	0.85	0.98			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1716	1399	2945			3201
Flt Permitted	0.95	1.00	1.00			0.86
Satd. Flow (perm)	1716	1399	2945			2767
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	91	104	480	58	43	361
RTOR Reduction (vph)	0	72	13	0	0	0
Lane Group Flow (vph)	91	32	525	0	0	404
Confl. Peds. (#/hr)	135	85		239	239	
Heavy Vehicles (%)	4%	2%	14%	9%	5%	9%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot	Perm	NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	20.8	20.8	33.0			33.0
Effective Green, g (s)	21.8	21.8	34.0			34.0
Actuated g/C Ratio	0.31	0.31	0.49			0.49
Clearance Time (s)	5.2	5.2	6.0			6.0
Lane Grp Cap (vph)	534	435	1430			1343
v/s Ratio Prot	c0.05		c0.18			
v/s Ratio Perm		0.02				0.15
v/c Ratio	0.17	0.07	0.37			0.30
Uniform Delay, d1	17.5	17.0	11.3			10.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.7	0.3	0.7			0.6
Delay (s)	18.2	17.3	12.0			11.4
Level of Service	B	B	B			B
Approach Delay (s)	17.7		12.0			11.4
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1966: Berkley Street & King Street E

02/23/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	198	16	0	450	15	23	30	14	7	80	24
Future Volume (vph)	0	198	16	0	450	15	23	30	14	7	80	24
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.4			4.4			5.5	5.5		5.5	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.95			0.98			1.00	0.63		0.93	
Flpb, ped/bikes		1.00			1.00			0.89	1.00		0.98	
Frt		0.99			1.00			1.00	0.85		0.97	
Flt Protected		1.00			1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1856			2052			1541	991		1468	
Flt Permitted		1.00			1.00			0.85	1.00		0.98	
Satd. Flow (perm)		1856			2052			1341	991		1449	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	208	17	0	474	16	24	32	15	7	84	25
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	12	0	13	0
Lane Group Flow (vph)	0	219	0	0	489	0	0	56	3	0	103	0
Confl. Peds. (#/hr)	321		609	609		321	280		509	509		280
Confl. Bikes (#/hr)			18									
Heavy Vehicles (%)	10%	20%	6%	2%	12%	8%	13%	2%	2%	2%	16%	7%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)		50.7			50.7			17.4	17.4		17.4	
Effective Green, g (s)		51.7			51.7			18.4	18.4		18.4	
Actuated g/C Ratio		0.65			0.65			0.23	0.23		0.23	
Clearance Time (s)		5.4			5.4			6.5	6.5		6.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		1199			1326			308	227		333	
v/s Ratio Prot		0.12			c0.24							
v/s Ratio Perm								0.04	0.00		c0.07	
v/c Ratio		0.18			0.37			0.18	0.02		0.31	
Uniform Delay, d1		5.7			6.6			24.8	23.8		25.5	
Progression Factor		1.00			1.42			1.00	1.00		1.00	
Incremental Delay, d2		0.3			0.8			0.3	0.0		0.5	
Delay (s)		6.0			10.1			25.0	23.8		26.1	
Level of Service		A			B			C	C		C	
Approach Delay (s)		6.0			10.1			24.8			26.1	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1968: Berkley Street /Berkley Street & Front Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	267	6	13	931	28	5	12	91	12	22	20
Future Volume (vph)	3	267	6	13	931	28	5	12	91	12	22	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0			5.0	5.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		0.99			0.99		1.00	0.78			1.00	0.64
Flpb, ped/bikes		1.00			1.00		0.66	1.00			0.92	1.00
Frt		1.00			1.00		1.00	0.87			1.00	0.85
Flt Protected		1.00			1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)		3378			3318		1159	1132			1670	904
Flt Permitted		0.95			0.95		0.73	1.00			0.91	1.00
Satd. Flow (perm)		3203			3152		895	1132			1543	904
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	3	281	6	14	980	29	5	13	96	13	23	21
RTOR Reduction (vph)	0	2	0	0	2	0	0	68	0	0	0	15
Lane Group Flow (vph)	0	288	0	0	1021	0	5	41	0	0	36	6
Confl. Peds. (#/hr)	173		202	202		173	384		165	165		384
Confl. Bikes (#/hr)			2			8			2			1
Heavy Vehicles (%)	17%	4%	2%	45%	3%	17%	2%	2%	13%	2%	2%	13%
Bus Blockages (#/hr)	0	0	0	0	6	0	0	0	0	0	0	0
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)		53.0			53.0		25.0	25.0			25.0	25.0
Effective Green, g (s)		54.0			54.0		26.0	26.0			26.0	26.0
Actuated g/C Ratio		0.60			0.60		0.29	0.29			0.29	0.29
Clearance Time (s)		6.0			6.0		6.0	6.0			6.0	6.0
Lane Grp Cap (vph)		1921			1891		258	327			445	261
v/s Ratio Prot								c0.04				
v/s Ratio Perm		0.09			c0.32		0.01				0.02	0.01
v/c Ratio		0.15			0.54		0.02	0.12			0.08	0.02
Uniform Delay, d1		7.9			10.6		22.9	23.6			23.3	22.9
Progression Factor		1.00			0.51		1.00	1.00			1.00	1.00
Incremental Delay, d2		0.2			1.0		0.1	0.8			0.4	0.2
Delay (s)		8.1			6.3		23.0	24.4			23.7	23.1
Level of Service		A			A		C	C			C	C
Approach Delay (s)		8.1			6.3			24.3			23.4	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
111: The Esplanade & Berkley Street 02/23/2021

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	21	105	34	35	21	21
Future Volume (vph)	21	105	34	35	21	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	111	36	37	22	22

Direction, Lane #	NB 1	SB 1	NE 1
Volume Total (vph)	133	73	44
Volume Left (vph)	22	0	22
Volume Right (vph)	0	37	22
Hadj (s)	0.07	-0.27	-0.17
Departure Headway (s)	4.1	3.9	4.2
Degree Utilization, x	0.15	0.08	0.05
Capacity (veh/h)	850	913	820
Control Delay (s)	7.9	7.2	7.4
Approach Delay (s)	7.9	7.2	7.4
Approach LOS	A	A	A

Intersection Summary			
Delay		7.6	
Level of Service		A	
Intersection Capacity Utilization		33.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
244: Parliment Street & Front Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	723	108	98	542	9	54	242	134	41	268	50
Future Volume (vph)	56	723	108	98	542	9	54	242	134	41	268	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	0.98		1.00	1.00			0.90			0.98	
Flpb, ped/bikes	0.94	1.00		0.96	1.00			0.99			0.98	
Frt	1.00	0.98		1.00	1.00			0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1413	3141		1635	3354			2820			2947	
Flt Permitted	0.39	1.00		0.25	1.00			0.85			0.86	
Satd. Flow (perm)	585	3141		429	3354			2416			2542	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	59	761	114	103	571	9	57	255	141	43	282	53
RTOR Reduction (vph)	0	13	0	0	1	0	0	40	0	0	15	0
Lane Group Flow (vph)	59	862	0	103	579	0	0	413	0	0	363	0
Confl. Peds. (#/hr)	122		141	141		122	135		314	314		135
Heavy Vehicles (%)	19%	2%	10%	5%	6%	2%	24%	5%	3%	11%	9%	27%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	6	0
Parking (#/hr)		0										
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0		44.0	44.0			34.0			34.0	
Effective Green, g (s)	45.0	45.0		45.0	45.0			35.0			35.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50			0.39			0.39	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	292	1570		214	1677			939			988	
v/s Ratio Prot		c0.27			0.17							
v/s Ratio Perm	0.10			0.24				c0.17			0.14	
v/c Ratio	0.20	0.55		0.48	0.35			0.44			0.37	
Uniform Delay, d1	12.5	15.5		14.8	13.6			20.3			19.6	
Progression Factor	1.25	1.32		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.4	1.2		7.6	0.6			1.5			1.1	
Delay (s)	17.0	21.6		22.4	14.2			21.8			20.7	
Level of Service	B	C		C	B			C			C	
Approach Delay (s)		21.3			15.4			21.8			20.7	
Approach LOS		C			B			C			C	

Intersection Summary				
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	98.5%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
245: Parliment Street & King Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	520	72	22	246	34	26	459	67	24	430	58
Future Volume (vph)	12	520	72	22	246	34	26	459	67	24	430	58
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.93			0.96			0.95			0.94	
Flpb, ped/bikes		0.99			0.98			0.99			0.99	
Frt		0.98			0.98			0.98			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1956			1904			3088			3062	
Flt Permitted		0.95			0.89			0.91			0.91	
Satd. Flow (perm)		1854			1709			2812			2783	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	547	76	23	259	36	27	483	71	25	453	61
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	636	0	0	315	0	0	581	0	0	533	0
Confl. Peds. (#/hr)	591		1330	1330		591	1244		546	546		1244
Confl. Bikes (#/hr)			131			31			46			30
Heavy Vehicles (%)	2%	4%	3%	15%	8%	2%	5%	6%	2%	2%	6%	2%
Bus Blockages (#/hr)	0	26	0	0	26	0	0	6	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		45.0			45.0			23.0			23.0	
Effective Green, g (s)		46.0			46.0			24.0			24.0	
Actuated g/C Ratio		0.58			0.58			0.30			0.30	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1066			982			843			834	
v/s Ratio Prot												
v/s Ratio Perm		c0.34			0.18			c0.21			0.19	
v/c Ratio		0.60			0.32			0.69			0.64	
Uniform Delay, d1		11.0			8.9			24.7			24.2	
Progression Factor		0.69			1.00			1.00			1.00	
Incremental Delay, d2		2.4			0.9			2.4			1.6	
Delay (s)		10.0			9.7			27.1			25.9	
Level of Service		A			A			C			C	
Approach Delay (s)		10.0			9.7			27.1			25.9	
Approach LOS		A			A			C			C	

Intersection Summary				
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	84.2%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1894: Parliment Street & Mill Street

02/23/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	91	102	486	145	60	524
Future Volume (vph)	91	102	486	145	60	524
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.2	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.82	0.87			1.00
Flpb, ped/bikes	1.00	1.00	1.00			0.98
Frt	1.00	0.85	0.97			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1716	1271	2889			3230
Flt Permitted	0.95	1.00	1.00			0.82
Satd. Flow (perm)	1716	1271	2889			2678
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	96	107	512	153	63	552
RTOR Reduction (vph)	0	74	40	0	0	0
Lane Group Flow (vph)	96	33	625	0	0	615
Confl. Peds. (#/hr)	401	165		372	372	
Heavy Vehicles (%)	4%	2%	5%	2%	6%	8%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot	Perm	NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	20.8	20.8	33.0			33.0
Effective Green, g (s)	21.8	21.8	34.0			34.0
Actuated g/C Ratio	0.31	0.31	0.49			0.49
Clearance Time (s)	5.2	5.2	6.0			6.0
Lane Grp Cap (vph)	534	395	1403			1300
v/s Ratio Prot	c0.06		0.22			
v/s Ratio Perm		0.03				c0.23
v/c Ratio	0.18	0.08	0.45			0.47
Uniform Delay, d1	17.6	17.0	11.8			12.0
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.7	0.4	1.0			1.2
Delay (s)	18.3	17.5	12.8			13.3
Level of Service	B	B	B			B
Approach Delay (s)	17.9		12.8			13.3
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1966: Berkley Street & King Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	432	25	0	254	22	5	60	36	11	57	21
Future Volume (vph)	0	432	25	0	254	22	5	60	36	11	57	21
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.4			4.4			5.5	5.5		5.5	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.96			0.96			1.00	0.62		0.92	
Flpb, ped/bikes		1.00			1.00			0.98	1.00		0.96	
Frt		0.99			0.99			1.00	0.85		0.97	
Flt Protected		1.00			1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2083			1927			1778	978		1536	
Flt Permitted		1.00			1.00			0.98	1.00		0.96	
Satd. Flow (perm)		2083			1927			1747	978		1485	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	455	26	0	267	23	5	63	38	12	60	22
RTOR Reduction (vph)	0	4	0	0	1	0	0	0	26	0	15	0
Lane Group Flow (vph)	0	477	0	0	289	0	0	68	12	0	79	0
Confl. Peds. (#/hr)	372		660	660		372	358		546	546		358
Confl. Bikes (#/hr)			100									
Heavy Vehicles (%)	68%	8%	2%	2%	16%	5%	5%	3%	2%	2%	5%	2%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)		52.1			52.1			16.0	16.0		16.0	
Effective Green, g (s)		53.1			53.1			17.0	17.0		17.0	
Actuated g/C Ratio		0.66			0.66			0.21	0.21		0.21	
Clearance Time (s)		5.4			5.4			6.5	6.5		6.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		1382			1279			371	207		315	
v/s Ratio Prot		c0.23			0.15							
v/s Ratio Perm								0.04	0.01		c0.05	
v/c Ratio		0.34			0.23			0.18	0.06		0.25	
Uniform Delay, d1		5.9			5.3			25.8	25.1		26.2	
Progression Factor		1.00			0.68			1.00	1.00		1.00	
Incremental Delay, d2		0.7			0.4			0.2	0.1		0.4	
Delay (s)		6.5			4.0			26.1	25.2		26.6	
Level of Service		A			A			C	C		C	
Approach Delay (s)		6.5			4.0			25.8			26.6	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1968: Berkley Street /Berkley Street & Front Street E

02/23/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	850	3	58	524	12	4	19	190	41	53	20
Future Volume (vph)	6	850	3	58	524	12	4	19	190	41	53	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		5.0	5.0			5.0	5.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00			0.99		1.00	0.81			1.00	0.64
Flpb, ped/bikes		1.00			0.99		0.69	1.00			0.94	1.00
Frt		1.00			1.00		1.00	0.86			1.00	0.85
Flt Protected		1.00			1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)		3484			3314		1213	1281			1633	960
Flt Permitted		0.95			0.78		0.69	1.00			0.81	1.00
Satd. Flow (perm)		3314			2585		885	1281			1357	960
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	6	895	3	61	552	13	4	20	200	43	56	21
RTOR Reduction (vph)	0	0	0	0	2	0	0	23	0	0	0	14
Lane Group Flow (vph)	0	904	0	0	624	0	4	197	0	0	99	7
Confl. Peds. (#/hr)	219		247	247		219	435		157	157		435
Confl. Bikes (#/hr)			7			2			10			
Heavy Vehicles (%)	17%	2%	2%	8%	3%	2%	2%	2%	2%	11%	2%	7%
Bus Blockages (#/hr)	0	0	0	0	6	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)		48.0			48.0		29.0	29.0			29.0	29.0
Effective Green, g (s)		49.0			49.0		30.0	30.0			30.0	30.0
Actuated g/C Ratio		0.54			0.54		0.33	0.33			0.33	0.33
Clearance Time (s)		7.0			7.0		6.0	6.0			6.0	6.0
Lane Grp Cap (vph)		1804			1407		295	427			452	320
v/s Ratio Prot								c0.15				
v/s Ratio Perm		c0.27			0.24		0.00				0.07	0.01
v/c Ratio		0.50			0.44		0.01	0.46			0.22	0.02
Uniform Delay, d1		12.8			12.3		20.1	23.6			21.6	20.1
Progression Factor		1.00			2.54		1.00	1.00			1.00	1.00
Incremental Delay, d2		1.0			1.0		0.1	3.6			1.1	0.1
Delay (s)		13.8			32.2		20.2	27.2			22.7	20.3
Level of Service		B			C		C	C			C	C
Approach Delay (s)		13.8			32.2			27.1			22.3	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	21	234	59	69	21	21
Future Volume (vph)	21	234	59	69	21	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	246	62	73	22	22

Direction, Lane #	NB 1	SB 1	NE 1
Volume Total (vph)	268	135	44
Volume Left (vph)	22	0	22
Volume Right (vph)	0	73	22
Hadj (s)	0.05	-0.29	-0.17
Departure Headway (s)	4.2	4.0	4.6
Degree Utilization, x	0.31	0.15	0.06
Capacity (veh/h)	842	882	714
Control Delay (s)	9.1	7.7	7.9
Approach Delay (s)	9.1	7.7	7.9
Approach LOS	A	A	A

Intersection Summary				
Delay		8.5		
Level of Service		A		
Intersection Capacity Utilization		49.4%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Signalized Intersection Capacity Analysis
244: Parliment Street & Front Street E

02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	285	63	130	820	55	99	287	116	83	245	61
Future Volume (vph)	33	285	63	130	820	55	99	287	116	83	245	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.99			0.92			0.95	
Flpb, ped/bikes	0.97	1.00		0.87	1.00			0.96			0.97	
Frt	1.00	0.97		1.00	0.99			0.97			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1358	2804		1414	3403			2581			2880	
Flt Permitted	0.21	1.00		0.52	1.00			0.77			0.74	
Satd. Flow (perm)	302	2804		777	3403			2011			2141	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	35	300	66	137	863	58	104	302	122	87	258	64
RTOR Reduction (vph)	0	21	0	0	5	0	0	31	0	0	17	0
Lane Group Flow (vph)	35	345	0	137	916	0	0	497	0	0	392	0
Confl. Peds. (#/hr)	143		186	186		143	397		398	398		397
Confl. Bikes (#/hr)			1			1			2			1
Heavy Vehicles (%)	27%	14%	38%	10%	2%	14%	15%	19%	16%	2%	9%	16%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	40.0	40.0		40.0	40.0			38.0			38.0	
Effective Green, g (s)	41.0	41.0		41.0	41.0			39.0			39.0	
Actuated g/C Ratio	0.46	0.46		0.46	0.46			0.43			0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	137	1277		353	1550			871			927	
v/s Ratio Prot		0.12			c0.27							
v/s Ratio Perm	0.12			0.18				c0.25			0.18	
v/c Ratio	0.26	0.27		0.39	0.59			0.57			0.42	
Uniform Delay, d1	15.1	15.2		16.2	18.2			19.2			17.7	
Progression Factor	0.86	0.76		1.00	1.00			1.00			1.00	
Incremental Delay, d2	4.4	0.5		3.2	1.7			2.7			1.4	
Delay (s)	17.3	12.1		19.4	19.9			21.9			19.1	
Level of Service	B	B		B	B			C			B	
Approach Delay (s)		12.6			19.8			21.9			19.1	
Approach LOS		B			B			C			B	

Intersection Summary				
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	99.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
245: Parliment Street & King Street E

02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	228	46	11	267	26	63	264	122	29	343	65
Future Volume (vph)	11	228	46	11	267	26	63	264	122	29	343	65
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.91			0.96			0.90			0.92	
Flpb, ped/bikes		0.99			0.99			0.96			0.99	
Frt		0.98			0.99			0.96			0.98	
Flt Protected		1.00			1.00			0.99			1.00	
Satd. Flow (prot)		1716			1893			2567			2900	
Flt Permitted		0.93			0.94			0.83			0.90	
Satd. Flow (perm)		1607			1777			2149			2630	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	240	48	12	281	27	66	278	128	31	361	68
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	300	0	0	310	0	0	472	0	0	456	0
Confl. Peds. (#/hr)	543		1277	1277		543	1300		567	567		1300
Confl. Bikes (#/hr)			21			129			33			32
Heavy Vehicles (%)	30%	14%	12%	10%	11%	4%	8%	18%	3%	15%	8%	2%
Bus Blockages (#/hr)	0	26	0	0	26	0	0	6	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.9			20.9			47.1			47.1	
Effective Green, g (s)		21.9			21.9			48.1			48.1	
Actuated g/C Ratio		0.27			0.27			0.60			0.60	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		439			486			1292			1581	
v/s Ratio Prot												
v/s Ratio Perm		c0.19			0.17			c0.22			0.17	
v/c Ratio		0.68			0.64			0.37			0.29	
Uniform Delay, d1		26.0			25.6			8.2			7.7	
Progression Factor		1.29			1.00			1.00			1.00	
Incremental Delay, d2		4.3			2.7			0.8			0.5	
Delay (s)		37.8			28.3			8.9			8.2	
Level of Service		D			C			A			A	
Approach Delay (s)		37.8			28.3			8.9			8.2	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.46			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	72.3%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1894: Parliment Street & Mill Street

02/24/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	86	99	458	55	41	345
Future Volume (vph)	86	99	458	55	41	345
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.2	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.90	0.95			1.00
Flpb, ped/bikes	1.00	1.00	1.00			0.98
Frt	1.00	0.85	0.98			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1716	1399	2944			3201
Flt Permitted	0.95	1.00	1.00			0.86
Satd. Flow (perm)	1716	1399	2944			2768
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	91	104	482	58	43	363
RTOR Reduction (vph)	0	72	13	0	0	0
Lane Group Flow (vph)	91	32	527	0	0	406
Confl. Peds. (#/hr)	135	85		241	241	
Heavy Vehicles (%)	4%	2%	14%	9%	5%	9%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot	Perm	NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	20.8	20.8	33.0			33.0
Effective Green, g (s)	21.8	21.8	34.0			34.0
Actuated g/C Ratio	0.31	0.31	0.49			0.49
Clearance Time (s)	5.2	5.2	6.0			6.0
Lane Grp Cap (vph)	534	435	1429			1344
v/s Ratio Prot	c0.05		c0.18			
v/s Ratio Perm		0.02				0.15
v/c Ratio	0.17	0.07	0.37			0.30
Uniform Delay, d1	17.5	17.0	11.3			10.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.7	0.3	0.7			0.6
Delay (s)	18.2	17.3	12.0			11.4
Level of Service	B	B	B			B
Approach Delay (s)	17.7		12.0			11.4
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.2
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1966: Berkley Street & King Street E

02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	198	60	0	478	15	51	31	14	7	82	24
Future Volume (vph)	0	198	60	0	478	15	51	31	14	7	82	24
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.4			4.4			5.5	5.5		5.5	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.84			0.98			1.00	0.61		0.93	
Flpb, ped/bikes		1.00			1.00			0.85	1.00		0.98	
Frt		0.97			1.00			1.00	0.85		0.97	
Flt Protected		1.00			1.00			0.97	1.00		1.00	
Satd. Flow (prot)		1632			2053			1417	958		1469	
Flt Permitted		1.00			1.00			0.80	1.00		0.98	
Satd. Flow (perm)		1632			2053			1163	958		1449	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	208	63	0	503	16	54	33	15	7	86	25
RTOR Reduction (vph)	0	12	0	0	0	0	0	0	12	0	13	0
Lane Group Flow (vph)	0	259	0	0	519	0	0	87	3	0	105	0
Confl. Peds. (#/hr)	387		679	679		387	289		584	584		289
Confl. Bikes (#/hr)			36			8			11			2
Heavy Vehicles (%)	10%	20%	6%	2%	12%	8%	13%	2%	2%	2%	16%	7%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)		50.7			50.7			17.4	17.4		17.4	
Effective Green, g (s)		51.7			51.7			18.4	18.4		18.4	
Actuated g/C Ratio		0.65			0.65			0.23	0.23		0.23	
Clearance Time (s)		5.4			5.4			6.5	6.5		6.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		1054			1326			267	220		333	
v/s Ratio Prot		0.16			c0.25							
v/s Ratio Perm								c0.07	0.00		0.07	
v/c Ratio		0.25			0.39			0.33	0.02		0.32	
Uniform Delay, d1		6.0			6.7			25.6	23.8		25.6	
Progression Factor		1.00			1.34			1.00	1.00		1.00	
Incremental Delay, d2		0.6			0.8			0.7	0.0		0.5	
Delay (s)		6.5			9.8			26.4	23.8		26.1	
Level of Service		A			A			C	C		C	
Approach Delay (s)		6.5			9.8			26.0			26.1	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1968: Berkley Street /Berkley Street & Front Street E 02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	287	12	13	959	28	19	28	93	26	37	34
Future Volume (vph)	21	287	12	13	959	28	19	28	93	26	37	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0			5.0	5.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		0.98			0.98		1.00	0.70			1.00	0.62
Flpb, ped/bikes		0.99			1.00		0.66	1.00			0.87	1.00
Frt		0.99			1.00		1.00	0.88			1.00	0.85
Flt Protected		1.00			1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)		3284			3311		1156	1048			1566	872
Flt Permitted		0.86			0.95		0.71	1.00			0.87	1.00
Satd. Flow (perm)		2846			3143		869	1048			1385	872
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	302	13	14	1009	29	20	29	98	27	39	36
RTOR Reduction (vph)	0	3	0	0	2	0	0	70	0	0	0	26
Lane Group Flow (vph)	0	334	0	0	1050	0	20	57	0	0	66	10
Confl. Peds. (#/hr)	270		300	300		270	439		485	485		439
Confl. Bikes (#/hr)			20			17			12			22
Heavy Vehicles (%)	17%	4%	2%	45%	3%	17%	2%	2%	13%	2%	2%	13%
Bus Blockages (#/hr)	0	0	0	0	6	0	0	0	0	0	0	0
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)		53.0			53.0		25.0	25.0			25.0	25.0
Effective Green, g (s)		54.0			54.0		26.0	26.0			26.0	26.0
Actuated g/C Ratio		0.60			0.60		0.29	0.29			0.29	0.29
Clearance Time (s)		6.0			6.0		6.0	6.0			6.0	6.0
Lane Grp Cap (vph)		1707			1885		251	302			400	251
v/s Ratio Prot								c0.05				
v/s Ratio Perm		0.12			c0.33		0.02				0.05	0.01
v/c Ratio		0.20			0.56		0.08	0.19			0.17	0.04
Uniform Delay, d1		8.2			10.8		23.3	24.1			23.9	23.0
Progression Factor		1.00			0.48		1.00	1.00			1.00	1.00
Incremental Delay, d2		0.3			1.0		0.6	1.4			0.9	0.3
Delay (s)		8.4			6.2		23.9	25.5			24.8	23.3
Level of Service		A			A		C	C			C	C
Approach Delay (s)		8.4			6.2			25.3			24.3	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
1: Berkley Street & B West Access

02/24/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	15	69	19	18	128
Future Volume (Veh/h)	15	15	69	19	18	128
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)	16	16	73	20	19	135
Pedestrians	350					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	31					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			48			41
pX, platoon unblocked	0.99					
vC, conflicting volume	606	433			443	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	598	433			443	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	96			98	
cM capacity (veh/h)	311	430			772	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	93	154
Volume Left	16	0	19
Volume Right	16	20	0
cSH	361	1700	772
Volume to Capacity	0.09	0.05	0.02
Queue Length 95th (m)	2.2	0.0	0.6
Control Delay (s)	16.0	0.0	1.4
Lane LOS	C		A
Approach Delay (s)	16.0	0.0	1.4
Approach LOS	C		

Intersection Summary			
Average Delay		2.6	
Intersection Capacity Utilization		24.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Parliment Street & Site B East Access

02/24/2021

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	33	40	41	359	399	2
Future Volume (Veh/h)	33	40	41	359	399	2
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)	35	42	43	378	420	2
Pedestrians	448					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	40					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				64	61	
pX, platoon unblocked	0.97	0.97	0.97			
vC, conflicting volume	1144	659	870			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1088	588	806			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	69	84	91			
cM capacity (veh/h)	112	265	478			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	77	169	252	280	142
Volume Left	35	43	0	0	0
Volume Right	42	0	0	0	2
cSH	164	478	1700	1700	1700
Volume to Capacity	0.47	0.09	0.15	0.16	0.08
Queue Length 95th (m)	16.8	2.2	0.0	0.0	0.0
Control Delay (s)	45.2	4.3	0.0	0.0	0.0
Lane LOS	E	A			
Approach Delay (s)	45.2	1.7		0.0	
Approach LOS	E				

Intersection Summary			
Average Delay		4.6	
Intersection Capacity Utilization		38.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
3: Berkley Street & Site F West Access

02/24/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	30	128	1	22	40
Future Volume (Veh/h)	1	30	128	1	22	40
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)	1	32	135	1	23	42
Pedestrians	152					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	13					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						68
pX, platoon unblocked						
vC, conflicting volume	376	288			288	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	376	288			288	
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	95			98	
cM capacity (veh/h)	530	651			1103	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	33	136	65
Volume Left	1	0	23
Volume Right	32	1	0
cSH	646	1700	1103
Volume to Capacity	0.05	0.08	0.02
Queue Length 95th (m)	1.2	0.0	0.5
Control Delay (s)	10.9	0.0	3.1
Lane LOS	B		A
Approach Delay (s)	10.9	0.0	3.1
Approach LOS	B		

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Parliment Street & Site F East Access

02/24/2021

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	73	1	1	558	336	101
Future Volume (Veh/h)	73	1	1	558	336	101
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)	77	1	1	587	354	106
Pedestrians	152					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	13					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				78	62	
pX, platoon unblocked	0.92					
vC, conflicting volume	854	382	612			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	670	382	612			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	75	100	100			
cM capacity (veh/h)	311	533	834			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	78	197	391	236	224
Volume Left	77	1	0	0	0
Volume Right	1	0	0	0	106
cSH	312	834	1700	1700	1700
Volume to Capacity	0.25	0.00	0.23	0.14	0.13
Queue Length 95th (m)	7.3	0.0	0.0	0.0	0.0
Control Delay (s)	20.3	0.1	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	20.3	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	21	107	36	35	21	21
Future Volume (vph)	21	107	36	35	21	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	113	38	37	22	22

Direction, Lane #	NB 1	SB 1	NE 1
Volume Total (vph)	135	75	44
Volume Left (vph)	22	0	22
Volume Right (vph)	0	37	22
Hadj (s)	0.07	-0.26	-0.17
Departure Headway (s)	4.1	3.9	4.2
Degree Utilization, x	0.15	0.08	0.05
Capacity (veh/h)	850	911	817
Control Delay (s)	7.9	7.2	7.4
Approach Delay (s)	7.9	7.2	7.4
Approach LOS	A	A	A

Intersection Summary			
Delay		7.6	
Level of Service		A	
Intersection Capacity Utilization		33.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
244: Parliment Street & Front Street E

02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	56	723	154	139	542	34	83	307	172	67	271	62
Future Volume (vph)	56	723	154	139	542	34	83	307	172	67	271	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.99			0.90			0.95	
Flpb, ped/bikes	0.94	1.00		0.95	1.00			0.97			0.98	
Frt	1.00	0.97		1.00	0.99			0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1406	3042		1609	3313			2760			2827	
Flt Permitted	0.40	1.00		0.26	1.00			0.76			0.69	
Satd. Flow (perm)	587	3042		433	3313			2124			1972	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	59	761	162	146	571	36	87	323	181	71	285	65
RTOR Reduction (vph)	0	3	0	0	3	0	0	50	0	0	17	0
Lane Group Flow (vph)	59	920	0	146	604	0	0	541	0	0	404	0
Confl. Peds. (#/hr)	133		205	205		133	423		373	373		423
Confl. Bikes (#/hr)			1			1						1
Heavy Vehicles (%)	19%	2%	10%	5%	6%	2%	24%	5%	3%	11%	9%	27%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	6	0
Parking (#/hr)		0										
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	51.0	51.0		51.0	51.0			27.0			27.0	
Effective Green, g (s)	52.0	52.0		52.0	52.0			28.0			28.0	
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.31			0.31	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Grp Cap (vph)	339	1757		250	1914			660			613	
v/s Ratio Prot		0.30			0.18							
v/s Ratio Perm	0.10			c0.34				c0.25			0.21	
v/c Ratio	0.17	0.52		0.58	0.32			0.82			0.66	
Uniform Delay, d1	8.9	11.5		12.1	9.8			28.7			26.9	
Progression Factor	1.19	1.31		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.9	0.9		9.6	0.4			11.0			5.5	
Delay (s)	11.5	16.0		21.7	10.2			39.6			32.4	
Level of Service	B	B		C	B			D			C	
Approach Delay (s)		15.7			12.5			39.6			32.4	
Approach LOS		B			B			D			C	

Intersection Summary				
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	100.5%	ICU Level of Service	G	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
245: Parliment Street & King Street E

02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	520	72	22	246	34	59	465	122	24	434	58
Future Volume (vph)	12	520	72	22	246	34	59	465	122	24	434	58
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.93			0.96			0.92			0.94	
Flpb, ped/bikes		0.99			0.99			0.98			0.99	
Frt		0.98			0.98			0.97			0.98	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1956			1904			2936			3066	
Flt Permitted		0.95			0.89			0.84			0.90	
Satd. Flow (perm)		1853			1705			2492			2774	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	547	76	23	259	36	62	489	128	25	457	61
RTOR Reduction (vph)	0	0	0	0	2	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	636	0	0	316	0	0	679	0	0	538	0
Confl. Peds. (#/hr)	606		1369	1369		606	1345		623	623		1345
Confl. Bikes (#/hr)			133			32			50			32
Heavy Vehicles (%)	2%	4%	3%	15%	8%	2%	5%	6%	2%	2%	6%	2%
Bus Blockages (#/hr)	0	26	0	0	26	0	0	6	0	0	6	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		39.4			39.4			28.6			28.6	
Effective Green, g (s)		40.4			40.4			29.6			29.6	
Actuated g/C Ratio		0.50			0.50			0.37			0.37	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		935			861			922			1026	
v/s Ratio Prot												
v/s Ratio Perm		c0.34			0.19			c0.27			0.19	
v/c Ratio		0.68			0.37			0.74			0.52	
Uniform Delay, d1		14.9			12.0			21.8			19.7	
Progression Factor		0.74			1.00			1.00			1.00	
Incremental Delay, d2		3.9			1.2			3.1			0.5	
Delay (s)		14.9			13.2			24.9			20.2	
Level of Service		B			B			C			C	
Approach Delay (s)		14.9			13.2			24.9			20.2	
Approach LOS		B			B			C			C	

Intersection Summary				
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	89.8%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1894: Parliment Street & Mill Street

02/24/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	91	102	488	145	60	527
Future Volume (vph)	91	102	488	145	60	527
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.2	4.2	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.82	0.87			1.00
Flpb, ped/bikes	1.00	1.00	1.00			0.98
Frt	1.00	0.85	0.97			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1716	1271	2890			3230
Flt Permitted	0.95	1.00	1.00			0.83
Satd. Flow (perm)	1716	1271	2890			2679
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	96	107	514	153	63	555
RTOR Reduction (vph)	0	74	40	0	0	0
Lane Group Flow (vph)	96	33	627	0	0	618
Confl. Peds. (#/hr)	401	165		374	374	
Heavy Vehicles (%)	4%	2%	5%	2%	6%	8%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Prot	Perm	NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	20.8	20.8	33.0			33.0
Effective Green, g (s)	21.8	21.8	34.0			34.0
Actuated g/C Ratio	0.31	0.31	0.49			0.49
Clearance Time (s)	5.2	5.2	6.0			6.0
Lane Grp Cap (vph)	534	395	1403			1301
v/s Ratio Prot	c0.06		0.22			
v/s Ratio Perm		0.03				c0.23
v/c Ratio	0.18	0.08	0.45			0.48
Uniform Delay, d1	17.6	17.0	11.8			12.0
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.7	0.4	1.0			1.2
Delay (s)	18.3	17.5	12.9			13.3
Level of Service	B	B	B			B
Approach Delay (s)	17.9		12.9			13.3
Approach LOS	B		B			B

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1966: Berkley Street & King Street E

02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	432	82	0	287	22	39	62	36	11	59	21
Future Volume (vph)	0	432	82	0	287	22	39	62	36	11	59	21
Ideal Flow (vphpl)	1250	1250	1250	1250	1250	1250	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.4			4.4			5.5	5.5		5.5	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.89			0.96			1.00	0.60		0.92	
Flpb, ped/bikes		1.00			1.00			0.89	1.00		0.96	
Frt		0.98			0.99			1.00	0.85		0.97	
Flt Protected		1.00			1.00			0.98	1.00		0.99	
Satd. Flow (prot)		1897			1933			1585	939		1540	
Flt Permitted		1.00			1.00			0.85	1.00		0.96	
Satd. Flow (perm)		1897			1933			1370	939		1483	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	455	86	0	302	23	41	65	38	12	62	22
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	26	0	14	0
Lane Group Flow (vph)	0	536	0	0	325	0	0	106	12	0	82	0
Confl. Peds. (#/hr)	438		730	730		438	368		622	622		368
Confl. Bikes (#/hr)			116			9			18			2
Heavy Vehicles (%)	68%	8%	2%	2%	16%	5%	5%	3%	2%	2%	5%	2%
Turn Type		NA			NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)		52.1			52.1			16.0	16.0		16.0	
Effective Green, g (s)		53.1			53.1			17.0	17.0		17.0	
Actuated g/C Ratio		0.66			0.66			0.21	0.21		0.21	
Clearance Time (s)		5.4			5.4			6.5	6.5		6.5	
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		1259			1283			291	199		315	
v/s Ratio Prot		c0.28			0.17							
v/s Ratio Perm								c0.08	0.01		0.06	
v/c Ratio		0.43			0.25			0.36	0.06		0.26	
Uniform Delay, d1		6.3			5.4			26.9	25.1		26.3	
Progression Factor		1.00			0.64			1.00	1.00		1.00	
Incremental Delay, d2		1.1			0.4			0.8	0.1		0.4	
Delay (s)		7.4			3.9			27.7	25.3		26.7	
Level of Service		A			A			C	C		C	
Approach Delay (s)		7.4			3.9			27.0			26.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1968: Berkley Street /Berkley Street & Front Street E 02/24/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	877	12	58	564	12	18	43	191	59	72	32
Future Volume (vph)	28	877	12	58	564	12	18	43	191	59	72	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		5.0	5.0			5.0	5.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		0.99			0.99		1.00	0.68			1.00	0.62
Flpb, ped/bikes		0.99			0.99		0.70	1.00			0.89	1.00
Frt		1.00			1.00		1.00	0.88			1.00	0.85
Flt Protected		1.00			1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)		3427			3315		1222	1097			1544	932
Flt Permitted		0.92			0.76		0.67	1.00			0.77	1.00
Satd. Flow (perm)		3148			2542		860	1097			1222	932
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	29	923	13	61	594	13	19	45	201	62	76	34
RTOR Reduction (vph)	0	1	0	0	1	0	0	12	0	0	0	23
Lane Group Flow (vph)	0	964	0	0	667	0	19	234	0	0	138	11
Confl. Peds. (#/hr)	324		352	352		324	488		554	554		488
Confl. Bikes (#/hr)			23			18			28			20
Heavy Vehicles (%)	17%	2%	2%	8%	3%	2%	2%	2%	2%	11%	2%	7%
Bus Blockages (#/hr)	0	0	0	0	6	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)		48.0			48.0		29.0	29.0			29.0	29.0
Effective Green, g (s)		49.0			49.0		30.0	30.0			30.0	30.0
Actuated g/C Ratio		0.54			0.54		0.33	0.33			0.33	0.33
Clearance Time (s)		7.0			7.0		6.0	6.0			6.0	6.0
Lane Grp Cap (vph)		1713			1383		286	365			407	310
v/s Ratio Prot								c0.21				
v/s Ratio Perm		c0.31			0.26		0.02				0.11	0.01
v/c Ratio		0.56			0.48		0.07	0.64			0.34	0.04
Uniform Delay, d1		13.5			12.7		20.5	25.4			22.5	20.2
Progression Factor		1.00			1.18		1.00	1.00			1.00	1.00
Incremental Delay, d2		1.3			1.1		0.4	8.4			2.3	0.2
Delay (s)		14.8			16.1		20.9	33.8			24.8	20.5
Level of Service		B			B		C	C			C	C
Approach Delay (s)		14.8			16.1			32.9			23.9	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
1: Berkley Street & B West Access

02/24/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	14	13	82	24	23	126
Future Volume (Veh/h)	14	13	82	24	23	126
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)	15	14	86	25	24	133
Pedestrians	306					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	27					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			48			41
pX, platoon unblocked						
vC, conflicting volume	586	404			417	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	586	404			417	
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	97			97	
cM capacity (veh/h)	335	471			833	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	29	111	157
Volume Left	15	0	24
Volume Right	14	25	0
cSH	389	1700	833
Volume to Capacity	0.07	0.07	0.03
Queue Length 95th (m)	1.8	0.0	0.7
Control Delay (s)	15.0	0.0	1.7
Lane LOS	B		A
Approach Delay (s)	15.0	0.0	1.7
Approach LOS	B		

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
2: Parliment Street & Site B East Access

02/24/2021

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	33	41	28	397	528	2
Future Volume (Veh/h)	33	41	28	397	528	2
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)	35	43	29	418	556	2
Pedestrians	196					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	17					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				64	61	
pX, platoon unblocked	0.89	0.89	0.89			
vC, conflicting volume	1020	475	754			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	781	171	483			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	93	96			
cM capacity (veh/h)	236	622	794			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	78	168	279	371	187
Volume Left	35	29	0	0	0
Volume Right	43	0	0	0	2
cSH	358	794	1700	1700	1700
Volume to Capacity	0.22	0.04	0.16	0.22	0.11
Queue Length 95th (m)	6.2	0.9	0.0	0.0	0.0
Control Delay (s)	17.8	2.0	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	17.8	0.8		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Berkley Street & Site F West Access

02/24/2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	39	256	1	28	114
Future Volume (Veh/h)	2	39	256	1	28	114
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)	2	41	269	1	29	120
Pedestrians	152					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	13					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						62
pX, platoon unblocked						
vC, conflicting volume	600	422			422	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	600	422			422	
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	93			97	
cM capacity (veh/h)	390	547			984	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	43	270	149
Volume Left	2	0	29
Volume Right	41	1	0
cSH	537	1700	984
Volume to Capacity	0.08	0.16	0.03
Queue Length 95th (m)	2.0	0.0	0.7
Control Delay (s)	12.3	0.0	1.9
Lane LOS	B		A
Approach Delay (s)	12.3	0.0	1.9
Approach LOS	B		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Parliment Street & Site F East Access

02/24/2021

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	139	2	1	590	472	91
Future Volume (Veh/h)	139	2	1	590	472	91
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)	146	2	1	621	497	96
Pedestrians	152					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.1					
Percent Blockage	13					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				84	56	
pX, platoon unblocked	0.92					
vC, conflicting volume	1010	448	745			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	838	448	745			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	40	100	100			
cM capacity (veh/h)	243	483	743			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	148	208	414	331	262
Volume Left	146	1	0	0	0
Volume Right	2	0	0	0	96
cSH	244	743	1700	1700	1700
Volume to Capacity	0.61	0.00	0.24	0.19	0.15
Queue Length 95th (m)	27.0	0.0	0.0	0.0	0.0
Control Delay (s)	40.1	0.1	0.0	0.0	0.0
Lane LOS	E	A			
Approach Delay (s)	40.1	0.0		0.0	
Approach LOS	E				

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	21	235	62	69	21	21
Future Volume (vph)	21	235	62	69	21	21
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	247	65	73	22	22

Direction, Lane #	NB 1	SB 1	NE 1
Volume Total (vph)	269	138	44
Volume Left (vph)	22	0	22
Volume Right (vph)	0	73	22
Hadj (s)	0.05	-0.28	-0.17
Departure Headway (s)	4.2	4.0	4.6
Degree Utilization, x	0.31	0.15	0.06
Capacity (veh/h)	841	880	712
Control Delay (s)	9.1	7.7	7.9
Approach Delay (s)	9.1	7.7	7.9
Approach LOS	A	A	A

Intersection Summary			
Delay		8.5	
Level of Service		A	
Intersection Capacity Utilization		49.5%	ICU Level of Service A
Analysis Period (min)		15	