

TECHNICAL MEMORANDUM

City of Brampton Denison Avenue Extension Final Transportation Study



October 2019

ASSOCIATED ENGINEERING QUALITY MANAGEMENT SIGN-OFF Signature
Date

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TECHNICAL MEMORANDUM

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TECHNICAL MEMORANDUM

City of Brampton

Denison Avenue Class Environmental Assessment Study Traffic Study

Issued: October 2019

Previous Issue: August 2019

1 Introduction

The City of Brampton retained Associated Engineering (AE) to undertake a Municipal Class Environmental Assessment (EA) Study for the extension of Denison Avenue from Park Street to Mill Street. The City of Brampton's 2015 Master Plan Update has identified the need for the extension of the road by 2021. The Class EA Study will evaluate traffic and connectivity needs, identify alternative road alignments, safety and operational improvements, land use implications, active transportation considerations, natural environment impacts and mitigation measures. The study is being carried out in accordance with the planning and design process for Schedule 'B' projects as outlined in the Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015), which is approved under the Ontario Environmental Assessment Act.

This traffic assessment study has been prepared as part of the EA study and provides study background, an overview of traffic assessment methodology, an assessment of the existing conditions, and an analysis of the future conditions with and without the proposed extension of Denison Avenue. A multi-modal level of service (MMLoS) analysis was employed including the modes of auto, bicycle and pedestrian. The transportation and traffic assessment will identify what, if any, improvements may be needed and recommendations with respect to the timing for implementation of those improvements.

2 Background

2.1 STUDY AREA

The City identified an extension of Denison Avenue from Park Street to Mill Street in its 2015 Transportation Master Plan as a means to improve connectivity and capacity improvements in the local transportation network. The objective of this study is to conduct a multi-modal analysis of the existing and future conditions from an operations perspective and identify potential improvements as part of the proposed extension.

The location of the proposed extension of Denison Avenue is shown in **Figure 2-1**. However, the traffic assessment study included the analysis for the surrounding intersections, as shown in **Figure 2-2**, and which included the following:

1. West Street @ Denison Avenue (existing 4-leg intersection – two-way stop)
2. Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.)
3. Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)
4. Mill Street N @ Nelson Street W (existing 4-leg intersection – four-way stop)

5. Mill Street N @ Railroad Street (existing 4-leg intersection – two-way stop)

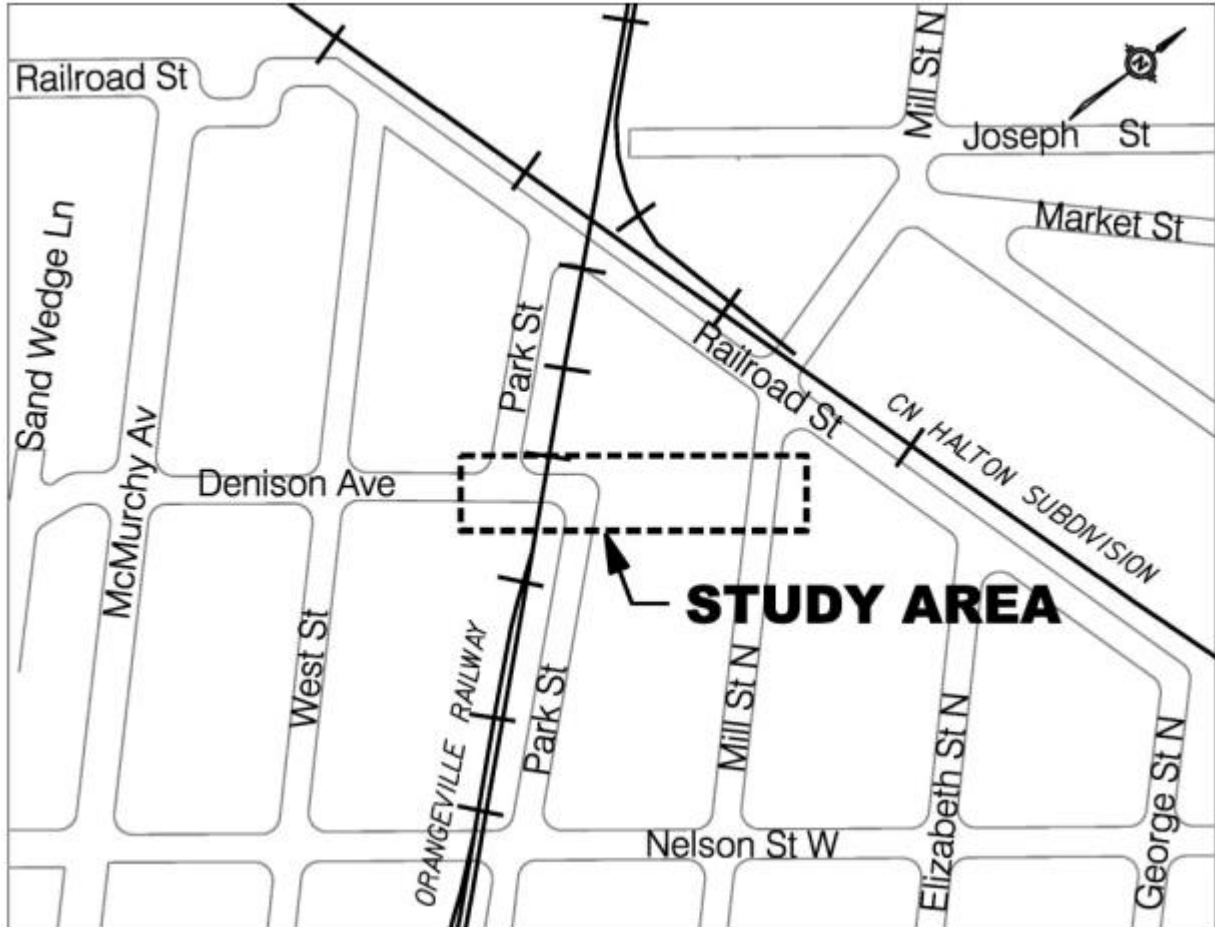


Figure 2-1: Study Area Defined in the RFP for the Denison Avenue Extension



Figure 2-2: Study Intersections

2.2 LAND USE

2.2.1 Existing Land Uses

The existing study area land uses are illustrated in **Figure 2-3**. Denison Avenue is surrounded by residential land use at the north and south sides. There are some commercial areas north of Railroad Street and at the southwest corner of the intersection of Mill Street and Railroad Street. The development on 45 Railroad is expected¹ to have 387 residential rental units, 496 m² of retail use, and 496 m² of a daycare use. The development of 45 Railroad will preserve the existing heritage two-level building. The Brampton Go Station

¹ Based on the 45 Railroad Street Proposed Mixed-Use Development Traffic Impact Study conducted by BA Group, March 2016

is located on the north side of Railroad Street with the main parking lot. The Brampton Go Station secondary parking lot is located south of Railroad Street adjacent to the proposed development.

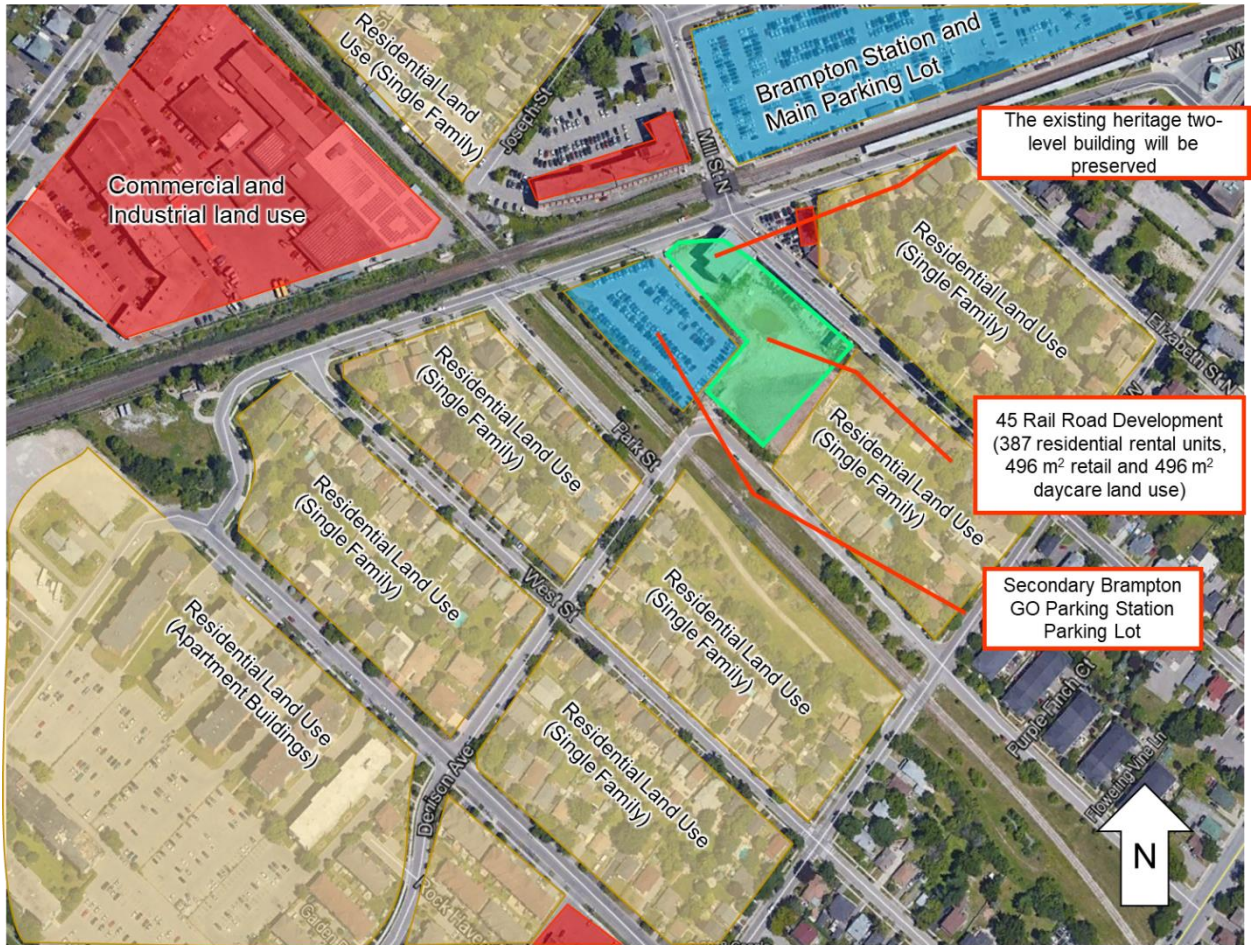


Figure 2-3: Existing Land Use Plan at the Study Area

2.2.2 Development Applications

The land use plans have been reviewed through Brampton's GeoHub. There are several development applications within the study area that may impact the existing travel patterns. **Figure 2-4** shows the proximate development applications surrounding Denison Avenue. The development on 45 Railroad is expected to have 387 residential rental units, 496 m² of retail use, and 496 m² of a daycare use². The development of 45 Railroad will preserve the existing heritage two-level building. The status of this development is shown as approved. There is another application to amend the official plan to rezone the downtown Brampton Secondary Plan (Area 7) to permit a university use. The application status is unstated. There is an approved application at the south end of Denison Avenue to amend the official plan and the zoning by-law³. These development applications are assumed to be captured in the growth rate estimated in **Section 3.4**.

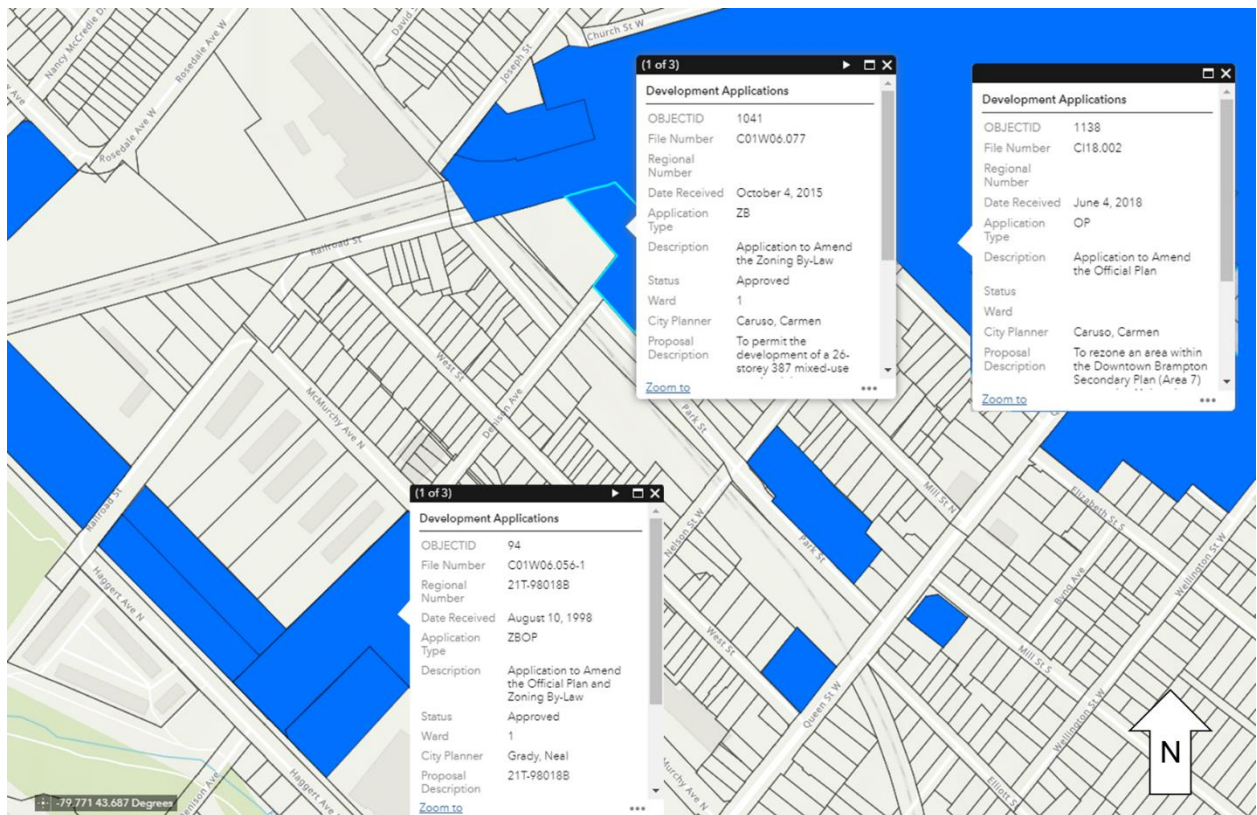


Figure 2-4: Development Applications available in Brampton GeoHub (Retrieved May 16, 2019)

² Based on the 45 Railroad Street Proposed Mixed-Use Development Traffic Impact Study conducted by BA Group, March 2016

³ This application is shown in GeoHub that it was received on August 10, 1998. It is assumed that this reflect the existing land use of residential units.

2.2.3 Land Use Capture in the Transportation Analysis

The study area intersections in this study were evaluated for the year 2019 considering the existing land uses. The existing land use trip generation is reflected in the recent traffic counts conducted in January 2019. The land use growth in the study area for the horizon years 2031 and 2041 was estimated based on the EMME background volume growth as detailed in Section 3.4.

The volumes forecasts for 2031 and 2041 also include the additional trip generation volumes from the proposed development of the property at 45 Railroad Street. The site development trips were obtained from the Traffic Impact Study conducted by BA Group for Phase 2b of that project (Appendix A, Figure 19)⁴.

⁴ 45 Railroad Street Proposed Mixed-Use Development Traffic Impact Study conducted by BA Group, March 2016

3 Transportation Analysis Methodology

3.1 FORECASTING AND ANALYSIS METHODOLOGY

As per the revised scope of the transportation and traffic analysis issued to the City of Brampton on January 28, 2019, and the City response received on February 4, 2019, the transportation analysis for this study will be conducted for the existing and future conditions using the Multi-Modal Level of Service (MMLOS) methodology.

The existing condition MMLOS analysis (2019) is based on the actual turning movement counts conducted on January 16, 2019, representing background volumes. The future condition MMLOS analysis (2031 and 2041) is conducted based on the forecasted turning movement volumes in addition to the 45 Railroad development trips. Therefore, several adjustments of the background volumes are applied as illustrated in Section 3.3. The forecasting turning movement volumes are estimated by applying the annual compound growth rate derived from the EMME output plots to the turning movement counts in 2019 as described in Section 3.4.

3.2 TRAFFIC COUNTS USED FOR THE BACKGROUND VOLUMES

The background volumes are based on the traffic counts conducted specifically for this project. Ontario Traffic Inc. (OTI) was retained by AE to conduct the traffic turning movement counts for the intersections as identified. The traffic counts were conducted on January 16, 2019, to capture the AM and PM peak hour volumes. The volume counts were classified to distinguish the number of heavy trucks, cyclists, and passenger vehicles. The number of pedestrians at each intersection leg was also counted. The full traffic count results are provided in **Appendix B**. Figure 3-1 and 3-2 shows the traffic counts for the year 2019 for AM and PM peaks, respectively. The peak direction for each link is indicated with a red arrow.

The counts were conducted for the following periods:

- Morning hours: from 7:00 am to 9:00 am,
- Afternoon hours: from 11:00 am to 2:00 pm, and
- Evening hours: from 3:00 pm to 6:00 pm

Traffic volumes were counted on a 15-minute interval. The highest group of four consecutive 15-minute counts were identified as the peak hour. The peak hours identified for all intersections are shown in Table 3-1.

Table 3-1: AM, MD and PM Peak Hours for All Intersections

No.	Intersection	AM Peak	MD Peak	PM Peak
1	West Street @ Denison Avenue	7:45 AM to 8:45 AM	12:00 PM to 01:00 PM	5:00 PM to 6:00 PM
2	Park Street @ Denison Avenue	7:45 AM to 8:45 AM	11:45 AM to 12:45 PM	5:00 PM to 6:00 PM
3	Park Street @ Nelson Street W	8:00 AM to 9:00 AM	12:00 PM to 01:00 PM	5:00 PM to 6:00 PM
4	Mill Street N @ Nelson Street W	7:45 AM to 8:45 AM	11:45 AM to 12:45 PM	5:00 PM to 6:00 PM
5	Mill Street N @ Railroad Street	8:00 AM to 9:00 AM	11:45 AM to 12:45 PM	5:00 PM to 6:00 PM

For a conservative assessment, peak volumes from all peak hours are considered concurrent to estimate critical performance in the intersection analysis. The volumes for MD Peak were lower than each of the AM and PM peak hour volumes. Therefore, AM and PM peak hour were considered in the intersection analysis.

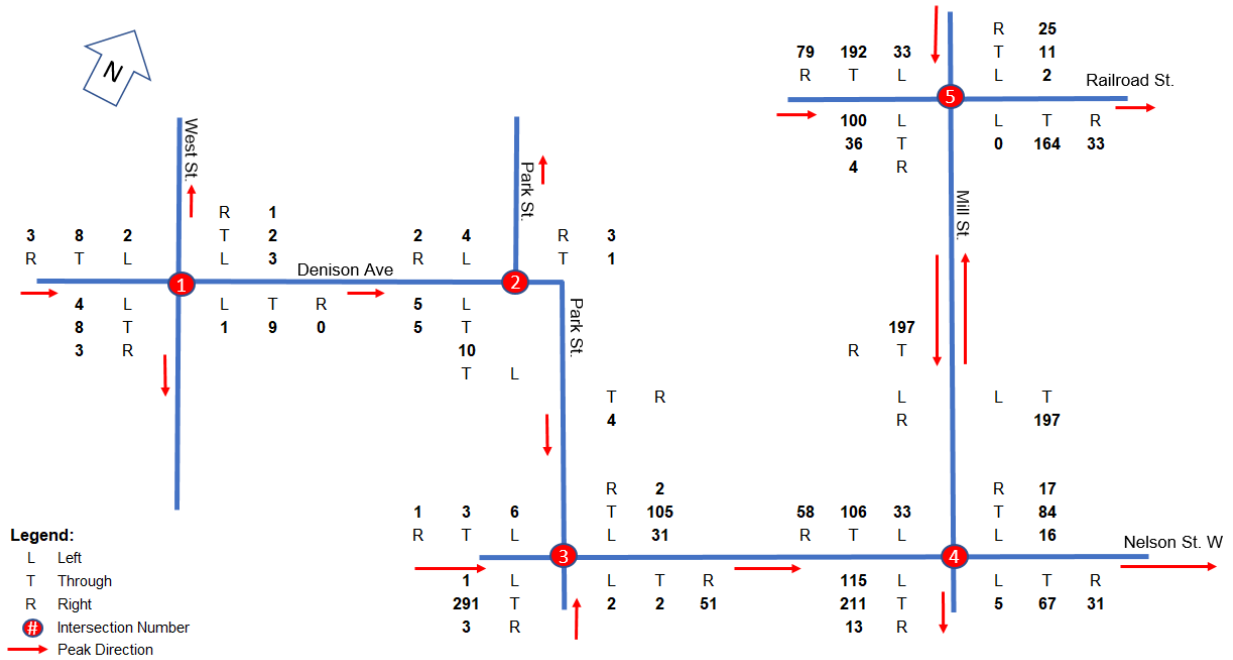


Figure 3-1: Traffic Counts – 2019 AM Peak

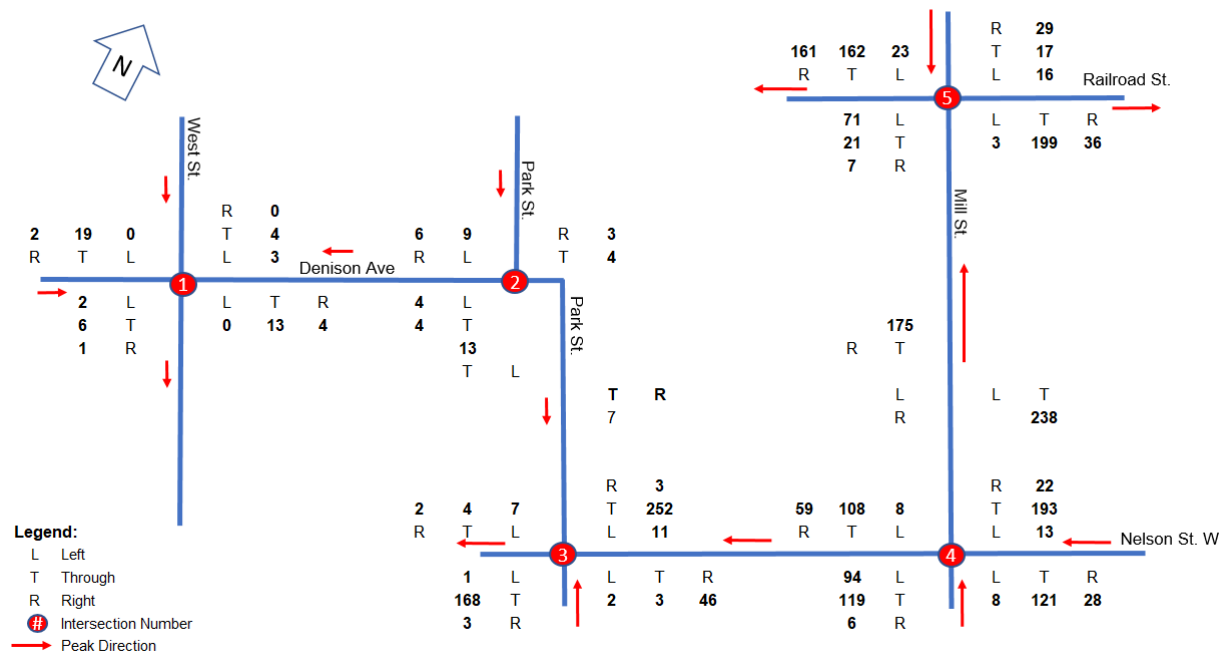


Figure 3-2: Traffic Counts – 2019 PM Peak

3.3 BACKGROUND VOLUME ADJUSTMENTS

Background volumes obtained from the traffic counts in 2019 were adjusted for the purpose of forecasting future conditions as follows:

- **Adjustment 1:**
 - As discussed with the City, the new development trips noted for the 45 Railroad Street development were not yet included in the EMME model, so the annual compound growth rates estimate did not account for these additional trips. Therefore, the ultimate Phase 2B site development trips within the study intersections were added to the forecasted background traffic for the year 2031 and 2041.
 - **Figure 3-3** and **Figure 3-4** shows the site traffic volumes noted in the 45 Railroad Street development for AM and PM peak hours, respectively.
- **Adjustment 2:**
 - The Denison Avenue extension between Park Street and Mill Street is assumed to attract 10% of the eastbound left-turning traffic and the southbound right-turning traffic at the intersection of Nelson Street and Mill Street. The rationale for this assumption was based on the following:
 - For local traffic destined to Park Street and Denison Avenue, the traffic counts show very low volumes from Nelson Avenue to Park Street and vice versa (southbound and northbound volumes at Park Street are less than 10 vehicles/hour). This indicates that volumes at Nelson

Avenue westbound (which include some volumes from Mill Street southbound right turn) are not destined to local roads. Therefore, local traffic diverting to use the Denison Avenue extension is very minimal.

- For traffic travelling from Mill Street southbound right turn into Nelson Avenue westbound, the volumes are also low (58 and 59 vehicle/hr for AM, and PM peaks, respectively) and using Denison Avenue extension would result in doing two successive turns rather than one turn at the intersection of Mill Street and Nelson Avenue. Assuming 10% is conservative as the motorist will tend to do one turn rather than two in such a local road network with short links and very low expected travel time savings.
- The eastbound traffic travelling on Nelson Street and turning left onto Mill Street northbound are 115 and 94 vehicles/hour for AM and PM peaks, respectively and using Denison Avenue extension would result in doing two successive turns rather than one turn at the intersection of Mill Street and Nelson Avenue. Additionally, Nelson Street and Mill Street intersection is an all-way stop control intersection, where the expected intersection at Mill Street and Denison Avenue Extension will be a 3-leg with a stop-control at Denison Avenue extension only. Making a left turn at Denison Avenue extension and waiting for gaps in Mill Street Traffic will generally be less convenient for the motorists. Furthermore, doing two turns rather than one would generally be less convenient for motorists resulting in less traffic demand. Therefore, the assumption of 10% is considered conservative in such a situation.
- **Adjustment 3:**
 - Denison Avenue is connected with Haggert Avenue which will attract more traffic towards Denison Avenue. It is assumed that an additional 15% of Nelson Avenue westbound and eastbound through movements would divert and use Denison Avenue instead. This was based on the following:
 - The available traffic counts (in 2019) shows that most volumes at Nelson Street are destined to the westbound with few traffic volumes turning right or left at Park Street and West Street.
 - The 15% diverted traffic is a conservative assumption for the purpose of this study as the Denison Avenue extension due to the minimal saving in travel time for these vehicles.
 - **Figure 3-5** and **Figure 3-6** on the following pages show adjustments 2 and 3 on the traffic volumes noted above for AM and PM peak hours, respectively.

Adjustment 1 is applied in future condition assessment for scenarios with and without the Denison Avenue extension. Adjustment 2 and 3 are applied in future condition assessment for the scenario with the Denison Avenue extension only.

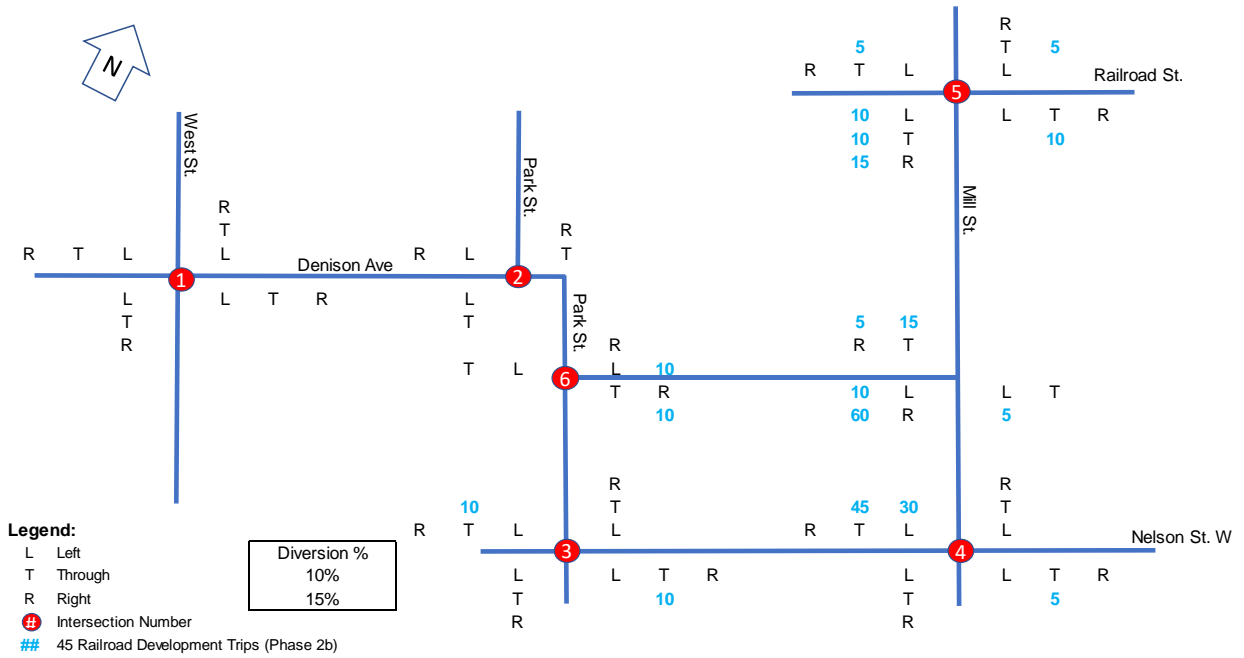


Figure 3-3: Adjustment 1 which includes the 45 Railroad Site Traffic (AM Peak)

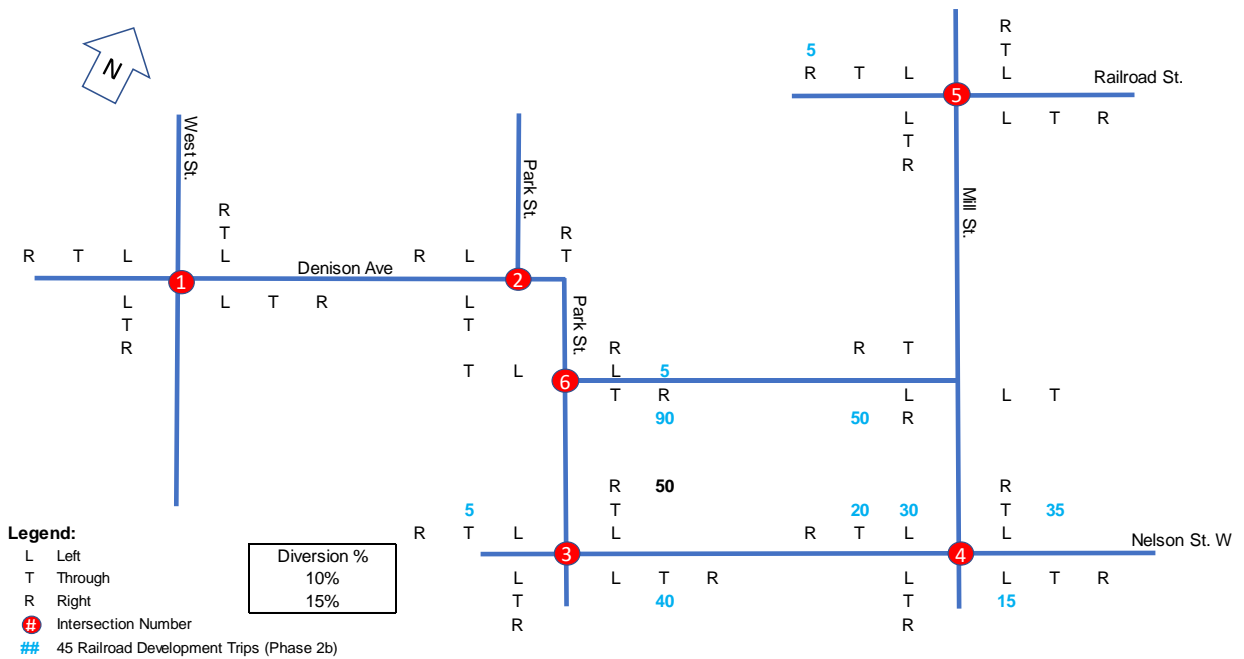


Figure 3-4: Adjustment 1 which includes the 45 Railroad Site Traffic (PM Peak)

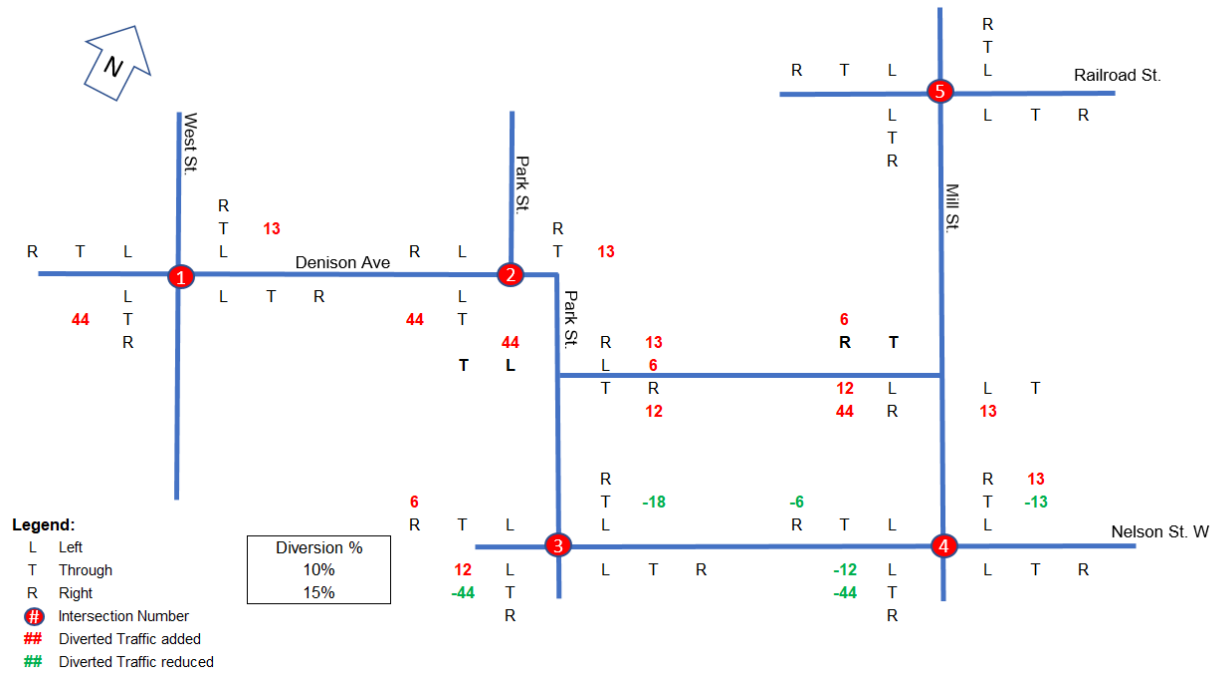


Figure 3-5: Adjustment 2 and 3 in Background Traffic – AM Peak

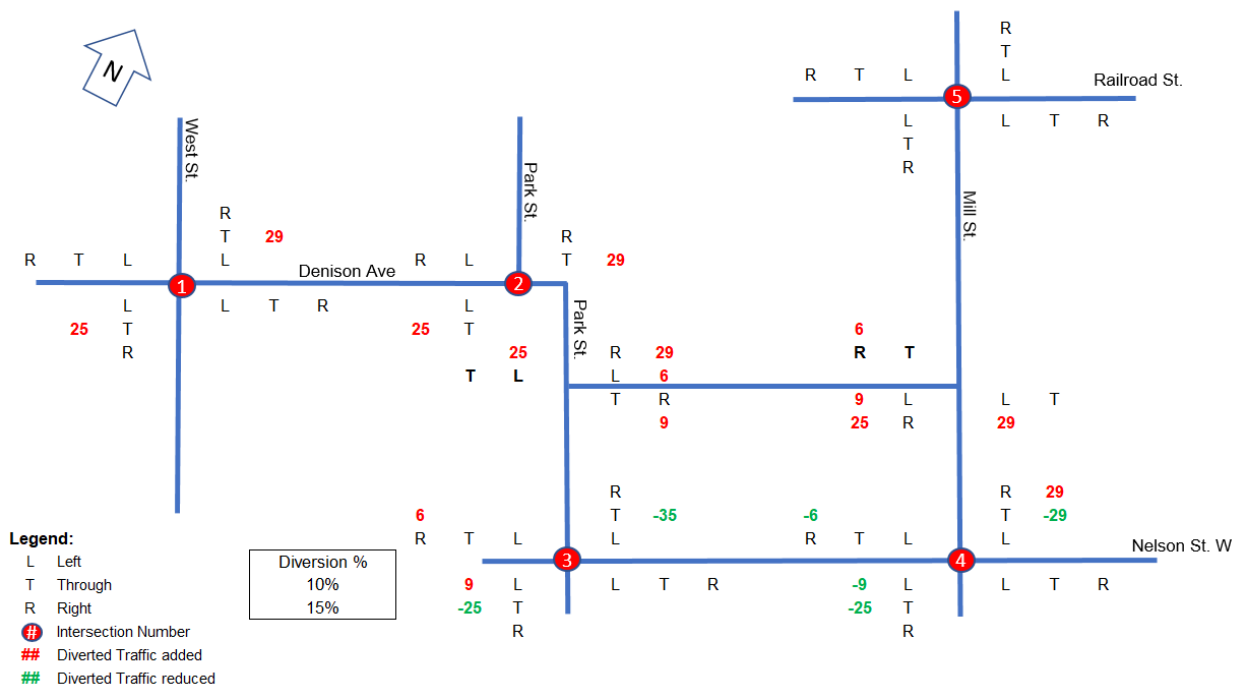


Figure 3-6: Adjustment 2 and 3 in Background Traffic – PM Peak

3.4 TRAFFIC GROWTH ESTIMATION

The City provided the outputs from the Travel Demand Forecasting Model (GTAModelV4) which is built on the EMME transportation planning software. The model outputs included the auto vehicle volumes, GO transit volumes, and the local transit volumes for 2011, 2031, and 2041 (for both AM and PM peak hours). All EMME model outputs provided by the City are available in **Appendix D**.

The EMME model outputs show the traffic volumes for 2011, and horizon years 2031 and 2041. As the EMME model focuses more on regional travel demand modelling, the EMME forecast traffic volumes are for the major road network only. The only road within the study area that is currently coded in the EMME is Railroad Street. **Figure 3-7** shows a sample EMME output and the network coding in the study area. Mill Street and Nelson Street are not coded in the City’s travel demand model (regional-scale models typically do not include local roads). These streets are instead captured in the model centroid connectors.

In order to capture a representative annual growth area for the study area, the zone connectors incoming and outgoing volumes are used rather than using volumes from a specific road. The zone connectors are also shown in **Figure 3-7**.

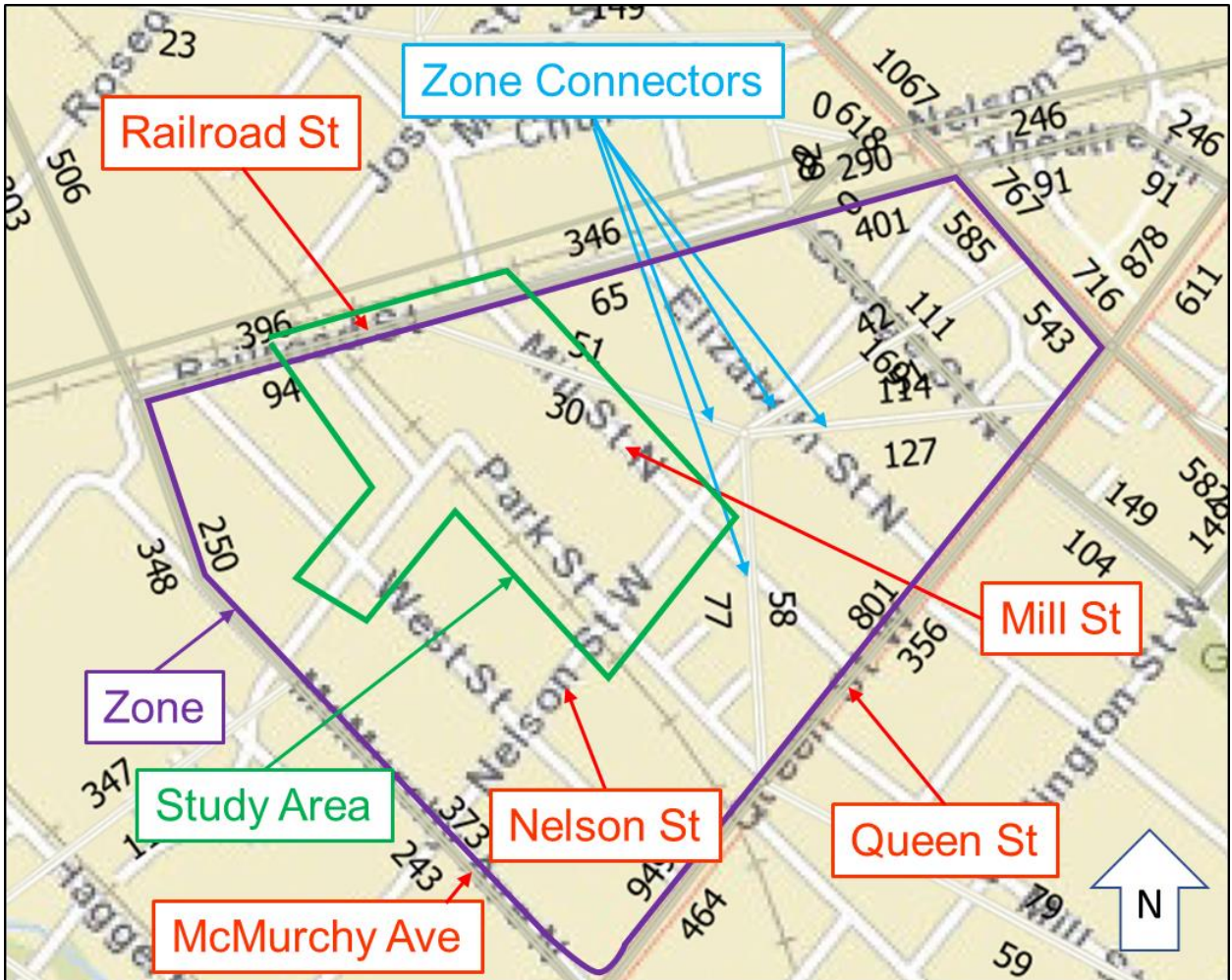


Figure 3-7: Sample EMME Output for PM Peak (Passenger Vehicles)

The compound growth is estimated using the below equation:

$$V_2 = V_1 * (1 + R)^N$$

Where V_2 is the future volume at a future year, V_1 is the traffic volume at start year, R is the annual compound growth rate, and N is the number of years difference between the future year and start year.

Therefore, when start year and future year volumes are available, the annual compound growth rate is estimated using the below equation:

$$R = (V_2/V_1)^{(1/N)} - 1$$

Table 3-2 shows the estimation of the annual compound growth rate using the connector incoming and outgoing volumes. The estimated annual compound growth rate is 3.5% from the year 2011 to 2031, and 2% from the year 2031 to 2041. The rate of 3.5% will be used to factor up 2019 counts (factor of 1.51) to forecast the 2031 volumes, and the rate of 2% was used to factor up the 2031 volumes (factor of 1.21) to estimate the 2041 volumes.

Table 3-2: Estimation of Annual Compound Growth Rate using EMME Output Connector Volumes

Volume Description	Connector Volume in Veh/h (2011)	Connector Volume in Veh/h (2031)	Connector Volume in Veh/h (2041)	Annual Compound Growth Rate (2011 to 2031)	Annual Compound Growth Rate (2031 to 2041)
AM Outgoing	96	272	311	5.3%	1.3%
AM Incoming	212	392	490	3.1%	2.3%
Total (AM)	308	664	801	3.9%	1.9%
PM Outgoing	306	565	702	3.1%	2.2%
PM Incoming	244	494	595	3.6%	1.9%
Total (PM)	550	1059	1297	3.3%	2.0%
Grand Total	858	1723	2098	3.5%	2.0%

As agreed with the City, the EMME outputs were used only for the estimation of the annual compound growth rate. The annual compound growth rate was used to factor up the existing counts obtained in 2019 to arrive at estimates for traffic volumes in the future horizon years of 2031 and 2041.

3.5 MMLOS METHODOLOGY

The MMLOS analysis was conducted for the existing conditions (the year 2019) and future conditions on the horizon years 2031 and 2041.

MMLOS Methodology: The MMLOS analysis is based on the City of Ottawa Guidelines which use quantitative performance measures for all modes (cycling, walking, transit, trucks, and vehicular)⁵. For this study, the guidelines are used to estimate Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) existing and target performance. However, for the Automobile Level of Service (ALOS), the guidelines are used only to identify the ALOS targets, but performance results were estimated for intersections using Synchro and for segments using HCM.

⁵ Multi-Modal Level of Service Guidelines, IBI Group, City of Ottawa, September 2015

Active Transportation Review: The study includes an overview qualitative assessment of the pedestrian and cyclists' connectivity at the study area to the active transportation modes. This includes a review of pedestrian and cyclists' routes, nearby public transportation facilities, and identifying the improvements required to improve the connectivity and efficiency of active transportation modes within the study area.

3.5.1 MMLOS for Road Segments

The MMLOS segment analysis will include estimating the PLOS, BLOS and ALOS. The methodology for each measure is described below.

3.5.1.1 Methodology for the Segment PLOS

The PLOS segment analysis was based on Exhibit 4 in the Ottawa MMLOS guidelines for the MMLOS methodology as shown in **Table 3-3**. The PLOS is determined based on sidewalk width, boulevard width, Annual Average Daily Traffic (AADT), presence of on-street parking and operating speed. The PLOS was based on the most critical part of the study segments. For example, if the segment sidewalk width changes along the segment, the narrower width is used in identifying the PLOS.

Table 3-3: PLOS Segment Evaluation Exhibit 4 - (Ottawa MMLOS guidelines, 2015)

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On-street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 ¹
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F ²	F ²
	<1.5	N/A		F ³	F ³	F ³	F ³
	No sidewalk	N/A		C ⁴	F ³	F ³	F ³

3.5.1.2 Methodology for the Segment BLOS

The BLOS segment analysis was based on Exhibit 11 in Ottawa guidelines for the MMLOS methodology as shown in **Table 3-4**. The BLOS is determined based on the type of bikeway (separated, mixed traffic, etc.), the number of travel lanes, operating speed and centreline marking. The BLOS was based on the most

critical part of the study segments. For example, if the segment speed limit changes along the segment, the higher speed limit is used in identifying the BLOS.

Table 3-4: BLOS Segment Evaluation Exhibit 11 – Mixed Traffic - (Ottawa MMLOS guidelines, 2015)

Mixed Traffic		
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	B
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	B
	2 to 3 travel lanes; 50 km/h	D
	4 to 5 travel lanes; ≤ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F

3.5.1.3 Methodology for the Segment ALOS

The segment ALOS is based on the HCM 2010 lane LOS results from the Synchro analysis model. The HCM is estimated based on the HCM Control Delay as shown in **Table 3-5**.

Table 3-5: HCM Lane LOS based on Control Delay

HCM Level of Service	Control Delay (seconds / vehicle)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

3.5.2 MMLOS for Intersections

The MMLOS intersection analysis includes estimating the PLOS, BLOS and ALOS. The methodology for each measure is described below.

3.5.2.1 Methodology for the Intersection PLOS

Ottawa MMLOS guidelines refer to a methodology to estimate PLOS only in signalized intersections. PLOS is estimated using two methods: Pedestrian Exposure to Traffic at Signalized Intersection (PETS) and the

pedestrian crossing delay using HCM methodology. The method that results in a worse condition would govern the intersection PLOS.

The PETS I score is calculated by the summation of the points related to the intersection geometry shown in **Table 3-6**. The PLOS is identified based on the point threshold shown in **Table 3-7**. The design features identified in the PETS I score include the following:

1. **Crossing Distance and Conditions:** This feature can also be used for un-signalized intersections.
2. **Signal Phasing and Timing Features:** This feature can also be used for un-signalized intersection if left turn and right turn conflicts are defined as “permissive”. Right Turn On Red (RTOR) will be applied to the un-signalized intersection as RTOR will be allowed.
3. **Corner Radius:** This feature will be measured through a scalable raster file which can be applied for the un-signalized intersections.
4. **Crosswalk Treatment:** this feature will measure the crosswalk treatment at each approach. As some approaches at the study area lack crosswalk but still have a pedestrian route, deduction of 9 points will be assumed to reflect this in the PETS I score.

Table 3-6: PETS I Scoring Tables (Exhibit 5 – Ottawa MMLOS guidelines, 2015)

5.1 Crossing Distance & Conditions		
Total travel lanes crossed	No median	With Median (>2.4m)
2	120	120
3	105	105
4	88	90
5	72	75
6	55	60
7	39	45
8	23	30
9	6	15
10	-10	0
Island Refuge	Points	
No	-4	
Yes	0	

5.3 Corner Radius	
Corner radius	Points
Greater than 25m	-9
> 15m to 25m	-8
> 10m to 15m	-6
> 5m to 10m	-5
> 3m to 5m	-4
Less than/equal to 3m	-3
No right turn	0
Right turn channel with receiving	-3
Right turn "smart channel"	2

5.2 Signal Phasing & Timing Features	
Left turn conflict ("Left_turns")	Points
Permissive	-8
Protected/permissive	-8
Protected	0
No left turn/prohibited	0
Right turn conflict ("Right_turns")	Points
Permissive or yield control	-5
Protected/permissive	-5
Protected	0
No right turn	0
Right turns on red ("RTOR")	Points
RTOR allowed	-3
RTOR prohibited at certain time(s)	-2
RTOR prohibited	0
Leading ped interval? ("LPI")	Points
No	-2
Yes	0

5.4 Crosswalk Treatment	
Crosswalk treatment ("Crosswalk")	Points
Standard transverse markings	-7
Textured/coloured pavement	-4
Zebra stripe hi-vis markings	-4
Raised crosswalk	0

Table 3-7: PETS I Evaluation Table (Exhibit 6 – Ottawa MMLOS guidelines, 2015)

Pedestrian Exposure to Traffic LOS	
Points threshold	LOS
≥90	A
≥75	B
≥60	C
≥45	D
≥30	E
<30	F

The pedestrian crossing delay and corresponding PLOS is estimated using **Table 3-8**. This would be calculated for signalized intersections. At un-signalized intersections, the pedestrians will have the priority and therefore the pedestrian delay will be less than 10 seconds.

Table 3-8: PLOS Intersection Evaluation (Exhibit 7 – Pedestrian Crossing Delay - Ottawa MMLOS Guidelines, 2015)

Average Pedestrian Crossing Delay Component	
$\text{Delay} = 0.5 \times \frac{(\text{Cycle Length} - \text{Pedestrian Effective Walk Time})^2}{\text{Cycle Length}}$	
< 10 s per intersection leg	LOS A
≥10 to 20 sec	LOS B
>20 to 30 sec	LOS C
>30 to 40 sec	LOS D
>40 to 60 sec	LOS E
> 60 sec	LOS F

3.5.2.2 Methodology for the Intersection BLOS

Ottawa MMLOS guidelines refer to a methodology to estimate BLOS only in signalized intersections. The methodology is based on the cyclists' facility, road geometry, speed and number of lane crosses for cyclist making a left turn. All existing intersections within the study area are unsignalized intersections where cyclists and motorists share the road. This case would generate a similar operation for cyclists in signalized and unsignalized intersections. Therefore, the methodology of identifying the BLOS based on Ottawa guidelines is shown in **Table 3-9**.

The BLOS is defined using two features:

- 1- The presence of the right turn lane and the turning speed of motorists
- 2- The cyclists left turn maneuvers at the intersection and the operating speed of motorists.

Table 3-9: BLOS Intersection Evaluation (Exhibit 12 – Mixed Traffic - Ottawa MMLOS guidelines, 2015)

Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	E
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Left-turn Configurations		

If future conditions include providing bike lanes or higher cyclist facilities, the methodology of identifying the BLOS is based on **Table 3-10**.

Table 3-10: BLOS Intersection Evaluation (Exhibit 12 – Bike Lanes - Ottawa MMLOS guidelines, 2015)

Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F

3.5.2.3 Methodology for the Intersection ALOS

The relative performance of an intersection depends on several different factors including:

- **Degree of Saturation** – measured in terms of a ratio of demand flow rate (v) to maximum capacity (c); intersections with V/C ratios = 1.0 are at capacity;
- **Level of Service** – a measure of the average delay per vehicle during a 15-minute analysis period. Level of services (LOS) ranges from A (minimal delay) to F (unacceptable delay);
- **Vehicle Delay** – average vehicle delay on an intersection or movement basis. Measured in seconds per vehicle; and
- **Queue Length** – a measure of the 95th percentile of queuing length during peak hour is compared with storage length capacity.

For design and planning purposes, a minimum level of service (LOS) “D” is considered acceptable for un-signalized intersections in “General Urban Areas” according to Ottawa Guidelines. It is typically used under AM, and PM, peak hour traffic conditions. A V/C ratio should be investigated for intersections with LOS F.

Table 3-11 summarizes the HCM LOS based on the average total delay at un-signalized (stop-controlled) intersections.

Table 3-11: Unsignalized Two-Way and All-Way Stop Control Intersections Level of Service Characteristics

HCM Level of Service	Average Total Delay (seconds / vehicle)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

As part of the traffic operational analysis, the following assumptions were made with respect to specific analysis criteria, including:

- The 85th percentile speed on all roadways in the study area was assumed to be equal to the speed limit.
- Truck volume percentages at relevant study intersections are based on traffic counts collected as part of this study.
- The ideal saturated flow is 1,800 vehicles per hour.
- Pedestrian crossing volumes at the study intersections are based on the pedestrian counts collected as part of this study.
- The length of average passenger vehicle is 7.6m and length of heavy vehicles is 13.7 m.
- All intersections are analyzed in Synchro Version 9.

3.5.3 MMLOS Targets

The MMLOS target in this study is based on the Ottawa guidelines. The relevant targets are shown below in **Table 3-12**. These targets will be applied for segments and intersections. Any intersection or segment that does not meet these targets is identified in this study. Targets will be based on the collector and local road classes (based on the actual segment) within the General Urban Area OP designation. PLOS target is C for both collectors and local roads. BLOS is based on the local route category and therefore will target a minimum LOS of B. Vehicular ALOS target is D.

Table 3-12: PLOS, BLOS and Auto LOS Targets - (Ottawa MMLOS guidelines, 2015)

OP Designation / Policy Area	Road Class	PLOS	Bicycle - BLOS				Auto - LOS ⁴
			Cross-town Bikeway	Spine Route	Local Route	Elsewhere	
General Urban Area	Arterial	C	B	C	B	D	D
	Collector	C	B	C	B	D	D
	Local	C	B	C	B	D	D

4 Existing Network Conditions

4.1 EXISTING ROAD NETWORK

The following presents a description of the existing road network in the study area.

Mill Street

Mill Street is designated as a north-south collector road within the study area. It is connected at the north with Railroad Street and at the south with Nelson Road. It is currently a two-lane (two-way) road. The speed limit is 50 km/hr. Mill Street has a two-way flow of 395 vehicles per hour in the AM peak and 423 vehicles per hour in the PM peak.⁶ Parking is not permitted on both sides of the road. There are residential accesses on both sides.

Railroad Street

Railroad Street is designated as an east-west local road within the study area. It is connected at the east with George Street South and at the west with McMurchy Avenue North. It is currently a two-lane (two-way) road. The speed limit is 50 km/hr with an advisory speed sign of 20 km/hr at the westbound toward the railway crossing. Railroad Street has a two-way flow of 230 vehicles per hour in the AM peak and 280 vehicles per hour in the PM peak. Parking is not permitted on both sides of the road. There are residential accesses on the south side.

Denison Avenue

Denison Avenue is the primary subject of this study and is designated as an east-west collector road. It is currently connected to the east with Park Street and to the west with McMurchy Avenue North. As per the site visit of the study team on February 4, 2019, it is expected that Denison Avenue will also connect with Haggert Avenue forming a four-leg intersection. It is currently a two-lane (two-way) road. The speed limit is 50 km/hr with an advisory speed sign of 20 km/hr for eastbound traffic approaching the horizontal curve at Park Street. Denison Avenue has a two-way flow of 21 vehicles per hour in the AM peak and 15 vehicles per hour in the PM peak. It is expected that Denison Avenue traffic volumes will increase with the connection of Haggert Avenue and the potential extension toward Mill Street. Parking is not allowed on both sides. There are residential accesses on both sides.

Nelson Street

Nelson Street is designated as an east-west local road within the study area. It is connected at the east with George Street South and at the west with McMurchy Avenue North. It is currently a two-lane (two-way) road. The speed limit is 50 km/hr. Nelson Street has a two-way flow of 486 vehicles per hour in AM peak and 479 vehicles per hour in the PM peak. Parking is not allowed on both sides. There are residential accesses on both sides.

⁶ Traffic volumes at the study roads were estimated from the counts conducted on January 2019, Refer to section 3.2.

Park Street

Park Street is designated as a north-south local road within the study area. It is connected to the north with Railroad Street and to the south with Denison Avenue and Nelson Road. It is currently a two-lane (two-way) road. The speed limit is 50 km/hr with an advisory speed sign of 20 km/hr at the 90-degree horizontal curve prior to the railway tracks. Park Street has a two-way flow of 15 of vehicles per hour in the AM peak and 22 vehicles per hour in the PM peak. Parking is permitted on both sides with the exception of between 2 AM – 6 AM, and for no longer than 3 consecutive hours.

West Street

West Street is designated as a north-south local road within the study area. It is connected at the north with Railroad Street and at the south with Denison Avenue and Nelson Road. It is currently a single carriageway (two-way) road with one lane in each direction. The speed limit is 50 km/hr. West Street has a two-way flow of 27 vehicles per hour in the AM peak and 36 vehicles per hour in the PM peak.

4.2 EXISTING CYCLING NETWORK

All roads within the study area provided are shared between cyclists and vehicles. There are currently no dedicated bike lanes and/or paths that can be used by the cyclists. The number of cyclists within the study area was captured in the traffic counts movements as shown in **Figure 4-1** for AM peak and **Figure 4-2** for PM peak. The number of cyclists during AM and PM peak hours are less than 3 per hour which indicate a current low demand for cyclists at the study area. The low number of cyclists is likely due to the time of year that the traffic count was conducted (January).

However, it is understood that the City's soon-to-be-completed Active Transportation Master Plan is proposing a "shared roadway" bike facility on Denison Avenue, connecting to a proposed "protected bike lane" on McLaughlin Road and to "protected bike lanes" on Railroad Street and on Queen Street via a "shared roadway" facility on Mill Street. These improvements are anticipated to increase cyclist demand.

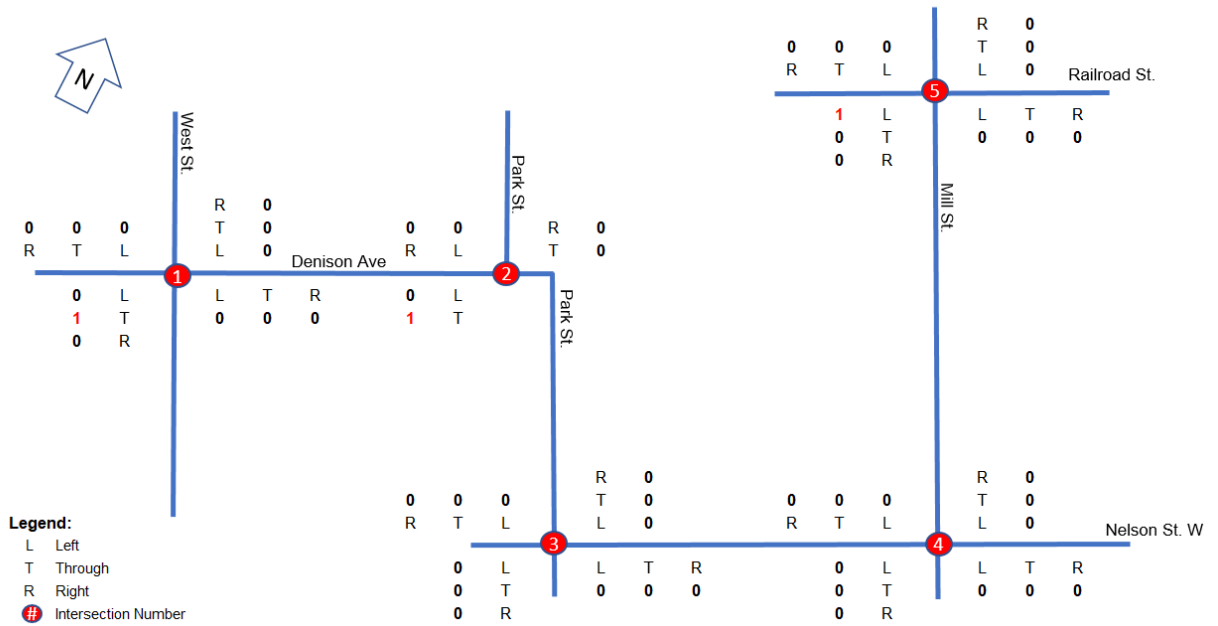


Figure 4-1: Existing Cyclists Counts Per Movement – 2019 AM Peak

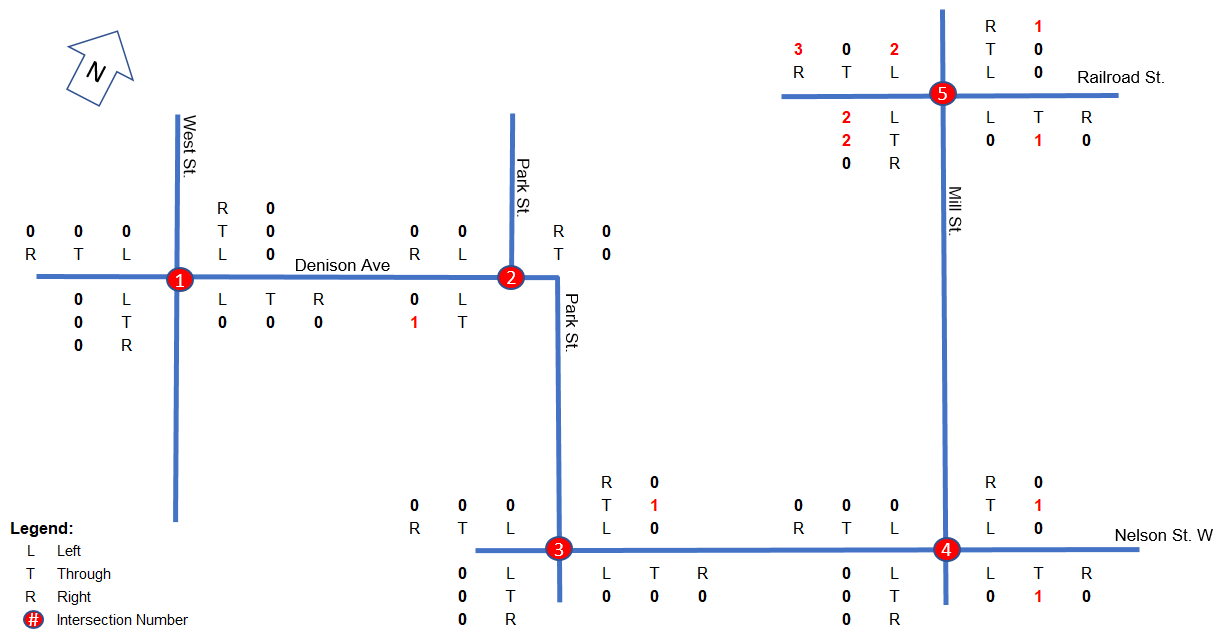


Figure 4-2: Existing Cyclists Counts Per Movement – 2019 PM Peak

4.3 EXISTING PEDESTRIAN NETWORK

Figure 4-3 shows the existing sidewalks within the study area. The pedestrians using Denison Avenue going to or from the Brampton GO Station use either Park Street or Nelson Avenue. Sidewalks are available on only one side of the road on Park Street and segments of Railroad Street and Denison Avenue, which results in reduced convenience for pedestrians. Pedestrians on Denison Avenue do not have a direct route to the GO station due to the lack of a continuous route that includes a sidewalk and the poor condition of existing sidewalks. The intersections of Mill Street / Railroad Street and Mill Street / Nelson Street have pedestrian crosswalk markings but the remaining three intersections within the study area lack any crosswalk markings. The following additional observations were noted:

- Some sections of sidewalk along Denison Avenue are heaving; and,
- The sidewalk on the south portion of Denison Avenue terminates at Park Street.



Figure 4-3: Existing Sidewalks at the Study Area

The number of pedestrians within the study area were captured in the traffic counts as shown in **Figure 4-4** and **Figure 4-5**. The number of pedestrians crossing at all intersections ranges between zero to 24 pedestrians in the AM peak hour. The same range applies to the PM peak hour except for the intersection of Railroad Street and Mill Street where there were 113 pedestrians crossing the south leg and 29 pedestrians crossing the east leg, presumed to be mostly pedestrians travelling to and from the GO Brampton station. Pedestrian movements at the other intersections show a generally low demand throughout the study area.

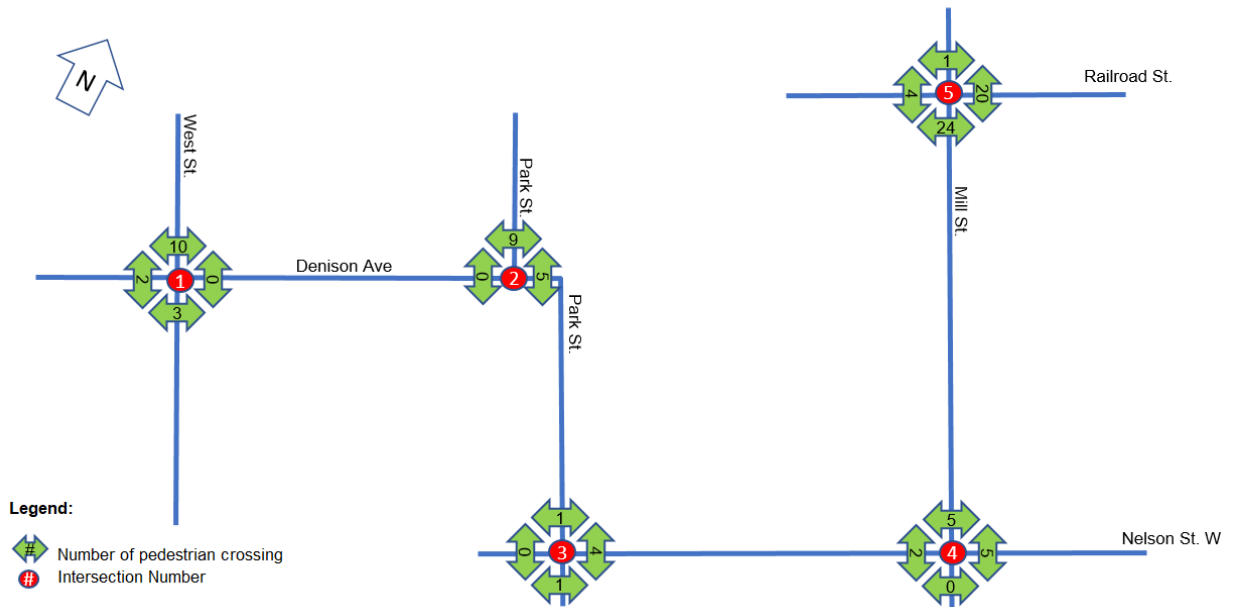


Figure 4-4: Existing Pedestrian Crossing Volumes per Intersection Leg – 2019 AM Peak

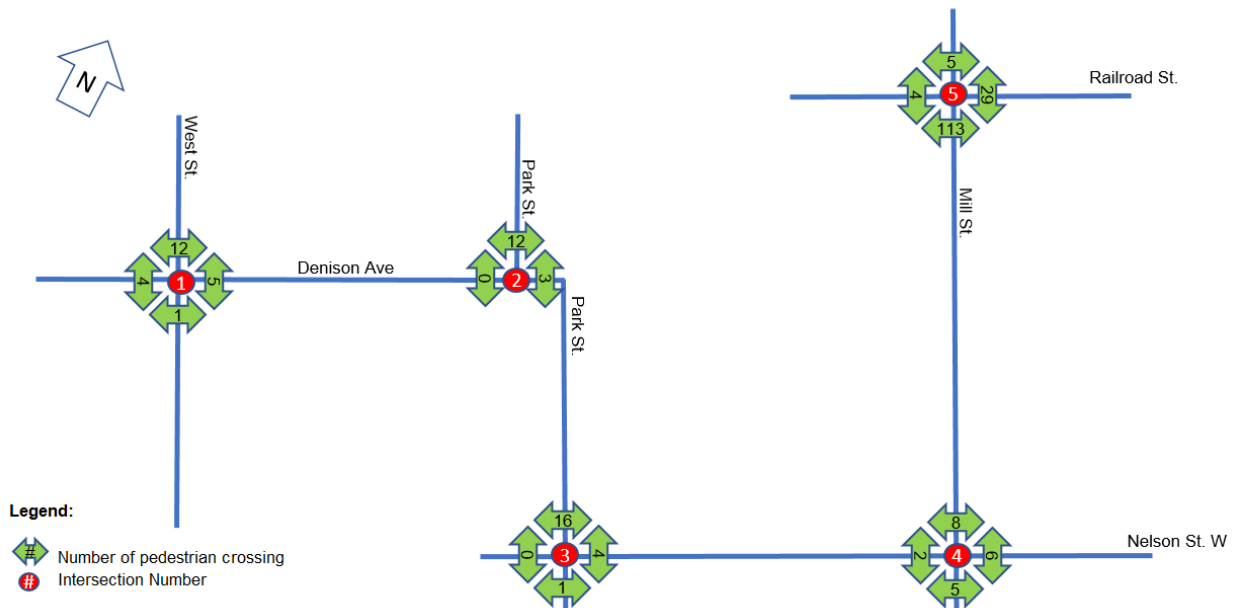


Figure 4-5: Existing Pedestrian Crossing Volumes per Intersection Leg – 2019 PM Peak

The current transit within the study area based on the 2018 Transit System Map⁷ is shown in **Figure 4-6**. The Brampton GO station is within 300 meters from Denison Avenue. Bus No. 52 has multiple stops on Railroad Street and McMurchy Avenue. Bus No. 1 has multiple stops on Queen Street which is parallel to Nelson Avenue. The bus stops surrounding the study area are all within 500 metres from the intersection of Denison Avenue and Park Street as shown in **Figure 4-7**.



Figure 4-6: 2018 Transit System Map – City of Brampton

⁷ 2018 Transit System Map. Refer to: http://www.brampton.ca/EN/residents/transit/plan-your-trip/PublishingImages/BRT7841109_RiderGuide_2018_WEB_Map.jpg

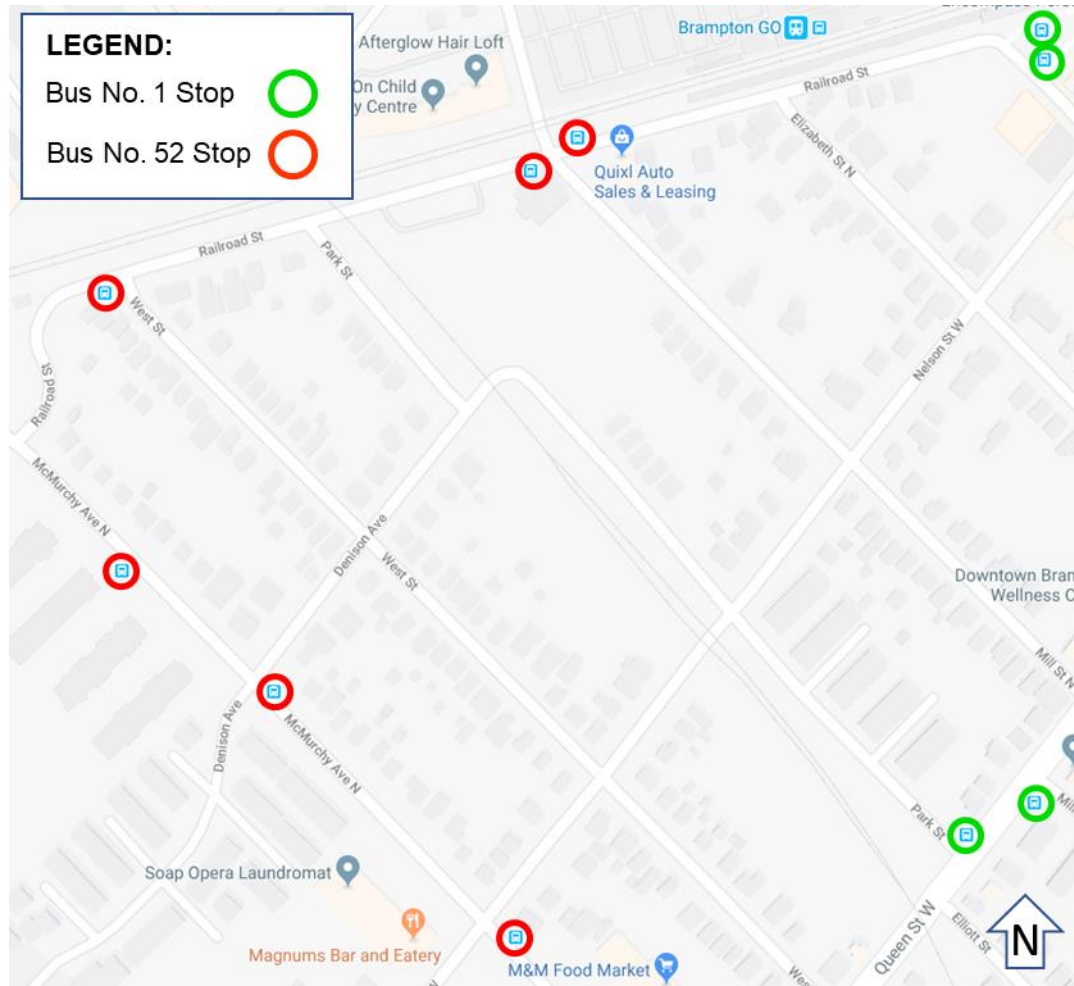


Figure 4-7: Surrounding Bus Stops at the Study Area

4.4 VALIDATION OF EXISTING VOLUMES

The traffic counts at each intersection were cross-referenced against each other to determine if any volume balancing was required. All volumes were balanced with less than 3 vehicle differences. The two intersections on Nelson Street (Intersections 3 and 4) had a difference of 9 vehicles at the AM Peak which is potentially due to residential driveways between the intersections.

The traffic counts at some intersections within the study area that were conducted in 2019 were cross-referenced against the traffic volume counts used in the Traffic Impact Study⁸ for the 45 Railroad development. The majority of the volume differences between the two sets of counts were minor. Volumes at

⁸ 45 Railroad Street Proposed Mixed-Use Development Traffic Impact Study conducted by BA Group, March 2016 (Appendix A, Figure 7)

Nelson Street, Mill Street and Railroad Street were generally higher in the 2019 count set. Some other movements from the 2015 counts were slightly higher than those in the 2019 counts. As a result, because there were no significant differences between the two counts, the OTI counts specifically conducted in January 2019 for the Denison Avenue extension study were assumed to be valid for use in this study.

5 MMLOS Assessment – Existing Conditions

The City of Ottawa Guidelines was used for the MMLOS assessment of the existing roads and intersections. The analysis was performed on the segments and intersections within the study area. It included PLOS, BLOS, and ALOS.

5.1 SEGMENT EXISTING CONDITIONS

The road segments considered in the MMLOS assessment are shown in **Figure 6-1** where the extent of each segment is shown in a different colour. All segments have a length of 250 meters or less and therefore, have not been segmented further. However, as per Ottawa guidelines, the segment level of services for all modes are governed by the critical section of the segment. For example, if a sidewalk width change along the segment, the narrower width is considered in the analysis.

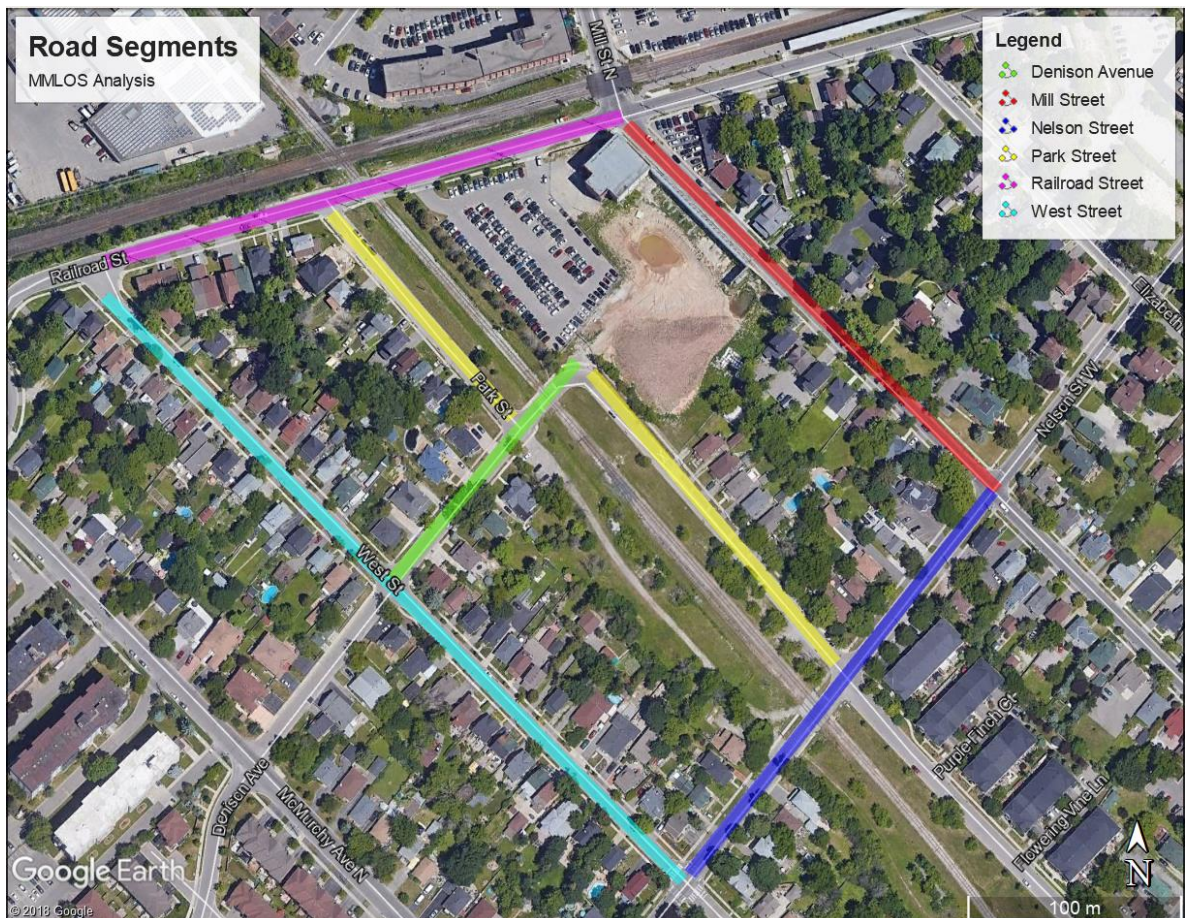


Figure 5-1: Segment Limits Considered in the MMLOS Assessment

5.1.1 Segment PLOS - Existing

As shown in **Table 5-1**, the PLOS for all segments is F. The sidewalk and boulevard widths were measured in the field for each segment. Measurements along the segment were undertaken in a representative cross-section of the segment identified earlier in **Figure 5-1**. Ottawa MMLOS guidelines refer that the critical (narrower in this case) measurement governs the segment PLOS. The critical direction of each segment is assumed to govern the segment PLOS. All segments have a PLOS of F due to the sidewalk width which is less than 1.5 meters.

Table 5-1: Pedestrian Level of Service (PLOS) for Study Segments – Existing Conditions 2019

Road Segment Name ⁹	Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT) ¹⁰	Presence of On-Street Parking	Operating Speed (km/h)	Segment PLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	1.20	1.00	112	Yes	50	F	C	No
Park Street	1.15	0.7	187	Yes	50	F	C	No
Railroad Street	1.20	2.70	1237	No	50	F	C	No
Mill Street	1.20	1-05	2975	No	50	F	C	No
West Street	1.20	1.95	262	Yes	50	F	C	No
Nelson Street	1.10	2.05	2737	No	50	F	C	No

Ottawa MMLOS Guidelines minimum desirable guidelines were determined¹¹ considering the study area as a “General Urban Area” which recommended PLOS of “C”. All roads within the study area do not meet the minimum desirable targets guidelines.

⁹ The Road Segments limits are shown in Figure 6-1.

¹⁰ AADT were estimated from PM peak hour volume (assuming that PM Peak Hour Volume is 8% of AADT)

¹¹ Refer to Exhibit 22, Ottawa MMLOS Guidelines, 2015

5.1.2 Segment BLOS - Existing

As shown in **Table 5-2**, the BLOS is B at the study segments which is mainly due to the speed limit of 50 km/h with the current number of travel lanes (2) in each segment. This meets the desirable MMLOS target for the local bike routes according to Ottawa Guidelines.

Table 5-2: Bicycle Level of Service (BLOS) - Existing Conditions 2019

Road Segment Name ¹²	Number of Travel Lanes	No Marked Centerline or Classified as residential?	Operating Speed (km/h)	Segment BLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	Yes	50	B	B	Yes
Park Street	2	Yes	50	B	B	Yes
Railroad Street	2	Yes	50	B	B	Yes
Mill Street	2	Yes	50	B	B	Yes
West Street	2	Yes	50	B	B	Yes
Nelson Street	2	Yes	50	B	B	Yes

5.1.3 Segment ALOS - Existing

The segment ALOS is estimated at the existing conditions based on the Synchro HCM 2010 results shown in **Table 5-3** for AM peak and Table 6-4 for PM peak. All segments meet the minimum ALOS recommended in Ottawa guidelines.

¹² The Road Segments limits are shown in Figure 6-1.

Table 5-3: Segment Vehicular Auto Level of Service (ALOS) - Existing Conditions 2019 (AM)

Road Segment Name ¹³	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	B	D	Yes
Railroad Street	2	C	D	Yes
Mill Street	2	B	D	Yes
West Street	2	A	D	Yes
Nelson Street	2	B	D	Yes

Table 5-4: Segment Vehicular Auto Level of Service (ALOS) - Existing Conditions 2019 (PM)

Road Segment Name ¹⁴	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	B	D	Yes
Railroad Street	2	C	D	Yes
Mill Street	2	B	D	Yes
West Street	2	A	D	Yes
Nelson Street	2	B	D	Yes

¹³ The Road Segments limits are shown in Figure 6-1.

¹⁴ The Road Segments limits are shown in Figure 6-1.

5.2 INTERSECTION EXISTING OPERATIONS

5.2.1 Intersection PLOS - Existing

Ottawa guidelines include a methodology for identifying PLOS for signalized intersections only. However, the same features in estimating the PESTI score of signalized intersections are used at the study un-signalized intersections as detailed in section 3.3.2.1. The corner radius at each intersection was measured for each approach as shown in **Figure 5-2**.

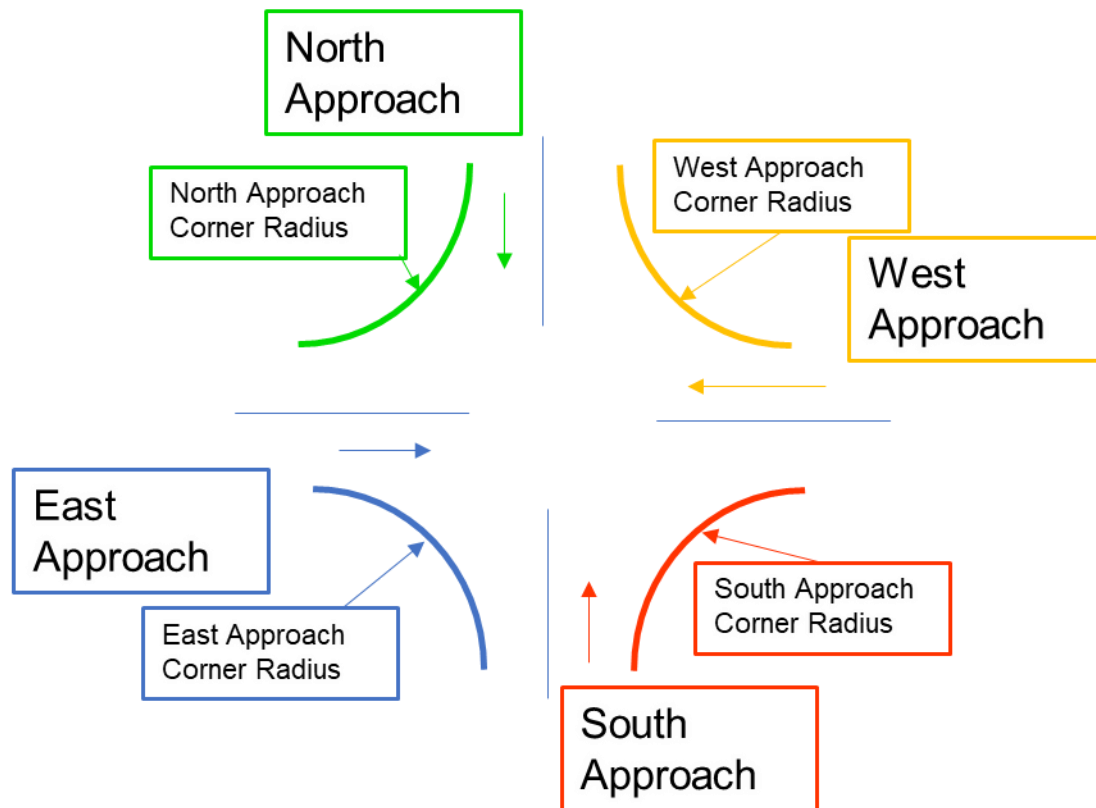


Figure 5-2: Corner Radius Designation for intersections

The corner radius for each approach in all intersections is shown in **Table 5-5**. All existing study intersections are unsignalized and have the same features below:

- 1- Crossing Distance and Conditions: All pedestrian routes at the study intersections include crossing two travel lanes with no median. This generates a 120 point. Lack of island refuge would deduct 4 points.
- 2- Signal Phasing & Timing Features: all left turns at these intersections are considered similar in behaviour to the "Permissive" from a pedestrian perspective resulting in deducting 8 points. Right

turns at all study intersections are considered similar in nature to “Permissive or yield Control” resulting in deducting 5 points. RTOR is considered similar to allowing right turns at the stop-controlled intersection which will result in deducting 3 points. No lead pedestrian interval at all these intersections which results in deducting 2 points.

- 3- Corner Radius: This feature changes for each approach at each intersection, and therefore will have a different point deduction based on the approach.
- 4- Crosswalk Treatment: This feature changes for each approach at each intersection, and therefore will have a different point deduction based on the approach.

Table 5-5: Measurements for Intersection Approaches Corner Radii

No	Intersection	Corner Radius (m)			
		North Approach	South Approach	West Approach	East Approach
1	West Street @ Denison Avenue	7.0	7.5	7.5	7.5
2	Park Street @ Denison Avenue	7.0	N/A	6.0	N/A
3	Park Street @ Nelson Street W	8.3	5.0	7.3	6.5
4	Mill Street N @ Nelson Street W	8.3	5.0	7.5	6.5
5	Mill Street N @ Railroad Street	5.0	5.0	5.0	6.0

The PETS I score and PLOS for each approach at the study intersections are shown in **Table 5-6**. All intersections have a PLOS of “B”.

Table 5-6: Approach and Critical Overall Intersection Score and PLOS – Existing - 2019

No	Intersection	PETSI Score / PLOS				
		North Approach	South Approach	West Approach	East Approach	Critical PLOS
1	West Street @ Denison Avenue	84 / B	84 / B	84 / B	84 / B	84 / B
2	Park Street @ Denison Avenue	84 / B	N/A	84 / B	84 / B	84 / B
3	Park Street @ Nelson Street W	84 / B	84 / B	84 / B	84 / B	84 / B
4	Mill Street N @ Nelson Street W	87 / B	87 / B	87 / B	87 / B	87 / B
5	Mill Street N @ Railroad Street	84 / B	84 / B	87 / B	87 / B	84 / B

5.2.2 Intersection BLOS - Existing

Cyclists are sharing the roadways at all intersections at the study. The features defining the BLOS at each approach is based on the following features:

- 1- The presence of the right turn lane and the turning speed of motorists: All intersection approaches does not have any right turn lane as all segments within the study area has one lane in each direction.
- 2- The cyclists left turn maneuvers at the intersection and the operating speed of motorists: cyclists are sharing the roadway at all intersections and can make a left turn with no lane crossed and an operating speed of 50 km/h.

The estimated BLOS at all intersection approaches is shown in **Table 5-7**.

Table 5-7: Approach and Critical Overall Intersection BLOS

No	Intersection	BLOS				Critical PLOS
		North Approach	South Approach	West Approach	East Approach	
1	West Street @ Denison Avenue	B	B	B	B	B
2	Park Street @ Denison Avenue	B	N/A	B	B	B
3	Park Street @ Nelson Street W	B	B	B	B	B
4	Mill Street N @ Nelson Street W	B	B	B	B	B
5	Mill Street N @ Railroad Street	B	B	B	B	B

5.2.3 Intersection ALOS - Existing

The existing intersections geometry and traffic controls were modelled using Synchro¹⁵ software for the following intersections:

1. West Street @ Denison Avenue (existing 4-leg intersection – two-way stop)
2. Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.)
3. Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)
4. Mill Street N @ Nelson Street W (existing 4-leg intersection – four-way stop)
5. Mill Street N @ Railroad Street (existing 4-leg intersection – two-way stop)

All intersections within the study area were analyzed with existing volumes to identify the current multi-modal performance of the intersections. The intersections lane configurations and traffic control were determined from the site visits and the existing layout in Google Earth.

The vehicular Auto Level of Service (ALOS) is assessed for the AM, and PM peak hours for the existing conditions in 2019.

Table 5-8 summarizes intersection performance for the existing conditions. Overall the study area intersections (Numbers 1 through 5) operate at an acceptable LOS of A and B which is exceeding the minimum targets of LOS D for General Urban Area as per Ottawa Guidelines.

¹⁵ Refer to Appendix C for Synchro output files.

Table 5-8: Overall Intersection Performance Summary (Level of Service) Existing - 2019

Intersection	2019	
	AM	PM
West Street @ Denison Avenue (existing 4-leg intersection – two-way stop)	A	A
Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.)	A	A
Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)	A	A
Mill Street N @ Nelson Street W (existing 4-leg intersection – four-way stop)	B	B
Mill Street N @ Railroad Street (existing 4-leg intersection – two-way stop)	A	A

Tables 5-9 and 5-10 show the overall intersection delay, LOS, delay, movement LOS, V/C, and queue length for each intersection and approach.

Table 5-9: Intersection Operational Analysis – Existing – 2019 (AM)

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	4.8	A	EB	9.1	A	0.0	0.6
				NB	7.3	A	0.0	0.0
				SB	7.3	A	0.0	0.0
				WB	9.0	A	0.0	0.0
2	Park Street @ Denison Avenue (Two-way stop control)	4.5	A	EB	7.2	A	0.0	0.0
				WB	9.0	A	0.0	0.0
				SB	-	-	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	2.0	A	EB	7.4	A	0.0	0.0
				NB	10.8	B	0.1	1.9
				SB	13.9	B	0.0	0.6
				WB	8.0	A	0.0	0.6
4	Mill Street N @ Nelson Street W (Four-way stop control)	11.8	B	EB	13.6	B	0.521	19.7
				NB	10	A	0.179	3.8
				SB	10.8	B	0.316	8.2
				WB	9.6	A	0.189	4.4
5	Mill Street N @ Railroad Street (Two-way stop control)	4.8	A	NB	0	A	-	0.0
				EB	18.6	C	0.367	10.8
				WB	11.7	B	0.071	1.3
				SB	7.8	A	0.027	0.6

Table 5-10: Intersection Operational Analysis - Existing – 2019 (PM)

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	2.7	A	EB	9.2	A	0.0	0.0
				NB	0.0	A	-	0.0
				SB	0.0	A	-	0.0
				WB	9.1	A	0.0	0.0
2	Park Street @ Denison Avenue (Two-way stop control)	5.3	A	EB	7.3	A	0.0	0.0
				WB	8.7	A	0.0	0.6
				SB	-	-	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	1.5	A	EB	7.8	A	0.0	0.0
				NB	9.9	A	0.1	1.3
				SB	13.1	B	0.0	0.6
				WB	7.6	A	0.0	0.0
4	Mill Street N @ Nelson Street W (Four-way stop control)	11	B	EB	11.4	B	0.357	10.1
				NB	10.4	B	0.261	6.3
				SB	10.5	B	0.283	7.6
				WB	11.3	B	0.364	10.8
5	Mill Street N @ Railroad Street (Two-way stop control)	3.9	A	NB	8.3	A	0.003	0.0
				EB	18.2	C	0.284	7.6
				WB	15.1	C	0.159	3.8
				SB	7.9	A	0.02	0.6

6 MMLOS Assessment – Future Conditions

6.1 FUTURE ROAD NETWORK

This section summarizes the analysis of MMLOS for future conditions. The analysis will be based on the forecasted volumes on the study area along with the extension of Denison Avenue.

The future potential extension of Denison Avenue is influenced by the proposed development site plan of 45 Railroad Street, which is currently in progress and was approved prior to the conduct of this EA study. The proposed realignment for this extension, as shown in **Figure 5-1**, is at the south end of the 45 Railroad Street property and thus not continuous with the existing Denison Avenue alignment west of Park Street. This jog in alignment is not typical and as such creates another two, three-leg intersections with Mill Street and Park Street. Thus, the study intersections for future conditions will be the following:

1. West Street @ Denison Avenue (existing 4-leg intersection – two-way stop);
2. Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.);
3. Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop);
4. Mill Street N @ Nelson Street W (existing 4-leg intersection – four-way stop);
5. Mill Street N @ Railroad Street (existing 4-leg intersection – two-way stop);
6. Denison Avenue @ Park Street (Proposed 3-leg intersection – stop control at Denison Avenue extension); and,
7. Denison Avenue @ Mill Street (Proposed 3-leg intersection – stop control at Denison Avenue extension).

The proposed Denison Avenue extension will facilitate access for the development on 45 Railroad in addition to the access via Railroad Street. This generally will assist in balancing flows between Railroad Street and Mill Street. Additionally, Mill Street is categorized as a “collector” and having access through the Denison Avenue extension (local road) generally aligns with the access management best practices.

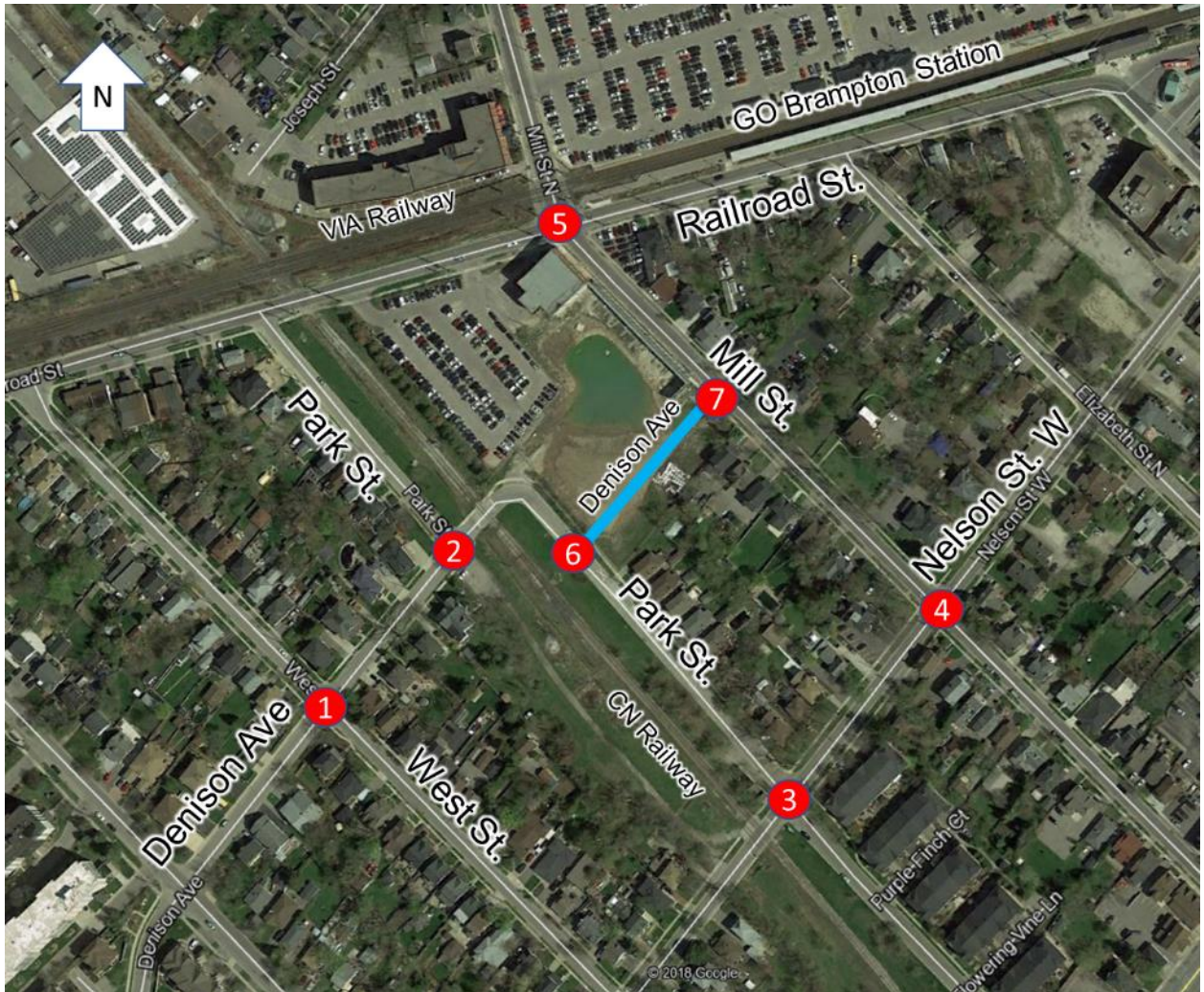


Figure 6-1: Study Intersections after Denison Avenue Extension

The proposed Denison Avenue extension would provide sidewalks on both sides of the roadway, per current City of Brampton design standards. The current City of Brampton Active Transportation Plan (not yet finalized) has identified Denison Avenue as a candidate for designated on-road and/or boulevard cycle lanes and, as such, it is assumed that these lanes would be incorporated into the design of a new Denison Avenue extension. For pedestrian/cyclist demand to and from the Go Station, the proposed alignment for the extension would only reduce walking and/or cycling distance by +/-20 meters as it is shown in **Figure 6-2**. However, the extension will generally reduce walking/cycling distance for other pedestrians/cyclists in the neighbourhood. The extension could provide road users with the ability to avoid a delay caused by a train using the tracks that run parallel to Park Street by allowing the user to route to Mill Street via the extension.

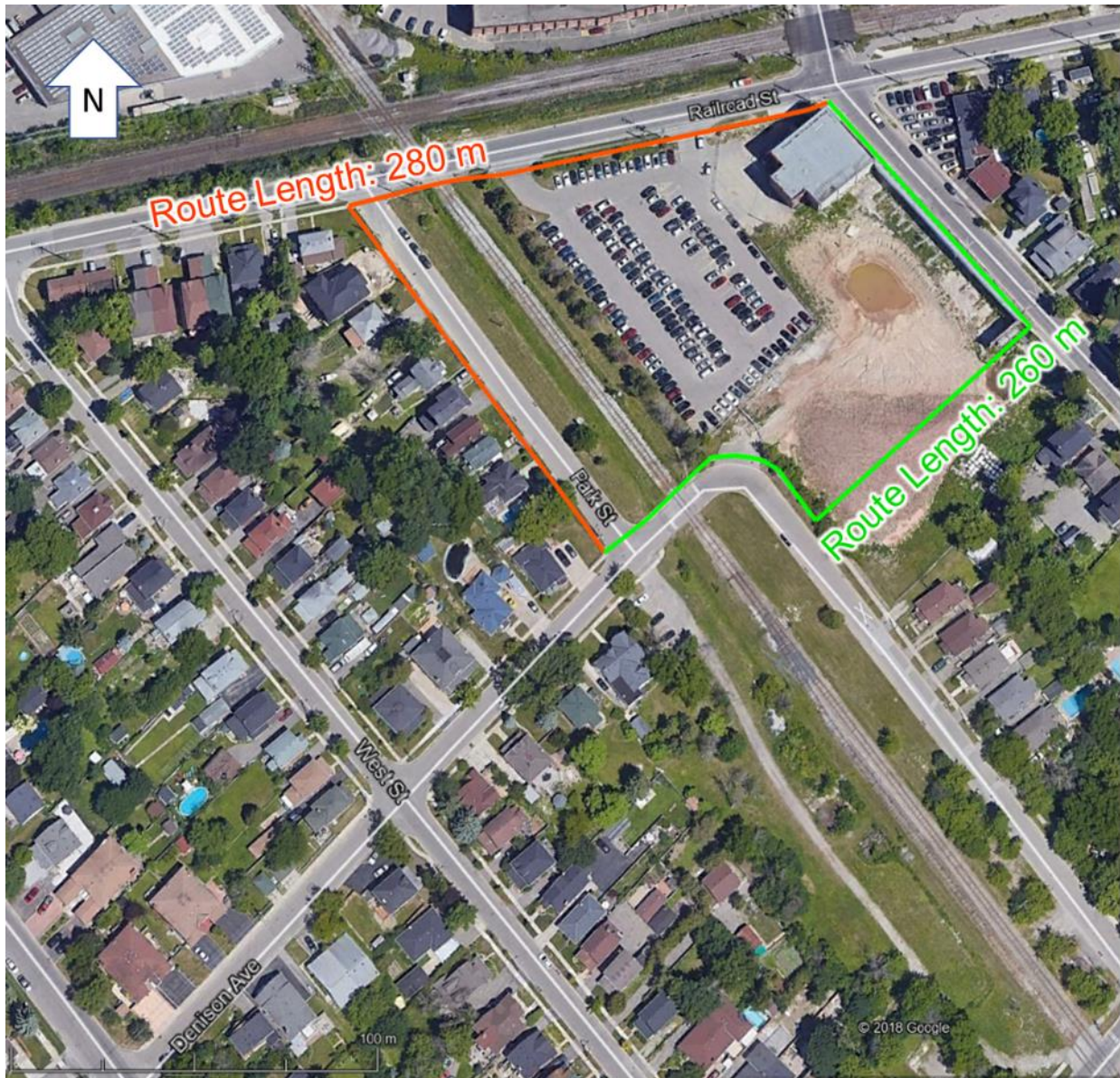


Figure 6-2: Estimation of Walking Distance Before and After Denison Avenue Extension

6.2 FUTURE TRAFFIC VOLUMES

This section describes the future traffic volumes for the study intersections for “Do-Nothing” scenario (no extension of Denison Avenue) and the Denison Avenue extension as proposed and described in previous sections. For the 2031 values, a growth rate of 3.5% per year (factor of 1.51) was applied to the 2019 counts

collected by OTI in January 2019, and a growth rate of 2% per year (factor of 1.22) was applied to the factored up 2031 volumes. The annual compound growth rates and factors are shown in **Table 6-1**.

Table 6-1: Annual Compound Growth Rates and Factors used for Forecasting Future Volumes

Growth from 2019 to 2031		Growth from 2031 to 2041	
Annual Compound Growth Rate	Growth Factor	Annual Compound Growth Rate	Growth Factor
3.5%	1.51	2.0%	1.22

6.2.1 Future Traffic Volumes without the Denison Avenue Extension (“Do-Nothing”)

The background traffic volumes and including the background adjustment, that includes the 45 Railroad Street development trips, were used to forecast the traffic volumes for the horizon years 2031 and 2041 in the Do-Nothing scenario wherein there is no extension of Denison Avenue between Park Street and Mill Street. The 45 Railroad Street trips were included in the background under the assumption that the development would proceed regardless of an extension of Denison Avenue.

No adjustments were made to the background to reflect any increased attractiveness of Denison Avenue to vehicular traffic in the future. As such, the future traffic volumes for this base condition (without the Denison Avenue extension) is shown in **Figure 6-3** to **Figure 6-6**.

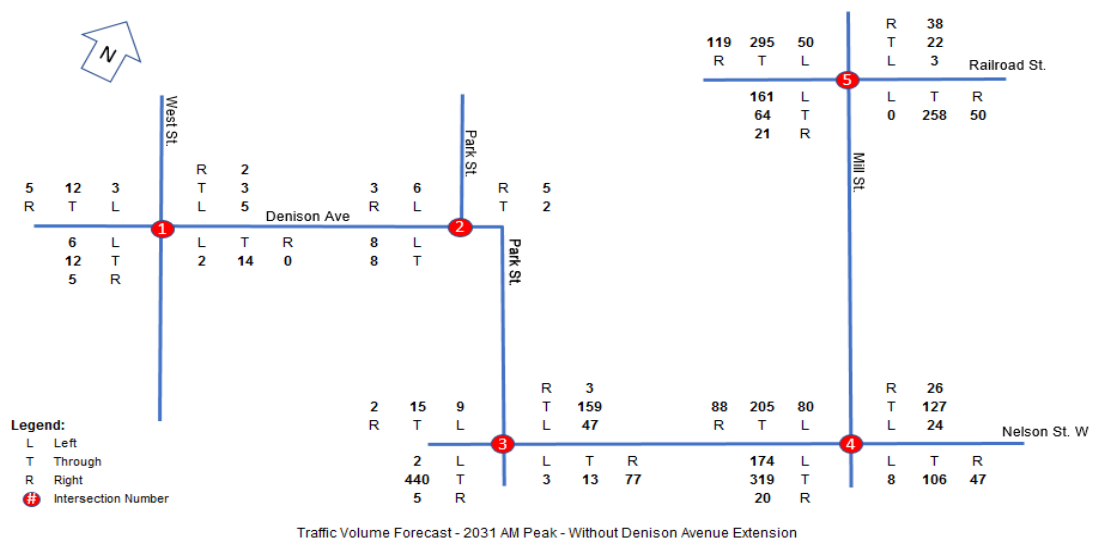


Figure 6-3: Traffic Volume Forecast – 2031 AM Peak – Without Denison Avenue Extension

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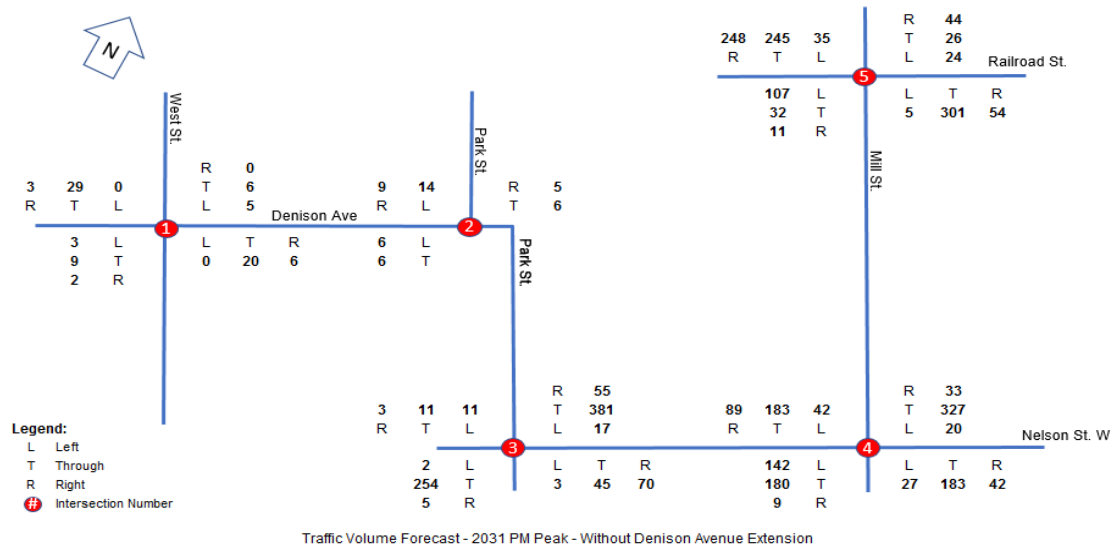


Figure 6-4: Traffic Volume Forecast – 2031 PM Peak – Without Denison Avenue Extension

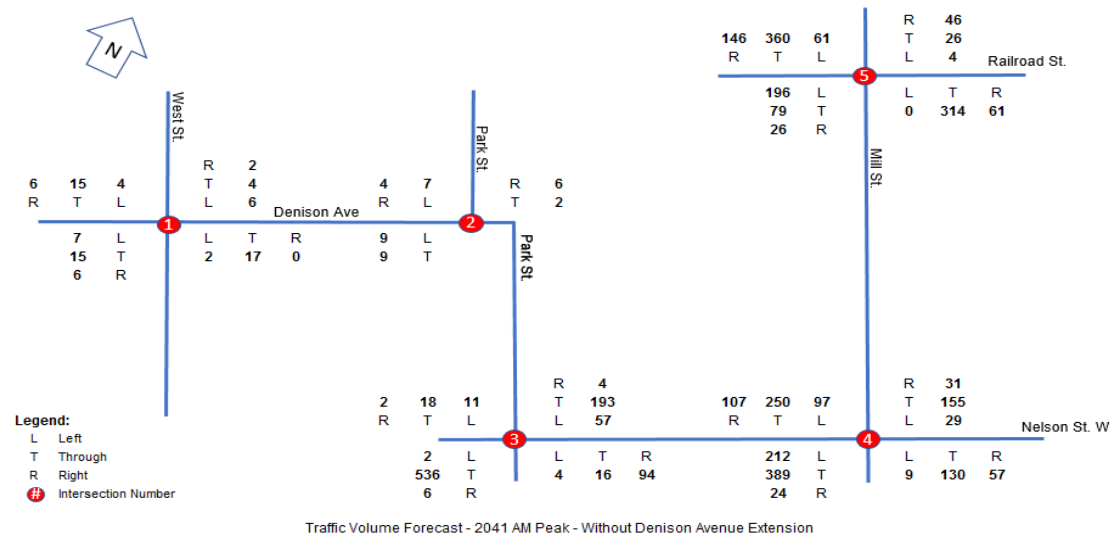


Figure 6-5: Traffic Volume Forecast – 2041 AM Peak – Without Denison Avenue Extension

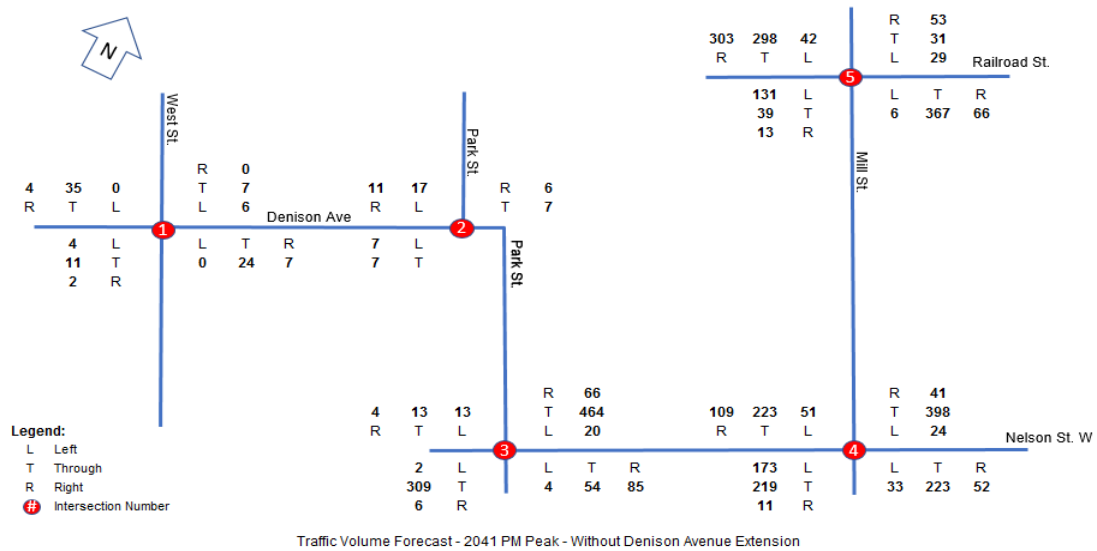


Figure 6-6: Traffic Volume Forecast – 2041 PM Peak – Without Denison Avenue Extension

6.2.2 Future Traffic Volumes with the Denison Avenue Extension

The background volumes for the study area traffic were adjusted as such to reflect the inclusion of an extension of Denison Avenue into the local area transportation network:

1. The inclusion of trips generated by the proposed 45 Railroad Street development;
2. The increased attractiveness of Denison Avenue for a left turn and right turn traffic from Mill Street and Nelson Street; and,
3. The increased attractiveness of Denison Avenue to through movement traffic on Nelson Street.

These adjustments were used to forecast the volumes for the horizon year 2031 and 2041, as shown in Figures 6-7 to Figure 6-10.

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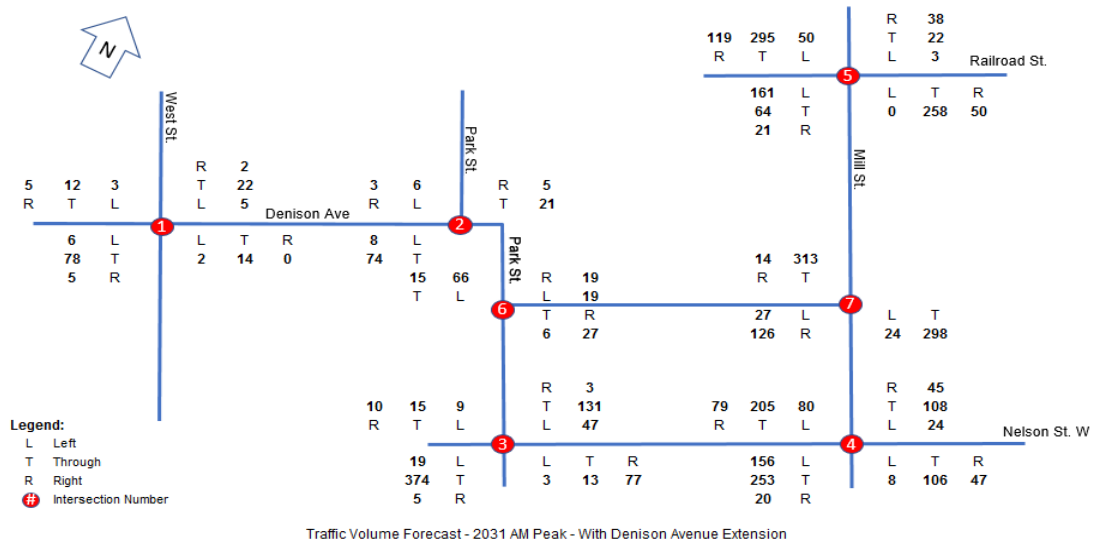


Figure 6-7: Traffic Volume Forecast – 2031 AM Peak - With Denison Avenue Extension

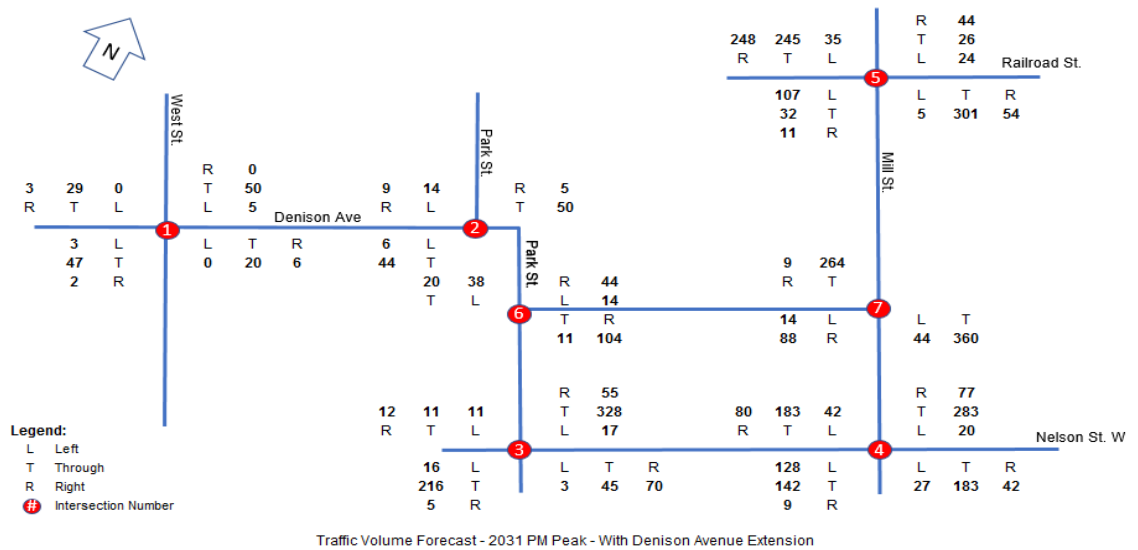


Figure 6-8: Traffic Volume Forecast – 2031 PM Peak - With Denison Avenue Extension

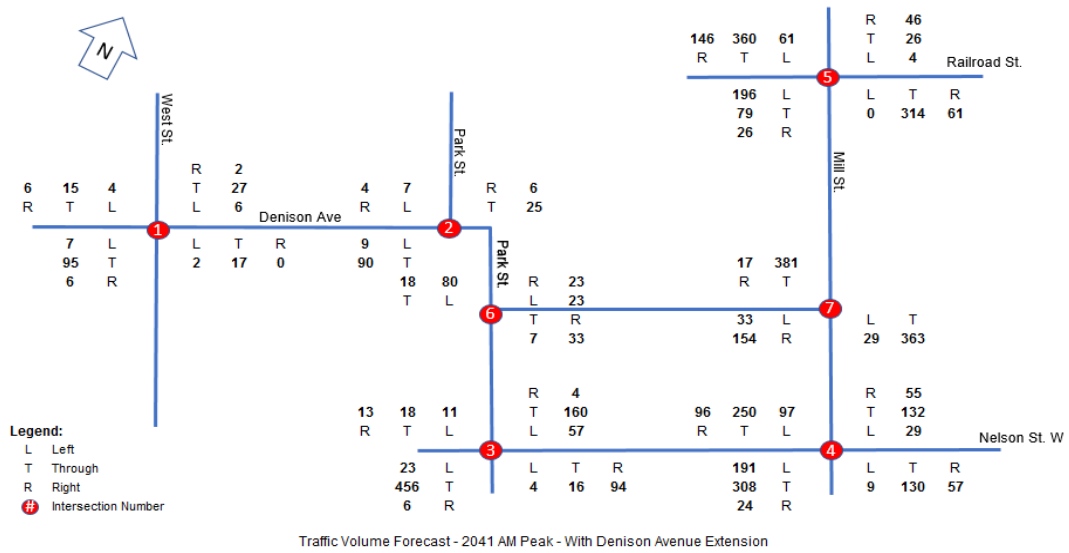


Figure 6-9: Traffic Volume Forecast – 2041 AM Peak - With Denison Avenue Extension

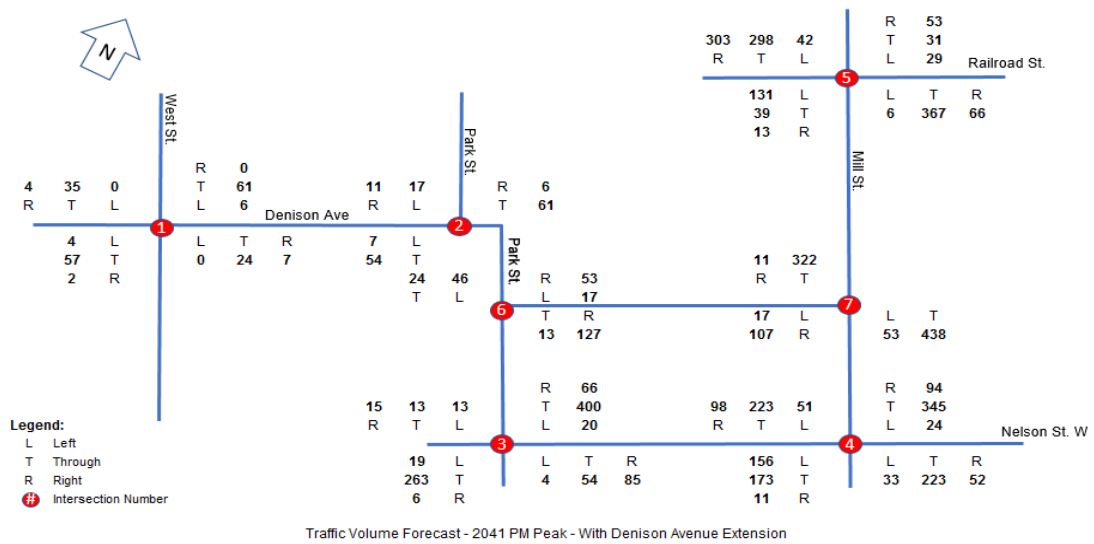


Figure 6-10: Traffic Volumes Forecast – 2041 PM Peak - With Denison Avenue Extension

6.3 FUTURE OPERATIONS – 2031

The following section presents the MMLOS analysis for future operations in 2031 – for the ‘do nothing’ scenario and for the Denison Avenue Extension.

6.3.1 Segment Future Operations 2031 – Do Nothing

Table 6-2 through **Table 6-5** show the segment PLOS, BLOS and ALOS scores for the ‘do nothing’ scenario in 2031.

Table 6-2: Segment PLOS – Do Nothing - 2031

Road Segment Name ¹⁶	Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT) ¹⁷	Presence of On-Street Parking	Operating Speed (km/h)	Segment PLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	1.20	1.00	169	Yes	50	F	C	No
Park Street	1.15	0.70	283	Yes	50	F	C	No
Railroad Street	1.20	2.70	1869	No	50	F	C	No
Mill Street	1.20	1.05	4495	No	50	F	C	No
West Street	1.20	1.95	396	Yes	50	F	C	No
Nelson Street	1.10	2.05	4136	No	50	F	C	No

¹⁶ The Road Segments limits are shown in Figure 6-1.

¹⁷ AADT were estimated for 2031 from forecasted PM peak hour volume (assuming that PM Peak Hour Volume is 8% of AADT)

Table 6-3: Segment BLOS – Do Nothing - 2031

Road Segment Name ¹⁸	Number of Travel Lanes	No Marked Centerline or Classified as residential?	Operating Speed (km/h)	Segment BLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	Yes	50	B	B	Yes
Park Street	2	Yes	50	B	B	Yes
Railroad Street	2	Yes	50	B	B	Yes
Mill Street	2	Yes	50	B	B	Yes
West Street	2	Yes	50	B	B	Yes
Nelson Street	2	Yes	50	B	B	Yes

Table 6-4: Segment ALOS – Do Nothing - 2031 (AM)

Road Segment Name	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	C	D	Yes
Railroad Street	2	F	D	No
Mill Street	2	D	D	Yes
West Street	2	A	D	Yes
Nelson Street	2	F	D	No

¹⁸ The Road Segments limits are shown in Figure 6-1.

Table 6-5: Segment ALOS – Do Nothing - 2031 (PM)

Road Segment Name	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	C	D	Yes
Railroad Street	2	F	D	No
Mill Street	2	D	D	Yes
West Street	2	A	D	Yes
Nelson Street	2	E	D	No

6.3.2 Intersection Future Operations 2031 – Do Nothing

Table 6-6 through Table 6-10 show the intersection PLOS, BLOS and ALOS scores for the ‘do nothing’ scenario in 2031.

Table 6-6: Approach and Intersection PETS I Score and PLOS – Do Nothing - 2030

No	Intersection	PETS I Score / PLOS				
		North Approach	South Approach	West Approach	East Approach	Critical PLOS
1	West Street @ Denison Avenue	84 / B	84 / B	84 / B	84 / B	84 / B
2	Park Street @ Denison Avenue	84 / B	N/A	84 / B	84 / B	84 / B
3	Park Street @ Nelson Street W	84 / B	84 / B	84 / B	84 / B	84 / B
4	Mill Street N @ Nelson Street W	87 / B	87 / B	87 / B	87 / B	87 / B
5	Mill Street N @ Railroad Street	84 / B	84 / B	87 / B	87 / B	84 / B

Table 6-7: Approach and Intersection BLOS – Do Nothing – 2031

No	Intersection	BLOS				
		North Approach	South Approach	West Approach	East Approach	Critical BLOS
1	West Street @ Denison Avenue	B	B	B	B	B
2	Park Street @ Denison Avenue	B	N/A	B	B	B
3	Park Street @ Nelson Street W	B	B	B	B	B
4	Mill Street N @ Nelson Street W	B	B	B	B	B
5	Mill Street N @ Railroad Street	B	B	B	B	B

Table 6-8: Overall ALOS Intersection Performance Summary – Do Nothing - 2031

Intersection	2031	
	AM	PM
West Street @ Denison Avenue (existing 4-leg intersection – two-way stop)	A	A
Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.)	A	A
Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)	A	A
Mill Street N @ Nelson Street W (existing 4-leg intersection – four-way stop)	E	D
Mill Street N @ Railroad Street (existing 4-leg intersection – two-way stop)	D	A

Table 6-9: ALOS Intersection Operational Analysis – Do Nothing - 2031 AM

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	4.9	A	EB	9.2	A	0.028	0.6
				NB	7.3	A	0.001	0.0
				SB	7.3	A	0.002	0.0
				WB	9.1	A	0.012	0.0
2	Park Street @ Denison Avenue (Two-way stop control)	4.2	A	EB	7.3	A	0.005	0.0
				WB	0.0	A	-	0.0
				SB	9.0	A	0.010	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	2.9	A	EB	7.6	A	0.002	0.0
				NB	14.1	B	0.203	5.1
				SB	19.5	C	0.102	1.9
				WB	8.5	A	0.048	0.6
4	Mill Street N @ Nelson Street W (Four-way stop control)	44.9	E	EB	74.5	F	1.022	100.2
				NB	15.9	C	0.389	11.4
				SB	30.7	D	0.786	44.4
				WB	15.6	C	0.404	12.0
5	Mill Street N @ Railroad Street (Two-way stop control)	26.6	D	NB	0	A	-	0.0
				EB	111	F	1.044	68.5
				WB	16.2	C	0.175	3.8
				SB	8.1	A	0.045	0.6

Table 6-10: ALOS Intersection Operational Analysis – Do Nothing - 2031 PM

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	2.8	A	EB	9.3	A	0.015	0.0
				NB	0.0	A	-	0.0
				SB	9.2	A	0.011	0.0
				WB	7.3	A	0.003	0.0
2	Park Street @ Denison Avenue (Two-way stop control)	5.3	A	EB	0.0	A	-	0.0
				WB	8.7	A	0.021	0.6
				SB	8.2	A	0.001	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	2.9	A	EB	13.9	B	0.221	5.1
				NB	16.2	C	0.069	1.3
				SB	7.7	A	0.011	0.0
				WB	17.2	C	0.544	20.3
4	Mill Street N @ Nelson Street W (Four-way stop control)	35.0	D	EB	14.7	B	0.428	13.3
				NB	16.5	C	0.525	19.0
				SB	19	C	0.613	26.0
				WB	8.6	A	0.004	0.0
5	Mill Street N @ Railroad Street (Two-way stop control)	9.9	A	NB	27.3	D	0.460	14.6
				EB	18.9	C	0.245	5.7
				WB	8.1	A	0.026	0.6
				SB	9.3	A	0.015	0.0

6.3.3 Segment Future Operations 2031 – With Denison Ave Extension

Table 6-11 through **Table 6-14** show the segment PLOS, BLOS and ALOS scores with the Denison Avenue Extension in 2031.

Table 6-11: Segment PLOS – With Denison Ave Extension - 2031

Road Segment Name ¹⁹	Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT) ²⁰	Presence of On-Street Parking	Operating Speed (km/h)	Segment PLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	1.20	1.00	169	Yes	50	F	C	No
Park Street	1.15	0.70	283	Yes	50	F	C	No
Railroad Street	1.20	2.70	1869	No	50	F	C	No
Mill Street	1.20	1.05	4495	No	50	F	C	No
West Street	1.20	1.95	396	Yes	50	F	C	No
Nelson Street	1.10	2.05	4136	No	50	F	C	No

¹⁹ The road segment limits are shown in Figure 6-1.

²⁰ AADT were estimated from PM peak hour volume (assuming that PM Peak Hour Volume is 8% of AADT)

Table 6-12: Segment BLOS - With Denison Ave Extension - 2031

Road Segment Name ²¹	Number of Travel Lanes	No Marked Centerline or Classified as residential?	Operating Speed (km/h)	Segment BLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	Yes	50	B	B	Yes
Park Street	2	Yes	50	B	B	Yes
Railroad Street	2	Yes	50	B	B	Yes
Mill Street	2	Yes	50	B	B	Yes
West Street	2	Yes	50	B	B	Yes
Nelson Street	2	Yes	50	B	B	Yes

Table 6-13: Segment ALOS – With Denison Ave Extension 2031 (AM)

Road Segment Name	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	B	D	Yes
Park Street	2	B	D	Yes
Railroad Street	2	F	D	No
Mill Street	2	C	D	Yes
West Street	2	A	D	Yes
Nelson Street	2	C	D	Yes

²¹ The road segment limits are shown in Figure 6-1.

Table 6-14: Segment ALOS – With Denison Ave Extension - 2031 (PM)

Road Segment Name	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	B	D	Yes
Railroad Street	2	F	D	No
Mill Street	2	C	D	Yes
West Street	2	A	D	Yes
Nelson Street	2	D	D	Yes

6.3.4 Intersection Future Operations 2031 – With Denison Ave Extension

Table 6-15 through Table 6-19 show the intersection PLOS, BLOS and ALOS scores with the Denison Avenue Extension in 2031.

Table 6-15: Approach and Intersection PETS I Score and PLOS – With Denison Ave Extension - 2031

No	Intersection	Score / PLOS				
		North Approach	South Approach	West Approach	East Approach	Critical PLOS
1	West Street @ Denison Avenue	84 / B	84 / B	84 / B	84 / B	84 / B
2	Park Street @ Denison Avenue	84 / B	N/A	84 / B	84 / B	84 / B
3	Park Street @ Nelson Street W	84 / B	84 / B	84 / B	84	84
4	Mill Street N @ Nelson Street W	87 / B	87 / B	87 / B	87 / B	87 / B
5	Mill Street N @ Railroad Street	84 / B	84 / B	87 / B	87 / B	84 / B
6	Denison Avenue @ Park Street	84 / B	84 / B	84 / B	84 / B	84 / B
7	Denison Avenue @ Mill Street N	84 / B	84 / B	84 / B	84 / B	84 / B

Table 6-16: Approach and Intersection BLOS – With Denison Ave Extension - 2031

No	Intersection	BLOS				Critical PLOS
		North Approach	South Approach	West Approach	East Approach	
1	West Street @ Denison Avenue	B	B	B	B	B
2	Park Street @ Denison Avenue	B	N/A	B	B	B
3	Park Street @ Nelson Street W	B	B	B	B	B
4	Mill Street N @ Nelson Street W	B	B	B	B	B
5	Mill Street N @ Railroad Street	B	B	B	B	B
6	Denison Avenue @ Park Street	B	B	B	B	B
7	Denison Avenue @ Mill Street N	B	B	B	B	B

Table 6-17: Intersection ALOS – With Denison Ave Extension - 2031

Intersection No.	Intersection	2031	
		AM	PM
1	West Street @ Denison Avenue (existing 4-leg intersection – two-way stop)	A	A
2	Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.)	A	A
3	Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)	A	A
4	Mill Street N @ Railroad Street (existing 4-leg intersection – two-way stop)	C	D
5	Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)	D	A
6	Denison Avenue @ Park Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	A	A
7	Denison Avenue @ Mill Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	A	A

Table 6-18: Intersection Operational Analysis ALOS with Denison Ave Extension - 2031 (AM)

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	7.7	A	EB	9.8	A	0.113	2.5
				NB	7.3	A	0.001	0.0
				SB	7.3	A	0.002	0.0
				WB	9.8	A	0.040	0.6
2	Park Street @ Denison Avenue (Two-way stop control)	1.2	A	EB	7.3	A	0.006	0.0
				WB	9.5	A	0.012	0.0
				SB	-	A	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	3.3	A	EB	7.5	A	0.014	0.0
				NB	13.1	B	0.186	4.4
				SB	16.1	C	0.102	1.9
				WB	8.3	A	0.045	0.6
4	Mill Street N @ Nelson Street W (Four-way stop control)	24.7	C	EB	33.3	D	0.826	53.9
				NB	14.5	B	0.359	10.1
				SB	24.3	C	0.715	36.8
				WB	14.2	B	0.372	10.8
5	Mill Street N @ Railroad Street (Two-way stop control)	26.6	D	NB	-	A	-	0.0
				EB	111.0	F	1.044	68.5
				WB	16.2	C	0.175	3.8
				SB	8.1	A	0.045	0.6
6	Denison Avenue @ Park Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	5.6	A	NB	-	A	-	0.0
				SB	7.4	A	0.046	0.6
				WB	9.4	A	0.048	1.3
7	Denison Avenue @ Mill Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	2.6	A	EB	13	B	0.258	6.3
				NB	8.1	A	0.022	0.6
				SB	-	A	-	0.0

Table 6-19: Intersection Operational Analysis ALOS with Denison Ave Extension - 2031 (PM)

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	6.3	A	EB	9.7	A	0.069	1.3
				NB	0.0	A	-	0.0
				SB	0.0	A	-	0.0
				WB	9.7	A	0.073	1.3
2	Park Street @ Denison Avenue (Two-way stop control)	2.0	A	EB	7.4	A	0.004	0.0
				WB	9.0	A	0.027	0.6
				SB	-	-	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	3.2	A	EB	8.2	A	0.015	0.0
				NB	14.6	B	0.255	6.3
				SB	16.5	C	0.106	2.5
				WB	7.8	A	0.140	0.0
4	Mill Street N @ Nelson Street W (Four-way stop control)	26.7	D	EB	23.3	C	0.637	27.9
				NB	20.8	C	0.582	22.8
				SB	24.9	C	0.676	32.3
				WB	34.6	D	0.813	50.1
5	Mill Street N @ Railroad Street (Two-way stop control)	9.9	A	NB	8.9	A	0.006	0.0
				EB	56.6	F	0.738	31.7
				WB	25.9	D	0.374	10.8
				SB	8.3	A	0.034	0.6
6	Denison Avenue @ Park Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	3.5	A	NB	-	A	-	0.0
				SB	7.5	A	0.028	0.6
				WB	9.1	A	0.067	1.3
7	Denison Avenue @ Mill Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	2.0	A	EB	11.7	B	0.172	3.8
				NB	8	A	0.038	0.6
				SB	-	A	-	0.0

6.4 FUTURE OPERATIONS – 2041

The following section presents the MMLOS analysis for future operations in 2041 – for the ‘do nothing’ scenario and for the Denison Avenue Extension.

6.4.1 Segment Future Operations 2041 – Do Nothing

Table 6-20 through **Table 6-23** shows the segment PLOS, BLOS and ALOS scores under the ‘do nothing’ scenario in 2041.

Table 6-20: Pedestrian Level of Service (PLOS) for Study Segments – Existing Conditions - 2041

Road Name	Sidewalk Width (m) ²²	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT) ²³	Presence of On-Street Parking	Operating Speed (km/h)	Segment PLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	1.20	1.00	206	Yes	50	F	C	No
Park Street	1.15	0.70	344	Yes	50	F	C	No
Railroad Street	1.20	2.70	2279	No	50	F	C	No
Mill Street	1.20	1.05	5480	No	50	F	C	No
West Street	1.20	1.95	483	Yes	50	F	C	No
Nelson Street	1.10	2.05	5042	No	50	F	C	No

²² Sidewalk and Boulevard width were estimated from Google Earth Images.

²³ AADT values were estimated from PM peak hour volume (assuming that PM Peak Hour Volume is 8% of AADT)

Table 6-21: Segment BLOS – Do Nothing – 2041

Road Segment Name ²⁴	Number of Travel Lanes	No Marked Centerline or Classified as residential?	Operating Speed (km/h)	Segment BLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	Yes	50	B	B	Yes
Park Street	2	Yes	50	B	B	Yes
Railroad Street	2	Yes	50	B	B	Yes
Mill Street	2	Yes	50	B	B	Yes
West Street	2	Yes	50	B	B	Yes
Nelson Street	2	Yes	50	B	B	Yes

Table 6-22: Segment ALOS – Do Nothing – 2041 (AM)

Road Segment Name ²⁵	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	F	D	No
Railroad Street	2	F	D	No
Mill Street	2	F	D	No
West Street	2	A	D	Yes
Nelson Street	2	F	D	No

²⁴ The Road Segments limits are shown in Figure 6-1.

²⁵ The Road Segments limits are shown in Figure 6-1.

Table 6-23: Segment ALOS – Do Nothing – 2041 (PM)

Road Segment Name ²⁶	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	D	D	Yes
Railroad Street	2	F	D	No
Mill Street	2	F	D	No
West Street	2	A	D	Yes
Nelson Street	2	F	D	No

6.4.2 Intersection Future Operations 2041 – Do Nothing

Table 6-24 through Table 6-28 show the intersection PLOS, BLOS and ALOS scores for the ‘do nothing’ scenario in 2041.

Table 6-24: Approach and Overall Intersection PETSU Score and PLOS – Do Nothing – 2041

No	Intersection	Score / PLOS				
		North Approach	South Approach	West Approach	East Approach	Critical PLOS
1	West Street @ Denison Avenue	84 / B	84 / B	84 / B	84 / B	84 / B
2	Park Street @ Denison Avenue	84 / B	N/A	84 / B	84 / B	84 / B
3	Park Street @ Nelson Street W	84 / B	84 / B	84 / B	84	84
4	Mill Street N @ Nelson Street W	87 / B	87 / B	87 / B	87 / B	87 / B
5	Mill Street N @ Railroad Street	84 / B	84 / B	87 / B	87 / B	84 / B

²⁶ The Road Segments limits are shown in Figure 6-1.

Table 6-25: Approach and Overall Intersection BLOS – Do Nothing 2041

No	Intersection	BLOS				Critical PLOS
		North Approach	South Approach	West Approach	East Approach	
1	West Street @ Denison Avenue	B	B	B	B	B
2	Park Street @ Denison Avenue	B	N/A	B	B	B
3	Park Street @ Nelson Street W	B	B	B	B	B
4	Mill Street N @ Nelson Street W	B	B	B	B	B
5	Mill Street N @ Railroad Street	B	B	B	B	B

Table 6-26: Overall Intersection Performance Summary ALOS – without Denison Avenue Extension (Do-Nothing) - 2041

No.	Intersection	2041	
		AM	PM
1	West Street @ Denison Avenue (existing 4-leg intersection – two-way Stop)	A	A
2	Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.)	A	A
3	Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)	C	A
4	Mill Street N @ Nelson Street W (existing 4-leg intersection – four-way stop)	F	F
5	Mill Street N @ Railroad Street (existing 4-leg intersection – two-way stop)	F	E

Table 6-27: Intersection Operational Analysis ALOS - Do Nothing - 2041 AM

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	4.9	A	EB	9.3	A	0.034	0.6
				NB	7.3	A	0.001	0.0
				SB	7.3	A	0.003	0.0
				WB	9.2	A	0.015	0.0
2	Park Street @ Denison Avenue (Two-way stop control)	4.5	A	EB	7.3	A	0.006	0.0
				WB	9.1	A	0.013	0.0
				SB	-	A	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	24.3	C	EB	7.7	A	0.002	0.0
				NB	93.6	F	0.997	64.0
				SB	67.2	F	0.374	9.5
				WB	8.9	A	0.063	1.3
4	Mill Street N @ Nelson Street W (Four-way stop control)	122.3	F	EB	223.9	F	1.409	206.7
				NB	22.3	C	0.574	17.1
				SB	72.9	F	1.123	80.5
				WB	22.4	C	0.595	19.0
5	Mill Street N @ Railroad Street (Two-way stop control)	97.3	F	NB	0	A	-	0.0
				EB	419.3	F	1.788	147.7
				WB	21.2	C	0.272	7.0
				SB	8.4	A	0.059	1.3

Table 6-28: Intersection Operational Analysis ALOS - Do Nothing - 2041 PM

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	2.8	A	EB	9.4	A	0.022	0.6
				NB	0.0	A	-	0.0
				SB	0.0	A	-	0.0
				WB	9.4	A	0.017	0.6
2	Park Street @ Denison Avenue (Two-way stop control)	5.5	A	EB	7.3	A	0.005	0.0
				WB	8.8	A	0.031	0.6
				SB	-	A	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	3.7	A	EB	8.7	A	0.002	0.0
				NB	20.2	C	0.398	12.0
				SB	26.5	D	0.163	3.8
				WB	8.0	A	0.018	0.6
4	Mill Street N @ Nelson Street W (Four-way stop control)	100.4	F	EB	107.25	F	1.177	93.2
				NB	52	F	0.944	50.1
				SB	56.3	F	0.970	54.5
				WB	157.6	F	1.280	130.0
5	Mill Street N @ Railroad Street (Two-way stop control)	37.1	E	NB	9.4	A	0.008	0.0
				EB	242.7	F	1.326	77.3
				WB	49.5	E	0.623	22.8
				SB	8.6	A	0.044	0.6

6.4.3 Segment Future Operations 2041 – With Denison Ave Extension

Table 6-29 through Table 6-32 show the segment PLOS, BLOS and ALOS scores with the Denison Avenue extension in 2041.

Table 6-29: Pedestrian Level of Service (PLOS) for Study Segments – Future Conditions 2041

Road Name	Sidewalk Width (m) ²⁷	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT) ²⁸	Presence of On-Street Parking	Operating Speed (km/h)	Segment PLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	1.20	1.00	206	Yes	50	F	C	No
Park Street	1.15	0.70	344	Yes	50	F	C	No
Railroad Street	1.20	2.70	2279	No	50	F	C	No
Mill Street	1.20	1.05	5480	No	50	F	C	No
West Street	1.20	1.95	483	Yes	50	F	C	No
Nelson Street	1.10	2.05	5042	No	50	F	C	No

²⁷ Sidewalk and Boulevard width were estimated from Google Earth Images.

²⁸ AADT values were estimated from PM peak hour volume (assuming that PM Peak Hour Volume is 8% of AADT)

Table 6-30: Segment BLOS – With Extension 2031

Road Segment Name ²⁹	Number of Travel Lanes	No Marked Centerline or Classified as residential?	Operating Speed (km/h)	Segment BLOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	Yes	50	B	B	Yes
Park Street	2	Yes	50	B	B	Yes
Railroad Street	2	Yes	50	B	B	Yes
Mill Street	2	Yes	50	B	B	Yes
West Street	2	Yes	50	B	B	Yes
Nelson Street	2	Yes	50	B	B	Yes

Table 6-31: Segment ALOS – With Extension – 2041 (AM)

Road Segment Name ³⁰	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	B	D	Yes
Park Street	2	C	D	Yes
Railroad Street	2	F	D	No
Mill Street	2	F	D	No
West Street	2	A	D	Yes
Nelson Street	2	F	D	No

²⁹ The Road Segments limits are shown in Figure 6-1.

³⁰ The Road Segments limits are shown in Figure 6-1.

Table 6-32: Segment ALOS – With Extension – 2041 (PM)

Road Segment Name ³¹	Number of Travel Lanes	Segment ALOS	Minimum Desirable MMLOS Targets	Meet Target?
Denison Avenue	2	A	D	Yes
Park Street	2	C	D	Yes
Railroad Street	2	F	D	No
Mill Street	2	F	D	No
West Street	2	A	D	Yes
Nelson Street	2	F	D	No

6.4.4 Intersection Future Operation 2041 – With Denison Ave Extension

Table 6-24 through Table 6-28 show the segment PLOS, BLOS and ALOS scores with the Denison Avenue Extension in 2041.

³¹ The Road Segments limits are shown in Figure 6-1.

Table 6-33: Approach and Overall Intersection PETS I Score and PLOS – With Denison Ave Extension - 2041

No	Intersection	PERSI Score / PLOS				
		North Approach	South Approach	West Approach	East Approach	Critical PLOS
1	West Street @ Denison Avenue	84 / B	84 / B	84 / B	84 / B	84 / B
2	Park Street @ Denison Avenue	84 / B	N/A	84 / B	84 / B	84 / B
3	Park Street @ Nelson Street W	84 / B	84 / B	84 / B	84 / B	84 / B
4	Mill Street N @ Nelson Street W	87 / B	87 / B	87 / B	87 / B	87 / B
5	Mill Street N @ Railroad Street	84 / B	84 / B	87 / B	87 / B	84 / B
6	Denison Avenue @ Park Street	84 / B	84 / B	84 / B	84 / B	84 / B
7	Denison Avenue @ Mill Street N	84 / B	84 / B	84 / B	84 / B	84 / B

Table 6-34: Approach and Critical Overall Intersection BLOS – with Denison Ave Extension - 2041

No	Intersection	BLOS				Critical PLOS
		North Approach	South Approach	West Approach	East Approach	
1	West Street @ Denison Avenue	B	B	B	B	B
2	Park Street @ Denison Avenue	B	N/A	B	B	B
3	Park Street @ Nelson Street W	B	B	B	B	B
4	Mill Street N @ Nelson Street W	B	B	B	B	B
5	Mill Street N @ Railroad Street	B	B	B	B	B
6	Denison Avenue @ Park Street	B	B	B	B	B
7	Denison Avenue @ Mill Street N	B	B	B	B	B

Table 6-35 - Intersection ALOS – With Denison Ave Extension - 2041

Intersection No.	Intersection	2041	
		AM	PM
1	West Street @ Denison Avenue (existing 4-leg intersection – two-way stop)	A	A
2	Park Street @ Denison Avenue (existing 3-leg intersection – stop control at Park St.)	A	A
3	Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)	A	A
4	Mill Street N @ Nelson Street W (existing 4-leg intersection – four-way stop)	F	F
5	Park Street @ Nelson Street W (existing 4-leg intersection – two-way stop)	F	E
6	Denison Avenue @ Park Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	A	A
7	Denison Avenue @ Mill Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	A	A

Table 6-36: Intersection Operational Analysis with Denison Ave Extension 2041 (AM)

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	7.9	A	EB	10.0	B	0.139	3.2
				NB	7.3	A	0.001	0.0
				SB	7.3	A	0.003	0.0
				WB	10.0	B	0.050	1.3
2	Park Street @ Denison Avenue (Two-way stop control)	1.2	A	EB	7.3	A	0.006	0.0
				WB	9.6	A	0.015	0.0
				SB	-	-	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	3.8	A	EB	7.6	A	0.018	0.6
				NB	15.6	C	0.268	7.0
				SB	20.3	C	0.163	3.8
				WB	8.6	A	0.059	1.3
4	Mill Street N @ Nelson Street W (Four-way stop control)	97	F	EB	166.5	F	1.276	149.6
				NB	24.8	C	0.542	19.7
				SB	87.9	F	1.050	90.0
				WB	39.4	E	0.792	43.1
5	Mill Street N @ Railroad Street (Two-way stop control)	97.3	F	NB	0	A	-	0.0
				EB	419.3	F	1.788	147.7
				WB	21.2	C	0.272	7.0
				SB	8.4	A	0.059	1.3
6	Denison Avenue @ Park Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	5.7	A	NB	-	A	-	0.0
				SB	7.5	A	0.057	1.3
				WB	9.7	A	0.061	1.3
7	Denison Avenue @ Mill Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	3.3	A	EB	15.9	C	0.383	11.4
				NB	8.3	A	0.028	0.6
				SB	-	A	-	0.0

Table 6-37: Intersection Operational Analysis With Denison Ave Extension 2041 (PM)

Int. No.	Intersection	Delay (s)	LOS	Movement	Delay (s)	LOS	V/C	Queue (m)
1	West Street @ Denison Avenue (Two-way stop control)	6.4	A	EB	9.9	A	0.085	1.9
				NB	0.0	A	-	0.0
				SB	0.0	A	-	0.0
				WB	9.9	A	0.091	1.9
2	Park Street @ Denison Avenue (Two-way stop control)	2.0	A	EB	7.4	A	0.005	0.0
				WB	9.3	A	0.035	0.6
				SB	-	-	-	0.0
3	Park Street @ Nelson Street W (Two-way stop control)	4.0	A	EB	8.5	A	0.020	0.6
				NB	18.3	C	0.366	10.1
				SB	20.9	C	0.164	3.8
				WB	7.9	A	0.017	0.6
4	Mill Street N @ Nelson Street W (Four-way stop control)	100.3	F	EB	71.5	F	1.042	65.9
				NB	55.2	F	0.952	52.6
				SB	83.4	F	1.098	76.7
				WB	164.9	F	1.280	135.0
5	Mill Street N @ Railroad Street (Two-way stop control)	37.1	E	NB	9.4	A	0.008	0.0
				EB	242.7	F	1.326	77.3
				WB	49.5	E	0.623	22.8
				SB	8.6	A	0.044	0.6
6	Denison Avenue @ Park Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	3.6	A	NB	-	A	-	0.0
				SB	7.6	A	0.035	0.6
				WB	9.3	A	0.084	1.9
7	Denison Avenue @ Mill Street (Proposed 3-leg intersection – stop control at Denison Avenue extension)	2.2	A	EB	13.3	B	0.237	5.7
				NB	8.2	A	0.048	1.3
				SB	-	A	-	0.0

7 Summary of MMLOS Assessment

7.1 SUMMARY OF MMLOS FOR SEGMENTS AND INTERSECTIONS

The summary of the MMLOS analysis for existing and future conditions for the study intersections is shown in **Table 7-1**. The ALOS of the intersection of Park Street and Denison Avenue and the intersection of Mill Street and Nelson Avenue slightly improve with the Denison Avenue extension but are still below target ALOS of “D”. The other remaining intersections meet the target ALOS of “D” with and without the extension. The BLOS of the study intersections meet the minimum targets with and without the extension of Denison Avenue for all intersections. The PLOS of the study intersections meets the minimum targets with and without the extension of Denison Avenue for all intersections. However, the PLOS of intersections will be governed by the PLOS of segments as shown in the below paragraphs.

Table 7-1: Summary MMLOS Analysis Results for the Study Intersections

#	Intersection	Existing Conditions			Future Conditions 2031 (without Denison Ave Ext)			Future Conditions 2031 (with Denison Ave Ext)			Future Conditions 2041 (without Denison Ave Ext)			Future Conditions 2041 (with Denison Ave Ext)		
		ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS
1	West Street @ Denison Avenue	A/A	B	B	A/A	B	B	A/A	B	B	A/A	B	B	A/A	B	B
2	Park Street @ Denison Avenue	A/A	B	B	A/A	B	B	A/A	B	B	A/A	B	B	A/A	B	B
3	Park Street @ Nelson Street W	A/A	B	B	A/A	B	B	A/A	B	B	C/A	B	B	A/A	B	B
4	Mill Street N @ Nelson Street W	B/B	B	B	E/D	B	B	C/D	B	B	F/F	B	B	F/F	B	B
5	Mill Street N @ Railroad Street	A/A	B	B	D/A	B	B	D/A	B	B	F/E	B	B	F/E	B	B
6	Denison Avenue @ Park Street	N/A	N/A	N/A	N/A	N/A	N/A	A/A	B	B	N/A	N/A	N/A	A/A	B	B
7	Denison Avenue @ Mill Street	N/A	N/A	N/A	N/A	N/A	N/A	A/A	B	B	N/A	N/A	N/A	A/A	B	B

The summary of the MMLOS analysis for existing and future conditions for the study segments is shown in **Table 7-2**. Mill Street, Nelson Street and Park Street improve with the extension of Denison Avenue. However, Denison Avenue segment will have a slightly lower ALOS due to the higher volumes and the proposed stop-controlled intersection with Mill Street. The ALOS of Denison Avenue still meets the minimum ALOS target. The ALOS of the remaining study segments operates at “F” with and without the extension which does not meet the minimum ALOS targets of “D”. The BLOS of the study segments meet the minimum targets with and without the extension of Denison Avenue for all intersections. However, the PLOS of the study segments is “F” due to the width of the sidewalks.

Table 7-2: Summary MMLOS Analysis Results for the Study Segments

Road Name	Existing Conditions			Future Conditions 2031 (without Denison Ave Ext)			Future Conditions 2031 (with Denison Ave Ext)			Future Conditions 2041 (without Denison Ave Ext)			Future Conditions 2041 (with Denison Ave Ext)		
	ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS	ALOS (AM/PM)	BLOS	PLOS
Denison Avenue	A/A	B	F	A/A	B	F	A/A	B	F	A/A	B	F	B/A	B	F
Park Street	B/B	B	F	C/C	B	F	C/C	B	F	F/D	B	F	C/C	B	F
Railroad Street	C/C	B	F	F/F	B	F	F/F	B	F	F/F	B	F	F/F	B	F
Mill Street	B/B	B	F	D/D	B	F	C/C	B	F	F/F	B	F	F/F	B	F
West Street	A/A	B	F	A/A	B	F	A/A	B	F	A/A	B	F	A/A	B	F
Nelson Street	B/B	B	F	F/E	B	F	D/D	B	F	F/F	B	F	F/F	B	F

Note:

Denison Avenue – between West Street and Park Street
 Park Street – between Railroad Street and Nelson Street
 Railroad Street between West Street and Mill Street
 Mill Street between Railroad Street and Nelson Street
 West Street between Railroad Street and Nelson Street
 Nelson Street between West Street and Mill Street

The detailed MMLOS assessments and results for existing and future conditions for the study intersections and segments are illustrated in Section 6 and 7.

7.2 QUALITATIVE ASSESSMENT AND AREA NEEDS

A qualitative assessment for the study area and the focus road segments that intersect with the Denison Avenue extension has been conducted. This helps in identifying qualitatively the neighbourhood needs especially for pedestrian and cyclists. The study area needs identified are listed below:

1. The existing study area lacks adequate pedestrian connectivity, and the extension of Denison Avenue provides a slightly reduced route distance (by around 20 meters) for pedestrians and cyclists to and from Mill Street. However, providing wider sidewalks along both sides of Denison Avenue up to the connection with Haggert Avenue would significantly improve the PLOS and pedestrian experience in the study area.
2. It is recommended to provide a pedestrian pathway from Denison Avenue to Railroad Street through the Brampton Go Secondary Parking lot where pedestrians are observed using the parking lot when coming from the GO Station. This reflects the pedestrian desire line at the area and can be fulfilled by pathway at the perimeter of the parking lot. This may need easement agreements with the GO station and possible coordination with the developer of 45 Railroad Street.
3. The intersection of Mill Street and Railroad Street is currently a two-way stop control intersection with stop signs at Railroad. Pedestrians crossing from the Brampton GO Station have to cross Mill Street from the south approach where vehicles have the right of way. Aside from the recommendations noted in the Safety Assessment which included eliminating the pedestrian walkway and crosswalk on the west approach to the intersection and relocating the stop bar and installing zebra crosswalk markings on the east and south approaches, it is suggested that the City of Brampton consider as a long term measure signalization of this intersection to provide a safer crossing for pedestrians and coordinating the signalized intersection with the Brampton GO train control. This can improve the intersection traffic operation and improve the safety performance for the pedestrian movements.
4. Investigate the need for a traffic signal or roundabout at the intersection of Mill Street and Nelson Street.
5. Crosswalks are recommended to be provided at all intersections to improve yield compliance to pedestrians and provide a safer crossing through the intersections.
6. It is recommended that the intersection of Denison Avenue and Haggert Avenue operate as an all-way stop control intersection along with crosswalks at each approach. This will enhance the overall connectivity of Denison Avenue between Mill Street and McLaughlin Road. Refer to **Figure 7-1** that shows the extent of the area that incorporates the two extensions of Denison Avenue.

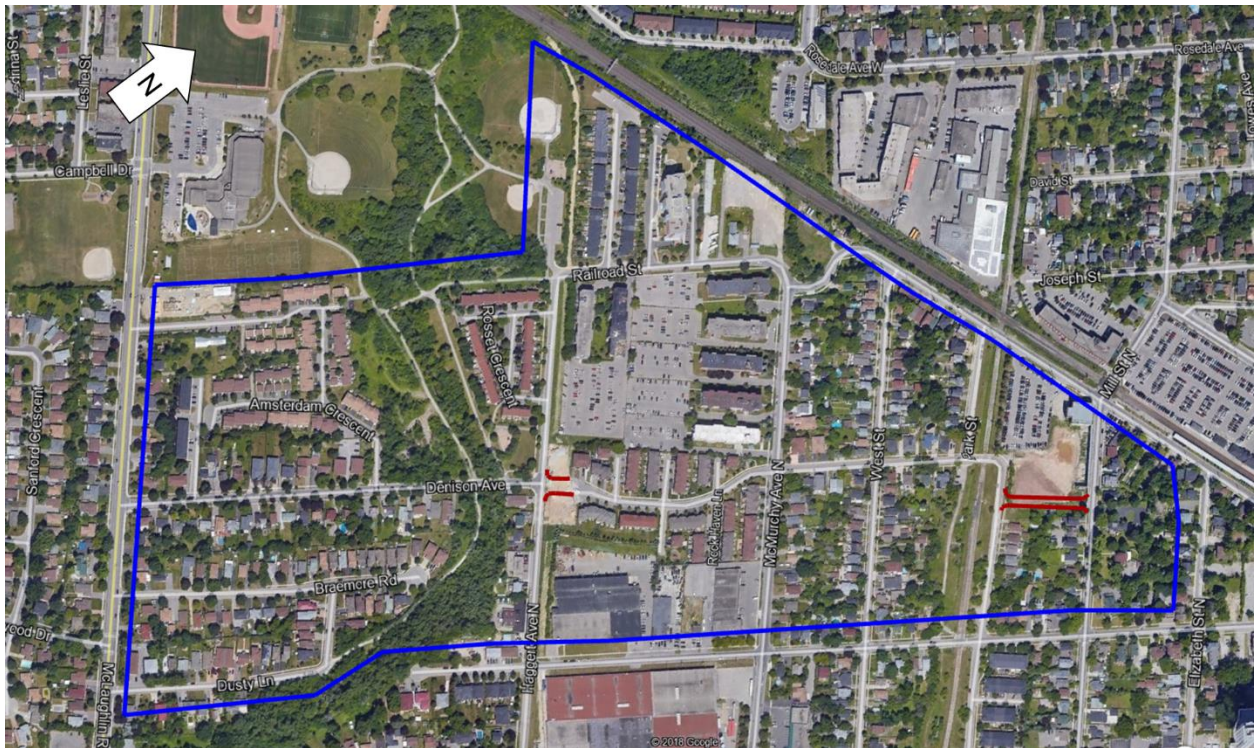


Figure 7-1: Extent of the Area that may be impacted by Denison Avenue Extension³²

8 Summary

This technical memorandum summarizes the transportation study, background, existing and proposed land uses within the study area, the analysis methodology, and existing and future traffic conditions MMLOS assessment.

The existing conditions assessment includes a review of the existing road network, cycling network and pedestrian network. The traffic counts conducted for this study were presented and validated. This report includes the estimation of the annual traffic growth within the study area based on the EMME model outputs as provided by the City of Brampton. However, all background volumes used are based on the traffic counts conducted in 2019.

The MMLOS analysis for existing and future (2031 and 2041) conditions for the study intersections and segments were conducted. The results are as follows.

³² It is understood that Denison Avenue now connected to Haggert Avenue but still not yet operational. However, the imagery used in Figure 7-1 is out of date for that area.

8.1 VEHICULAR ANALYSIS

The ALOS at the study intersections and segments slightly improves with the extension of Denison Avenue. Specific issues noted are:

- Under the 'do nothing scenario' in 2031:
 - The Railroad Street and Nelson Street segments will operate at a Level of Service of F;
 - The intersection of Mill Street North and Nelson Street West will have an overall Level of Service of E with a failing eastbound movement (Level of Service F)
 - The intersection of Mill Street North and Railroad Street will have an overall Level of Service of D with a failing eastbound movement (Level of Service F).
- In 2031, with the Denison Avenue extension
 - The Railroad Street segment will operate at a Level of Service of F;
 - The intersection of Mill Street North and Railroad Street will have an overall Level of Service of D with a failing eastbound movement (Level of Service F).
- Under the 'do nothing scenario' in 2041:
 - The Park Street, Railroad Street, Mill Street and Nelson Street segments will have a Level of Service of F;
 - The intersection of Mill Street North and Nelson Street West will have an overall Level of Service of F with a failing eastbound/southbound movement (Level of Service F)
 - The intersection of Mill Street North and Railroad Street will have an overall Level of Service of F with a failing eastbound movement (Level of Service F).
- In 2041, with the Denison Avenue extension:
 - The Railroad Street, Mill Street and Nelson Street segments will have a Level of Service of F
 - The intersection of Mill Street North and Nelson Street West will have an overall Level of Service of F with a failing eastbound/southbound movement (Level of Service F)
 - The intersection of Mill Street North and Railroad Street will have an overall Level of Service of F with a failing eastbound movement (Level of Service F).

8.2 PEDESTRIAN ANALYSIS

The PLOS of the study area is governed by the PLOS of "F" in all study segments due to the width of the sidewalks (less than 1.2 m). Pedestrian movements at the study intersections show a generally low demand throughout the study area except for the intersection of Railroad Street and Mill Street where GO Station pedestrians' volumes are high (113 pedestrians crossing the south leg). The pedestrian sidewalks within the study are not inter-connected, notably at Park Street and Denison Avenue. The existing condition of several sections of the sidewalk are heaving and/or are in poor condition, and most intersections lack pedestrian crosswalks markings. For pedestrians' demand to and from the Go Station, the proposed alignment for the Denison Avenue extension would only reduce the walking distance by +/-20 meters. However, the extension will generally reduce the walking distance for other pedestrians in the neighbourhood.

8.3 CYCLIST ANALYSIS

The BLOS of the study intersections and segments is “B” which meets the target BLOS with and without the extension. The route for pedestrians and cyclists within the study area are only reduced by around 20 meters with the Denison Avenue extension which does not provide significant benefits for the pedestrians and cyclists within the area.

Cyclists currently share the roads within the study area with vehicles and there are no dedicated bike lanes. However, the number of observed/counted cyclists were generally low which was less than 3 cyclists per directions in either the AM or PM peak hour. The low number of cyclists is likely due to the time of year that the traffic count was conducted (January).

However, it is understood that the City’s soon-to-be-completed Active Transportation Master Plan is proposing a “shared roadway” bike facility on Denison Avenue, connecting to a proposed “protected bike lane” on McLaughlin Road and to “protected bike lanes” on Railroad Street and on Queen Street via a “shared roadway” facility on Mill Street. These improvements are anticipated to increase cyclist demand.

For cyclists’ demand to and from the Go Station, the proposed alignment for the Denison Avenue extension would only reduce cycling distance by +/-20 meters. However, the extension will generally reduce cycling distance for other cyclists in the neighbourhood.

8.4 SUMMARY OF QUALITATIVE ANALYSIS

The improvements recommended based on the qualitative needs assessments are summarized in the following:

1. Providing wider pedestrian sidewalks along both sides of Denison Avenue up to the connection with Haggert Avenue which will significantly improve the PLOS and pedestrian experience in the study area. It is however acknowledged that the City of Brampton does not currently require sidewalks on both sides of residential streets.
2. Providing a pedestrian pathway from Denison Avenue to Railroad through the Brampton GO Secondary Parking lot where pedestrians are observed using the parking lot to when coming from the GO Station.
3. Aside from the recommendations noted in the Safety Assessment which included eliminating the pedestrian walkway and crosswalk on the west approach to the intersection and relocating the stop bar and installing zebra crosswalk markings on the east and south approaches, it is suggested that the City of Brampton consider as a long term measure signalization of this intersection to provide a safer crossing for pedestrians and coordinating the signalized intersection with the Brampton GO train control. This can improve traffic operation and improve the safety performance for the pedestrian movements.
4. Investigate the need for a traffic signal or roundabout at the intersection of Mill Street and Nelson Street.
5. Providing crosswalks at all intersections to improve yield compliance to pedestrians and provide a safer crossing through the intersections.

6. Connecting Denison Avenue with Haggert Avenue by creating a four-leg all-way stop control intersection along with crosswalks at each approach. This will enhance the overall connectivity of Denison Avenue starting at Mill Street and ending at McLaughlin Road.

8.5 CONCLUSIONS

In summary, it is demonstrated that the extension of Denison Avenue will generally increase the connectivity of the local transportation network with minimal improvements for the vehicular traffic in the 2031 and 2041 horizon years. Pedestrians and cyclists may benefit from the extension but additional improvements are identified within the study area which would likely complement the benefits of the extension. There are generally no negative transportation impacts identified from the extension. The extension will facilitate access to the 45 Railroad Street development, aiding in traffic flow into/out of the development.

9 Next Steps

The City comments on the draft report have been addressed and this final transportation study report will be submitted to the City for use on subsequent EA stages.

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TECHNICAL MEMORANDUM

Closure

This technical memorandum was prepared for the City of Brampton for the transportation and traffic analysis of Denison Avenue Class Environment Assessment.

The services provided by **Associated Engineering (Ont.) Ltd.** in the preparation of this technical memorandum were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

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TECHNICAL MEMORANDUM



Appendix A – 45 Railroad Development Traffic Impact Assessment

45 RAILROAD STREET PROPOSED MIXED-USE DEVELOPMENT

Traffic Impact Study

Prepared For: Preston Homes & Redwood Properties

March 1, 2016



**MOVEMENT
IN URBAN
ENVIRONMENTS**

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1.0 INTRODUCTION

During the period between December 2006 and January 2010, BA Group was retained by Stone Manor Developments Limited and had submitted two traffic impact study reports and subsequent response memorandums to the City of Brampton in support of Official Plan and Zoning By-law amendment applications for a proposed mixed-use development (Blade Condo) at the 45 Railroad Street property. Since that time, the site had been sold by Stone Manor Developments Limited to the current owner, Preston Homes & Redwood Properties. The subject site has been granted zoning amendment approval.

BA Group is now retained by Preston Homes & Redwood Properties to provide transportation consulting services in relation to a site plan application for the proposed mixed-use development at the 45 Railroad Street property located in downtown Brampton at the southwestern corner of Railroad Street and Mill Street North. The site location is illustrated in Figure 1.

1.1 SITE DESCRIPTION

The site is “L” shaped, orientated at an oblique angle and bounded by: Mill Street in the east, Railroad Street in the north, a secondary Brampton GO parking lot and Park Street in the west, and existing residential dwelling units in the south. The site was occupied by the former Dominion Skate Factory, a heritage two-storey brick building. This factory has been demolished, however, the heritage two-storey building and the Mill Street façade has been preserved and will be incorporated into the development.

The secondary Brampton GO parking lot immediately west of the site accommodates approximately 161 surface parking spaces. The parking lot has existing access off of Railroad Street at two locations, sharing the east Railroad Street access with the site at the boundary between the two. However, this second eastern access is located within the property boundary of the subject site. An easement is in place between the property owner and Brampton GO to allow Brampton GO to have access privileges to the future development located at Railroad Street to facilitate users to the surface parking lot.

On the west side of the site where Park Street meets Denison Avenue, it makes a jogged connection between the southern and northern segments of Park Street. Currently, the eastern extent of Denison Avenue terminates at Park Street. Schedule B – City Road Hierarchy in the City of Brampton’s Official Plan shows the future extension of Denison Avenue to Mill Street North along the southern periphery of the site. This extension will involve a realignment of Park Street at the north end, where the Denison Avenue extension will intersect with Park Street, adjacent to the site and the GO parking lot.

1.2 PROPOSED DEVELOPMENT

The development proposal consists of a total of 387 condominium rental units within two towers (27-storeys and 25-storeys) with 495.5 m² of grade related retail and 495.5 m² of daycare use. These suites are comprised of a mix of 120 one-bedroom, 187 two-bedroom, and 80 three-bedroom units. The two towers will be constructed over a two phase development plan. Reduced scale copies of the ground floor and parking level site plan drawings are attached in **Appendix B**.



Parking for the site is provided in a three level below grade underground parking garage. A total of 508 vehicle parking spaces, including 397 residential tenant, 78 residential visitor, and 33 non-residential parking spaces will be provided to serve the development. In addition, 238 total bicycle parking spaces will be provided for residential occupants and visitors and non-residential occupants and visitors at the ground level. A comparison of the current development proposal to the prior proposals is summarized in Table 1.

TABLE 1 DEVELOPMENT PROPOSAL COMPARISON

	2007 Proposal	Current Proposal		Net
		Phase 1	Phase 2	
Residential				
Bachelor	0 units	0 units	0 units	0 units
1-Bedroom	206 units	61 units	59 units	-86 units
2-Bedroom	144 units	86 units	101 units	+43 units
3-Bedroom	0 units	46 units	34 units	+80 units
Subtotal	350 units	193 units	194 units	+37 units
Retail	550 m ²	495.5 m ²	-	-54.5 m ²
Daycare	0 m ²	495.5 m ²	-	+495.5 m ²
Vehicle Parking	460 spaces	285 spaces	223 spaces	+48 spaces
Bicycle Parking	-	194 spaces	44 spaces	+238 spaces
Loading	1 'Type G'	1 'Type G'	-	-

Notes

1. Based on site plans dated October 1, 2015 by Graziani & Corazza Architects Inc.

DEVELOPMENT PHASING

The current contemplated phasing program consists of the construction of the northern tower and the completion of the project will be the construction of the southerly tower.

Phase 1 – North Tower

The first phase of development involve the construction of the north tower which contain 193 dwelling units, approximately 500 square metres of ancillary retail and a daycare with gross floor area of 500 square metres. After Phase 1 is completed, the north tower will have main access from Railroad Street and secondary access from Park Street.

During the construction of Phase 1 of the development, the current easterly access for the Brampton GO parking lot will be eliminated. Therefore during this period, the Brampton GO parking lot will only have access off of its western Railroad Street driveway to facilitate traffic operations.



Phase 2 – South Tower

The second phase of development involves the construction of the south tower which contains 194 additional dwelling units. After Phase 2 is completed, the development will have main access from Railroad Street and secondary access from either Park Street or Denison Avenue, depending on the status of the Denison Avenue extension. Prior to the completion of the Denison extension, the secondary access will be off Park Street. After completion of the extension, the secondary access will be off Denison Avenue.

During construction of Phase 2 of the development, the secondary access driveway off Park Street will not be available and all Phase 1 traffic must route to/from the main access driveway off Railroad Street.

1.3 STUDY SCOPE

This report provides an assessment of the transportation related aspects of the site. The study scope for this transportation impact study was prepared in consultation with City of Brampton planning and services staff. The following sections provide a summary of key parameters adopted for the study.

1.3.1 Study Area

The study area includes the following intersections:

Signalized:

- Main Street / Church Street West
- Main Street / Nelson Street
- Main Street / Queen Street West
- Main Street / Wellington Street West
- George Street / Queen Street West
- Mill Street / Queen Street West

Unsignalized:

- Mill Street / Nelson Street
- Mill Street / Railroad Street
- Mill Street / Church Street West
- Park Street / Railroad Street
- Site Access Driveway intersections
- Brampton GO Parking Lot Driveway intersections



1.3.2 Horizon Year

The area intersections will be analyzed for the following horizon years:

- Existing traffic conditions
- 5 Year Future Background conditions
 - Baseline
 - Interim Phase 1 construction
- 5 year Future Total conditions
 - Baseline (Phase 1 completion)
 - Interim Phase 2 construction
 - Phase 2 completion without extension
 - Phase 2 completion with extension

1.3.3 Time Periods

Area study intersections will be analyzed at weekday morning and afternoon peak hour periods.



2.0 TRANSPORTATION CONTEXT

2.1 AREA TRAVEL CHARACTERISTICS

The site is located within walking distance to the Brampton GO rail terminal, which offers a high level of accessibility to higher order transit services. The location is also along local transit route 52, which connects residents to the higher order ZUM bus service along Main Street and thereby reducing auto reliance for area residents. BA Group has undertaken a review of travel characteristics for the site vicinity using information provided by the 2011 Transportation Tomorrow Survey (TTS). Modal choice travel characteristics for residential land uses in the area for inbound and outbound directions are summarized in Table 2.

TABLE 2 RESIDENTIAL MODAL CHOICE FOR SITE ENVIRONS

Direction	Transit	Auto Driver	Auto Passenger	Walk	Cycle
Inbound ²	16%	64%	11%	8%	1%
Outbound ³	13%	64%	13%	10%	1%

Notes:

1. Reflects all trips made to / from residential land uses within 2006 GTA Zones 3492, 3349, 3520, 3347
2. Based on inbound trips made during the afternoon peak period from 15:00 to 18:00
3. Based on outbound trips made during the morning peak period from 6:00 to 9:00

Given the site's proximity to the Brampton GO parking lots, a significant portion of existing traffic on the area street network in the site vicinity during the peak period is related to commuter transit trips. To better understand the directional distribution of this traffic, BA Group has reviewed the 2011 TTS for transit trips made to / from the Brampton GO terminal that arrive / leave by driving during the morning and afternoon peak period. Directional distribution patterns for users of the commuter lot are summarized in Table 3.

TABLE 3 COMMUTER LOT TRIP DISTRIBUTION

Direction	To / From Main St N	To / From Main St S	To / From Queen St W	To / From Queen St E
Inbound ²	48%	15%	22%	16%
Outbound ³	55%	15%	18%	13%

2.2 AREA TRANSIT NETWORK

2.2.1 Existing Transit Service

The site is located adjacent to the Downtown Brampton Terminal which provides a connection to a wide range of transit services including: VIA Rail services, GO bus and rail services, and local Brampton transit. These services are briefly described in the following section. Area transit services are illustrated in Figure 2.



The Downtown Brampton Terminal, also known as the Brampton GO Rail Station, is located on the north side of the rail tracks with access from Church Street West and Mill Street North. The commuter lot adjacent to the station can accommodate approximately 590 vehicles (including accessible spaces). The station is also served by a secondary commuter parking lot located south of the rail tracks adjacent to the site with access from Railroad Street. This secondary lot can accommodate approximately 161 vehicles and generates a significant portion of vehicular traffic along Railroad Street and pedestrian traffic crossing the Mill Street / Railroad Street intersection during peak periods.

VIA RAIL

The Via Rail provides a connection to other major cities across Canada. The Downtown Brampton Terminal is along the Toronto-Sarnia route. This station is unstaffed and is operated via a self-service kiosk.

GO RAIL AND BUSES

GO Rail

The Kitchener GO Train line operates between Kitchener to Union Station with headway of 30 minutes during the morning peak period (6:00 to 9:00) then with headways of 60 minutes thereafter until 16:00. In the reverse direction, the route operates between Union Station to Kitchener with headway of 60 minutes during the day between 9:30 to 16:30 then with headways of 30 minutes during the afternoon peak period until 18:40. Outside of this time, the Kitchener GO Rail line is not in operation.

GO Bus

Route 31 operates from Union Station to the Downtown Brampton Terminal during the morning peak period (6:00 to 8:00) with headway of 30 minutes, during the evening period (19:00 to 21:00) with headway of 90 minutes, and during the night (midnight to 2:30) with headway of 60 minutes. In the reverse direction, Route 31 operates from the Downtown Brampton Terminal to Union Station during the morning (4:30 to 5:30) with headway of 30 minutes, during the evening peak period (16:30 to 22:00) with headway of 30 minutes, and during the night (22:00 to 1:00) with headway of 60 minutes.

Route 37 provides a connection from Orangeville Mall to the Downtown Brampton Terminal with linkage to the Kitchen GO Rail during the morning peak period (5:30 to 8:00) with headway of 30 minutes in the southbound direction or from the terminal to Orangeville Mall during the afternoon peak period (16:30 to 19:00) with headway of 30 minutes in the northbound direction. Two additional trains are scheduled for the route during off-peak periods in either direction.

BRAMPTON TRANSIT

ZUM 501 – Queen Street East

The ZUM 501 rapid bus transit service operates east-west all day along Queen Street East between Main Street in the west and York University in the east. During the weekday peak periods, the route operates with headways of 7.5 minutes and with headways of 10 minutes during mid-day off-peak periods in either direction. During weekday late night and early morning periods, the route operates with headways of 10 to 15 minutes.



ZUM 502 – Main Street

The Zum 502 rapid bus transit service operates east-west all day along Main Street between Sandalwood Parkway in the west and Mississauga City Centre Terminal in the east with a stop at the Downtown Brampton Terminal. During the weekday peak periods, the route operates with headways of 9 minutes and with headways of 11 minutes during mid-day off-peak periods in either direction. During weekday late night and early morning periods, the route operates with headways of 20 minutes.

Route 1 – Queen Street

Route 1 operates east-west along Queen Street between Chinguacousy Road in the west and The Gore Road in the east along Queen Street with headways of 10 minutes during weekday peak periods in both directions.

Route 2 – Main Street

Route 2 operates north-south along Main Street between the Highway 407 GO Park and Ride in the south and Heart Lake Terminal in the north with headways of 20 minutes during weekday peak periods in both directions.

Route 24 – Van Kirk

Route 24 operates north-south along Van Kirk Drive between George Road / Diplock Lane in the south and Hurontario Street / Mayfield Road in the north with headways of 30 minutes during weekday peak periods in both directions.

Route 25 - Edenbrook

Route 25 operates north-south along Edenbrook Hill Drive, Fletchers Creek Boulevard, and Vodden Street West between the Downtown Brampton Terminal in the south and Wanless Drive / Queen Mary Drive in the north only during the peak periods with headway of 30 minutes in both directions.

Route 52 - McMurchy

Route 52 operates north-south along McMurchy Avenue South and forms a loose loop around Sheridan College between the Downtown Brampton Terminal in the north and Sheridan College in the south with headways of 20 minutes during peak periods in both directions.

Route 56 - Springbrook

Route 56 operates in a northwest to southeast orientation along various streets north-south then along Queen Street West east-west between Mount Pleasant GO Station and the Downtown Brampton Terminal with headways of 30 minutes during peak periods in both directions.



2.2.2 Future Transit Improvements

The Brampton 2015 Transportation Master Plan has identified a number of improvements to the existing transit infrastructure and service provision between now and 2031. The key improvements in relation to the site vicinity are summarized in the following sections. Future area transit services are illustrated in Figure 3.

By 2016, the ZUM 501 rapid transit service will be extended westward from Main Street to Mississauga Road which will connect downtown Brampton to the western boundary of the city. This extension will serve to reduce the auto reliance of west Brampton GO users to travel to / from the Downtown Brampton Terminal via transit rather than by car.

Existing ZUM services along Main Street (north of Queen Street) and Queen Street East (east of Main Street) will be upgraded to rapid transit with exclusive transit right-of-way by 2031. This upgrade will better connect users to the planned light rail transit planned for the Main Street corridor between Queen Street and the Highway 407 terminal by 2041.

2.3 STREET NETWORK FEATURES

The existing road network, lane configurations, and signal controls are illustrated in Figure 4 and are described in the following section.

Queen Street serves as the major east-west arterial in the City of Brampton crossing its downtown core. It is divided into east and west segments by Main Street. The east segment between Highway 410 to Kennedy Road has a 6-lane cross section with a shared two-way left turn median. West of Kennedy Road to Main Street, it has a 5-lane cross section including a shared two-way left turn median. West of Main Street, in the site vicinity, it has a typical 4-lane cross section with, for the most part, no on-street parking.

Main Street serves as the major north-south arterial in the City of Brampton crossing its downtown core. It is divided into north and south segments by Queen Street. It has a typical 4-lane cross section in the vicinity of the site with some on-street pay-and-display parking on either side of the street. Main Street crosses below the rail corridor to maintain uninterrupted traffic flow.

Railroad Street is a local road in the City of Brampton that runs east-west parallel to the railway tracks between McMurchy Avenue and George Street North. It has a typical 2-lane cross section in the vicinity of the site. The southern Brampton commuter lot access driveways connect only to Railroad Street.

Mill Street is a 2-lane collector street in the City of Brampton that runs north-south between Rosedale Avenue in the north and Charolais Boulevard in the south. Mill Street is split into north and south segments by Queen Street and has an offset connection between its north and south segments. Aside from Main Street North, Mill Street is the only street in the site vicinity allowing a connection across the railway tracks.

Denison Avenue is a 2-lane local road in the City of Brampton that runs east-west between east of Haggert Avenue North in the west and Park Street in the east. There are plans to extend Denison Avenue eastward to connect with Mill Street North.



Park Street is a 2-lane local road in the City of Brampton that runs north-south between Railroad Street in the north and Queen Street in the south. It makes a jogged connection with Denison Avenue.

2.4 DENISON STREET EXTENSION

A review of Schedule B – City Road Hierarchy from the City of Brampton’s Official Plan shows the future extension of Denison Avenue to Mill Street. This configuration will require an approximately 30 metre offset between the existing Denison Avenue and the extension. This extension will involve a realignment of Park Street at the north end, where the Denison Avenue extension will intersect with Park Street and will result in an offset between the existing Denison Avenue on the west side of Park Street and the Denison Avenue extension on the east side of Park Street.

This extension has been illustrated in the site plans. However, this extension is not in any of the City’s capital budgets and there is no planned construction date for the extension. Given the unknown timeline for the extension, the development proposal has contemplated two scenarios – one with access onto Park Street prior to completion of the extension and one with access onto the new Denison Avenue extension.

The future road network for Phase 1, Interim Phase 2, and Phase 2a is illustrated in Figure 5. The future road network for Phase 2b is illustrated in Figure 6.



3.0 TRAFFIC VOLUMES

3.1 EXISTING TRAFFIC

Base traffic volumes during the morning and afternoon peak hours adopted in this traffic study are based on turning movement counts obtained from the City of Brampton and turning movement counts collected on behalf of BA Group as summarized in Table 4.

TABLE 4 TURNING MOVEMENT COUNT SOURCES

Intersection	Source	Date
Main Street / Church Street	City of Brampton	Wednesday, September 9, 2015
Main Street / Nelson Street West	City of Brampton	Wednesday, September 9, 2015
Main Street / Queen Street West	City of Brampton	Tuesday, June 9, 2015
Main Street / Wellington Street West	City of Brampton	Thursday, June 4, 2015
George Street / Queen Street West	City of Brampton	Thursday, June 4, 2015
Mill Street / Church Street	Spectrum	Tuesday, November 10, 2015
Mill Street / Railroad Street	Spectrum	Tuesday, November 10, 2015 (AM) Wednesday, November 11, 2015 (PM)
Mill Street / Nelson Street West	Spectrum	Tuesday, November 10, 2015
Mill Street / Queen Street West	City of Brampton	Tuesday, December 9, 2014
GO Access East / Railroad Street	Spectrum	Tuesday, November 10, 2015
GO Access West / Railroad Street	Spectrum	Tuesday, November 10, 2015
Park Street / Railroad Street	Spectrum	Tuesday, November 10, 2015
Park Street / Denison Avenue	Spectrum	Tuesday, November 10, 2015
Park Street / Nelson Street West	Spectrum	Tuesday, November 10, 2015

The existing traffic volumes in the study area are illustrated in Figure 7.

3.2 BACKGROUND TRAFFIC

3.2.1 Corridor Growth

BA Group has undertaken a review of traffic growth patterns along Queen Street and Main Street in the site vicinity over the past 15 years to ascertain whether there has been any sustained upward trend in traffic volumes on these corridors that should be considered as part of future traffic operations analyses undertaken as part of this study.

This review has indicated there has been a sustained annual growth rate of 0% along Queen Street and 0.5% Main Street during the morning peak hour and afternoon peak hour. These general corridor growth rates have been adopted in this study over the 5 year study horizon (Figure 8). Detail of the corridor growth analysis undertaken is provided in **Appendix C**.



3.2.2 Site Specific Background Developments

Specific allowances for background traffic were included for one site which was approved but not yet constructed, 122 Main Street North, based on consultation with City of Brampton transportation planners. Given specific trip generation information was not provided by city staff for the development, BA Group has generated trips for the development based on its site statistics. This background development contemplated the development of 330 dwelling units and 1,920 m² GFA of retail. Based on the site specific zoning by-law for 122 Main Street North as approved at the OMB, parking for commercial uses shall be provided as per the Central Area Parking Requirements under Section 20.3.2 of the Brampton Zoning By-Law.

This by-law stipulates that beyond the first 150 m² GFA of commercial area, parking shall be provided for the remaining area at a ratio of 1 parking space per 20 m² GFA. Application of this ratio will require the provision of 89 parking spaces. Trip generation for the retail component of the proposal was estimated based on the proposed number of parking spaces using a parking discharge rate based on previous surveys conducted by BA Group at commercial parking sites. These surveys are summarized in **Appendix D**. Residential trip generation rates were adopted on information from the ITE Trip Generation Manual Code 232 for high-rise residential condo uses. Trip generation for 122 Main Street North is summarized in Table 5.

TABLE 5 122 MAIN STREET NORTH TRIP GENERATION

Land Use	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	2-way	In	Out	2-way
Residential						
Trip Rates	0.06	0.30	0.36	0.23	0.14	0.37
Trips (330 units)	20	100	120	75	45	120
Retail (89 spaces)¹						
Trip Rates	0.25	0.10	0.35	0.50	0.50	1.00
Pass-by Trips	0	0	0	30	30	60
Primary Trips	20	10	30	15	15	30
Total Primary Trips	20	100	120	105	75	180

Notes:

1. Parking supply based on application of Brampton Zoning By-Law

Site specific traffic allowance for 122 Main Street North is illustrated in Figure 9.

3.2.3 Future Background Traffic Volumes

Future background traffic volumes were calculated as the sum of existing traffic volumes, general regional corridor growth, and site specific background development traffic allowance and are illustrated in Figure 10.

3.3 SITE TRAFFIC

The proposal is expected to generate residential traffic, daycare traffic, and a small amount of commercial traffic. The site traffic generation and distribution is described in the following section and the updated site traffic is compared to trip generation potential of the previous proposal.

3.3.1 Residential Traffic

Residential traffic estimates were updated based on information contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual 9th Edition (instead of the 7th Edition used in the previous submission). The chosen trip generation rate was based on information in the guide for High-Rise Residential Condo/Townhouse uses (land use code 232).

The resulting trip generation data is summarized in Table 6 below. Application of the adopted trip rates would generate in the order of 65 and 70 two-way vehicular trips during the morning and afternoon peak hour, respectively during Phase 1. After Phase 2, the development will generation in the order of 140 and 145 total two-way vehicular trips during the morning and afternoon peak hour, respectively.

TABLE 6 RESIDENTIAL TRIP GENERATION

Development Phasing	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	2-way	In	Out	2-way
Trip Rate (trips/unit)	0.06	0.30	0.36	0.23	0.14	0.37
Phase 1 Trips (193 units)	10	55	65	45	25	70
Phase 2 Trips (194 units)	15	60	75	45	30	75
Total Site Residential Trips (387 units)	25	115	140	90	55	145

The distribution of residential traffic was estimated based on a review of home-based trips gathered from the 2011 Transportation Tomorrow Survey for the site vicinity (2006 GTA Zone 122). The residential trip distribution is summarized in Table 7.

TABLE 7 RESIDENTIAL TRIP DISTRIBUTION

Direction	Main To / From N	Main To / From S	Queen To / From W	Queen To / From E
Inbound	17%	11%	17%	55%
Outbound	14%	12%	12%	62%

Notes:

1. Based on residential auto trips in the 2011 database made to / from 2006 TTS Zones 3348, 3492, 3349, 3520, 3347, 3350
2. Inbound distribution based on afternoon peak period (15:00-18:00); outbound based on morning peak period (6:00-9:00)

3.3.2 Non-Residential Traffic

The development consists of a total of approximately 1,000 square metres of non-residential use. Of the proposed GFA, approximately 500 square metres is dedicated to a future daycare facility, with the balance to retail use. The balance of retail GFA is expected to predominantly serve the residents of the building, the residents in the local area, and pedestrian traffic passing by the site – particularly commuters walking from the GO parking lot to the station. As such, the proposed 495.5m² GFA retail use is expected to be ancillary in nature and will generate negligible vehicle traffic. Trip generation for the daycare component of the proposal was estimated based on application trip rates derived from the ITE Trip Generation Manual 9th Edition using Code 565 for “Day Care Centers” on a per child basis. The trip generation for the daycare component is summarized in Table 8.

TABLE 8 DAYCARE TRIP GENERATION

Development Phasing	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	2-way	In	Out	2-way
ITE565 Trip Rate (trips/child)	0.40	0.35	0.75	0.35	0.40	0.75
Phase 1 Trips (100 children)	40	35	75	35	40	75
Phase 2 Trips (0 spaces)	0	0	0	0	0	0
Total Site Retail Trips (100 children)	40	35	75	35	40	75

Distribution of daycare traffic was based on the location of concentration of local residential uses and existing turning movement ratios at area intersections.

3.3.3 Total Site Traffic

The total trip generation for the site is summarized in Table 9.

TABLE 9 PROPOSED SITE TRAFFIC COMPARISON

Development Phasing	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	2-way	In	Out	2-way
Current Proposal						
Phase 1 Total Site Trips	50	90	140	80	65	145
Phase 2 Total Site Trips	15	60	75	45	30	75
Total Site Traffic	65	150	215	125	95	220
2007 Proposal						
Total Site Traffic	30	105	135	90	55	145
Net Traffic	+35	+45	+80	+35	+40	+75

A comparison of new vehicular trips generated by the current proposal versus the 2007 proposal indicate a net increase of 80 and 75 two-way vehicle trips during the morning and afternoon peak hours, respectively.

3.3.4 Development Phasing – Site Traffic Assignment

Four scenarios were considered for site trip assignment and redistribution of existing GO parking lot traffic to reflect the various stages of development phases as described in the following section.

Interim Phase 1 – During Construction of North Tower

Interim phase 1 corresponds with the future background scenario during the construction of Phase 1 when the existing site access driveway on Railroad Street, which provides access to the GO Station surface parking lot, will be closed. To maintain the same level of access during this closure of its east access driveway, the Brampton GO commuter parking lot adjacent to the site will gain a temporary access off of Park Street. A moderate amount of GO parking lot traffic redistribution is anticipated as illustrated in Figure 11. Interim future background traffic volumes are illustrated in Figure 12.

Phase 1 – Completion of North Tower

With the completion of Phase 1 of the development, the northeastern component of the proposal with frontage onto Mill Street North and Railroad Street will be built out. The site access onto Railroad Street will be reopened. In addition, the proposed development will be served by a new secondary access off of Park Street. New residential and retail site traffic during Phase 1 is illustrated in Figure 13 and Figure 14, respectively. Total Phase 1 site traffic is illustrated in Figure 15.

Interim Phase 2 – During Construction of South Tower

Interim phase 2 corresponds with the construction of Phase 2 of the proposed development during which the secondary access driveway off Park Street would be closed. All Phase 1 traffic must be served by the Railroad Street access. Phase 2 construction traffic diversion is illustrated in Figure 16. Interim Phase 2 site traffic is illustrated in Figure 17.

Phase 2a – Completion of South Tower Prior to Denison Extension

With the completion of Phase 2 of the development, the southwestern component of the proposal with frontage onto Park Street and the future Denison Avenue extension will be built out. Given the uncertainty for the timing of the Denison Avenue extension, this phase considers completion of the development proposal prior to completion of the extension. The secondary site access driveway will be off of Park Street. The combined residential and retail site traffic for both phases of the development, taking into consideration the routing of site traffic given intermittent train blockage at Railroad Street / Mill Street, is illustrated in Figure 18.

Phase 2b – Completion of South Tower After Denison Extension

With the completion of both Phase 2 of the development and the Denison Avenue extension, the secondary site access driveway will connect to the extension instead of Park Street. After minor redistribution of site traffic to account for the change in access driveway location, the combined residential and retail site traffic for both phases of the development, taking into consideration the routing of site traffic given intermittent train blockage at Railroad Street / Mill Street, is illustrated in Figure 19, respectively.



3.4 FUTURE TOTAL TRAFFIC

Future total traffic volumes for Phase 1, Interim Phase 2, Phase 2a, and Phase 2b is the sum of the interim future background traffic volumes and total site traffic for the associated phase, and are illustrated in Figure 20, Figure 21, Figure 22, and Figure 23, respectively.



4.0 CAPACITY ANALYSIS

4.1 METHODOLOGY

Traffic operations analyses within the study area are based upon the methodologies outlined in the Highway Capacity Manual (HCM) methodology and the Synchro 9.0 software package, instead of the Canadian Capacity Guide (CCG) methodology and the Calc-2 software package used in the previous submission. With increasing Brampton GO rail transit usage, there is an increase of patrons who drive and park at the GO parking lot and utilize transit (bus) services. Given the current uni-directional operation of the GO rail limited to 30 minutes during the peak period during the morning and afternoon, operation of surrounding area intersections (i.e. the study area) is heavily influenced by the “peaky” traffic activity as vehicles arrive or leave the parking lot coinciding with the departure or arrival of the GO train.

The key performance indicator utilized for the signalized analysis is the volume to capacity (V/C) ratio where a V/C ratio of 1.0 reflects ‘at capacity’ conditions. The key performance indicator for the unsignalized analysis is a level of service (LOS) measure (ranging from A to F) that is derived based upon average delays. LOS A represents minimal delay while LOS F represents extended delay.

Existing signal timings were obtained from the City of Brampton and utilized as the basis for the signalized analysis. Signal timings have been adjusted, where appropriate, in future conditions to optimize intersection operations. The default saturation flow rate of 1900 vehicle per hour per lane was adopted.

4.1.1 Wellington Street / Main Street

An intergreen study was conducted for the westbound left turn movement at Wellington Street / Main Street during the morning and afternoon peak hours as attached in **Appendix E**.

This study provides an average number of vehicles per cycle that complete the turning maneuver during the intergreen (amber and all red phase) period. In Synchro, this lengthening of the green time is represented by a lost time adjustment parameter which effectively treats the parameter value (when negative) as the number of seconds vehicles continue to complete their turning movements during the intergreen phase. Typically, each vehicle turning during the intergreen phase represents an effective extension of the green time by 1 second. Results from the intergreen study are summarized in Table 10.

TABLE 10 WELLINGTON STREET / MAIN STREET INTERGREEN STUDY SUMMARY

Movement	AM Peak Hour	PM Peak Hour
WBL	0.35	0.45

Notes:

1. Based on intergreen study conducted by BA Group Thursday, December 10, 2015

4.2 MILL STREET NORTH BRAMPTON GO RAIL CROSSING

An at-grade rail crossing is located just north of the intersection of Mill Street and Railroad Street which have traffic operations impacts during the train crossing. The rail crossing serves the Kitchener GO railway line, which operates with a regular schedule of four two-way trains during both peak hours (two eastbound trains and two westbound trains). In addition, the CN freight train also routes along these rail tracks. However, the scheduling of the CN trains, as far as we can ascertain, operates randomly within a typical 24 hour period.

This crossing effectively meters the traffic volume at the Mill Street / Railway Street intersection by withholding traffic and allowing the built up traffic to disperse all at once. In effect, the demand volume at the intersection was increased during the clearance period until the built up queues have been dispersed. BA Group has modeled the impact of the railway crossing by analyzing the operation of Mill Street / Railroad Street based on the average peak 5 minute traffic and pedestrian volumes during the clearance periods after each train crossing event during the peak hours. Detailed analysis sheet indicating the observed peak 5 minute volumes and scaling to the peak hour are attached in **Appendix F**.

4.2.1 Calibration of Mill Street / Railroad Street Model

Traffic and pedestrian volumes during the clearance intervals have been determined by manually observing the Spectrum videos of the Mill Street / Railway Street intersection on Tuesday, November 10, 2015 for the morning peak hour and Wednesday, November 11, 2015 for the afternoon peak hour. Given Synchro recognises vehicular / pedestrian volumes on an hourly basis, BA Group had observed a 5-minute interval during the 'clearance' phase, which reflects the maximum demand, and scaled the volume to an hourly basis for the purposes of the Synchro analysis to better understand the impact of vehicular / pedestrian volumes during a typical crossing condition. These average peak 5 minute vehicular and pedestrian volumes were scaled to hourly volumes, to enable the hourly analysis methodology in Synchro, and are summarized in Table 11 and Table 12, respectively.



TABLE 11 SCALED HOURLY VEHICULAR VOLUMES DURING TRAIN CROSSING CLEARANCE

Movement	AM GO Train ¹	PM GO Train ²	PM CN Train ³
SBL	20	16	56
SBT	108	372	251
SBR	168	190	502
NBL	4	0	0
NBT	176	424	419
NBR	32	28	84
WBL	0	4	0
WBT	16	8	28
WBR	20	67	84
EBL	56	111	112
EBT	64	28	28
EBR	8	4	0

Notes:

1. Reflects the peak hour period between 7:00 – 8:00
2. Reflects the peak hour period between 16:45 – 17:45
3. CN Train crossing event was only observed during the afternoon peak hour

TABLE 12 SCALED HOURLY PEDESTRIAN VOLUMES DURING TRAIN CROSSING CLEARANCE

Approach	AM GO Train ¹	PM GO Train ²	PM CN Train ³
North Leg	4	8	0
South Leg	80	211	809
East Leg	96	215	698
West Leg	4	24	56

Notes:

1. Reflects the peak hour period between 7:00 – 8:00
2. Reflects the peak hour period between 16:45 – 17:45
3. CN Train crossing event was only observed during the afternoon peak hour

These volumes assume a sustained hypothetical vehicular and pedestrian demand throughout the hour equivalent to the average peak 5-minute volumes observed after each train crossing event. These volumes are therefore higher than the peak hour volumes at the intersection and are only used to model the operations of the Mill Street / Railroad Street intersection during the peak 5-minute after a train crossing event.

BA Group conducted a queue study at the Mill Street / Railroad Street intersection on Wednesday, November 11, 2015 for all four approaches at the intersection, with respect to the presence of a train at the railway crossing. These queues were used to calibrate the Synchro model of the intersection through adjustment of the critical gap and follow-up time parameters for the east-west movements, and are summarized in Table 13.



TABLE 13 MILL STREET / RAILROAD STREET MAX QUEUE DURING TRAIN CROSSINGS

Approach	GO Train		CN Train	
	Average	95 th Percentile	Average	95 th Percentile
NB	2 (8)	4 (11)	n/a (16)	n/a (16)
SB	3 (8)	8 (13)	n/a (16)	n/a (16)
EB	1 (3)	3 (9)	n/a (11)	n/a (11)
WB	1 (1)	2 (3)	n/a (2)	n/a (2)

Notes:

1. xx (xx) – AM (PM)
2. Values represent number of passenger car vehicles

The critical gap and follow-up time parameters were adjusted such that the observed and modelled 95th percentile queues match. The adopted calibration parameters are summarized in Table 14.

TABLE 14 CRITICAL GAP AND FOLLOW UP TIME CALIBRATION SUMMARY

Movement	Go Train		CN Train	
	Critical Gap (tC)	Follow Up Time (tF)	Critical Gap (tC)	Follow Up Time (tF)
EBL	8.5 (7.2)	6.4 (3.1)	n/a (4.9)	n/a (2.5)
EBT	8.5 (6.8)	6.4 (2.8)	n/a (4.9)	n/a (2.5)
EBR	6.2 (6.8)	3.3 (2.8)	n/a (n/a)	n/a (n/a)
WBL	n/a (8.8)	n/a (4.2)	n/a (n/a)	n/a (n/a)
WBT	10.0 (8.6)	10.0 (4.0)	n/a (2.8)	n/a (2.5)
WBR	10.0 (8.6)	10.0 (4.0)	n/a (2.8)	n/a (2.5)

Notes:

1. xx (xx) – AM (PM)

4.2.2 Intersection Blockage and Queue Dissipation Time

BA Group has reviewed the Spectrum traffic videos of the intersection operations to determine the average blockage time and queue dissipation time at the Mill Street / Railroad Street and railway crossing intersections. Video footages from Tuesday, November 10, 2015 (for the morning peak period) and Wednesday, November 11, 2015 (for the afternoon peak period) were reviewed.

The average blockage time was defined as the average sum of time it takes for the gates to come down, for the train to pass, and for the gates to lift across all train crossing events during the morning peak and afternoon peak periods. Average queue dissipation time was defined as the average time it takes for the accumulated queue to dissipate and intersection operations returning to normal levels. The observed average blockage and queue dissipate time are summarized in Table 15.



TABLE 15 MILL ST / RAILROAD ST – AVERAGE QUEUE DISSIPATION / BLOCKAGE TIME

	Per Event		Per Peak Hour	
	GO Train	CN Train	GO Train	CN Train
Blockage Time	65s (93s)	n/a (362s)	195s (279s)	n/a (362s)
Queue Dissipation	23s (87s)	n/a (252s)	69s (87s)	n/a (252s)
Subtotal			264s (366s)	n/a (614s)
Subtotal % of the Hour			7.3% (10.2%)	n/a (17.1%)
Total			264s (980s)	
Total % of the Hour			7.3% (27.3%)	

Notes:

1. xx (xx) – AM (PM)

The delay summarized above represents a worst case scenario where a vehicle arrives just as the gate comes down during a train crossing event. A typical vehicle could arrive anytime during the blockage or queue dissipation and thus experience only a portion of the above maximum delay. Furthermore, the CN train crossing is the main contributor to the delay at the Mill Street / Railroad Street intersection. However, its schedule varies and therefore may not occur during the peak hours. In such a scenario, the blockage and queue dissipation time percentage of the hour would be greatly reduced.

4.2.3 Train Crossing Analysis of Mill Street / Railroad Street

Given the adoption of the peak 5 minute demand volumes after a train crossing event, expanded to an hourly volume, the unsignalized delay results for the intersection are summarized in Table 16.

TABLE 16 MILL STREET / RAILROAD STREET UNSIGNALIZED ANALYSIS SUMMARY

Intersection / Movement	Normal		GO		CN		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Existing								
EBLTR	C (C)	18 (19)	E (F)	38 (218)	(F)	(379)	C (F)	19 (101)
WBLTR	B (B)	13 (13)	D (F)	33 (65)	(D)	(28)	B (C)	14 (21)

Notes:

1. xx (xx) – AM (PM)

The intersection operates well with level-of-service LOS C or better during normal operations. Given a train crossing event, the intersection experiences greater delays in the morning peak hour, operating with LOS D and extensive delays in the afternoon peak hour, operating with LOS F and with over 5 minutes of delay.

An overall level-of-service can be derived based on the relative percentage of time these events occur during the peak hour as summarized in Table 15 in the previous section. A weighted average of intersection delay indicate Mill Street / Railroad Street will operate with LOS C or better during the morning peak hour and, on average, with LOS F during the afternoon peak hour.

Therefore, it is anticipated that site traffic will divert from Mill Street / Railroad Street during the afternoon peak period to travel to / from the site and instead route around the intersection to enter the site via the secondary access off of Park Street. Due to the relatively good operations during the morning peak period, despite the train crossings, site traffic will not divert during the morning peak period and will route conventionally to both site accesses through all intersections as appropriate.

The secondary site access is available during the majority of the project phases. However, during the construction of Phase 2 of the development, the secondary access of Park Street will not be available and the access off of Railroad Street will be the only access to / from the site. During the morning peak hour under this scenario, there will be heavier use of the Mill Street / Railroad Street intersection due to site traffic. During the afternoon peak hour, it is anticipated that site traffic will actively route around the Mill Street / Railroad Street intersection and enter / exit the site via the west side of Railroad Street.

Future peak hour site traffic volumes have been adjusted to reflect this routing of site traffic described above during train crossing events, as illustrated in Figure 13 through Figure 19. Overall future total traffic volumes in Section 3 already reflect this routing of site traffic.

4.3 ANALYSIS APPROACH FOR STUDY AREA

Given the above, future conditions have been analyzed for the entire network under the four development phases – Phase 1, Interim Phase 2 construction (Phase 2 Int), Phase 2 – Before Extension (Phase 2a), and Phase 2 After Extension (Phase 2b) – using their respective future total traffic volumes. This represents the general conditions over the hour without any train crossing impact. Results of these analyses are presented in Section 4.4 and 4.5.

A separate sensitivity analysis was undertaken for the Mill Street / Railroad Street intersection during the morning peak hour to model the operations of the east-west legs immediately after a train crossing event during the peak hour as queued up traffic disperses. The sensitivity analysis was not conducted during the afternoon peak hour, with the exception of the Interim Phase 2 construction scenario, as site traffic was routed around the Mill Street / Railroad Street intersection and thus will not directly impact it. This analysis is presented in Section 4.6.

4.4 SIGNALIZED INTERSECTIONS

The capacity analysis results under existing and future background conditions at area signalized intersections are summarized in Table 17. Detailed Synchro analysis sheets are attached in **Appendix G**.

4.4.1 Existing and Future Background

TABLE 17 EXISTING & FUTURE BACKGROUND - SIGNALIZED CAPACITY ANALYSIS SUMMARY

Intersection / Movement	Existing		Future Background (Baseline)		Future Background (Cons) ²	
	V/C	Delay	V/C	Delay	V/C	Delay
Main St / Queen St						
Overall	0.62 (0.45)	29 (29)	0.64 (0.48)	29 (29)	0.64 (0.48)	29 (29)
EBTR	0.58 (0.40)	19 (17)	0.58 (0.40)	19 (17)	0.58 (0.40)	19 (17)
WBTR	0.33 (0.46)	25 (27)	0.33 (0.49)	25 (28)	0.33 (0.49)	25 (28)
NBTR	0.30 (0.45)	31 (35)	0.31 (0.47)	31 (35)	0.31 (0.47)	31 (35)
SBTR	0.65 (0.31)	38 (39)	0.69 (0.33)	37 (35)	0.69 (0.33)	37 (35)
Queen St / Mill St						
Overall	0.33 (0.35)	8 (8)	0.33 (0.35)	8 (8)	0.33 (0.35)	8 (8)
EBL	0.15 (0.39)	5 (8)	0.15 (0.39)	5 (8)	0.15 (0.39)	5 (8)
EBT	0.36 (0.24)	6 (5)	0.36 (0.24)	6 (5)	0.36 (0.24)	6 (5)
WBTR	0.18 (0.33)	4 (4)	0.19 (0.33)	4 (4)	0.19 (0.33)	4 (4)
SBLR	0.18 (0.16)	52 (52)	0.18 (0.16)	52 (52)	0.18 (0.16)	52 (52)
Main St / Church St						
Overall	0.53 (0.62)	23 (28)	0.58 (0.63)	24 (26)	0.58 (0.63)	24 (26)
EBL	0.33 (0.49)	38 (33)	0.33 (0.49)	38 (33)	0.33 (0.49)	38 (33)
EBTR	0.43 (0.23)	40 (30)	0.43 (0.23)	40 (30)	0.43 (0.23)	40 (30)
WBL	0.21 (0.22)	50 (44)	0.21 (0.22)	50 (44)	0.21 (0.22)	50 (44)
WBTR	0.34 (0.84)	52 (65)	0.34 (0.84)	52 (65)	0.34 (0.84)	52 (65)
NBTL	0.22 (0.56)	13 (17)	0.24 (0.58)	16 (12)	0.24 (0.58)	16 (12)
NBTR	0.22 (0.56)	13 (17)	0.24 (0.58)	16 (12)	0.24 (0.58)	16 (12)
SBTL	0.55 (0.41)	17 (20)	0.62 (0.43)	18 (21)	0.62 (0.43)	18 (21)
SBTR	0.55 (0.41)	17 (20)	0.62 (0.43)	18 (21)	0.62 (0.43)	18 (21)
Notes:						
1. xx (xx) – AM (PM)						
2. Analysis results represent operations during construction of Phase 1 of the proposed development						



Intersection / Movement	Existing		Future Background (Baseline)		Future Background (Cons) ^z	
	V/C	Delay	V/C	Delay	V/C	Delay
Main St / Nelson St						
Overall	0.62 (0.56)	23 (32)	0.70 (0.63)	22 (34)	0.70 (0.63)	22 (34)
EBL	0.34 (0.55)	40 (32)	0.37 (0.56)	41 (31)	0.37 (0.56)	41 (31)
EBTR	0.48 (0.21)	44 (28)	0.49 (0.20)	44 (27)	0.49 (0.20)	44 (27)
WBL	0.12 (0.13)	51 (46)	0.12 (0.13)	50 (46)	0.12 (0.13)	50 (46)
WBTR	0.71 (0.83)	65 (71)	0.70 (0.82)	65 (70)	0.70 (0.82)	65 (70)
NBTL	0.26 (0.38)	27 (39)	0.27 (0.44)	19 (45)	0.27 (0.44)	19 (45)
NBTR	0.26 (0.38)	27 (39)	0.27 (0.44)	19 (45)	0.27 (0.44)	19 (45)
SBTL	0.60 (0.45)	10 (11)	0.72 (0.57)	11 (13)	0.72 (0.57)	11 (13)
SBTR	0.60 (0.45)	10 (11)	0.72 (0.57)	11 (13)	0.72 (0.57)	11 (13)
George St / Queen St						
Overall	0.47 (0.47)	14 (17)	0.47 (0.47)	14 (17)	0.47 (0.47)	14 (17)
EBTL	0.49 (0.45)	8 (11)	0.49 (0.46)	8 (11)	0.49 (0.46)	8 (11)
EBTR	0.49 (0.45)	8 (11)	0.49 (0.46)	8 (11)	0.49 (0.46)	8 (11)
WBTL	0.41 (0.38)	6 (4)	0.42 (0.38)	7 (4)	0.42 (0.38)	7 (4)
WBTR	0.41 (0.38)	6 (4)	0.42 (0.38)	7 (4)	0.42 (0.38)	7 (4)
NBL	0.22 (0.40)	43 (40)	0.22 (0.40)	43 (40)	0.22 (0.40)	43 (40)
NBTR	0.12 (0.24)	42 (39)	0.12 (0.24)	42 (39)	0.12 (0.24)	42 (39)
SBL	0.20 (0.35)	53 (54)	0.20 (0.35)	53 (54)	0.20 (0.35)	53 (54)
SBTR	0.49 (0.59)	56 (58)	0.49 (0.59)	56 (58)	0.49 (0.59)	56 (58)
Main St / Wellington St						
Overall	0.51 (0.59)	30 (24)	0.52 (0.62)	30 (23)	0.52 (0.62)	30 (23)
EBL	0.19 (0.12)	51 (49)	0.17 (0.11)	51 (49)	0.17 (0.11)	51 (49)
EBTR	0.70 (0.53)	53 (55)	0.70 (0.53)	53 (54)	0.70 (0.53)	63 (54)
WBL	0.80 (0.83)	91 (86)	0.82 (0.85)	97 (91)	0.82 (0.85)	97 (91)
WBTR	0.20 (0.39)	51 (52)	0.20 (0.38)	51 (52)	0.20 (0.38)	51 (52)
NBTL	0.33 (0.51)	6 (8)	0.34 (0.54)	6 (8)	0.34 (0.54)	6 (8)
NBTR	0.33 (0.51)	6 (8)	0.34 (0.54)	6 (8)	0.34 (0.54)	6 (8)
SBTL	0.42 (0.20)	27 (19)	0.43 (0.21)	28 (17)	0.43 (0.21)	28 (17)
SBTR	0.42 (0.20)	27 (19)	0.43 (0.21)	28 (17)	0.43 (0.21)	28 (17)

Notes:

1. xx (xx) – AM (PM)
2. Analysis results represent operations during construction of Phase 1 of the proposed development

Under existing conditions, all signalized intersections will operate well with overall intersection V/C ratios of 0.62 or better during both the morning and afternoon peak hours. All intersections experience acceptable delay. The westbound movements at Main Street / Wellington Street experiences a relatively higher delay because it has a long cycle length of 140 seconds and a relatively small actuation vehicular volume for the westbound side street so only minimum green time is allocated to the westbound movements.

Currently, the westbound left movement at Main Street / Wellington Street operate under permissive turning. A westbound left turn advance could help reduce the delays to this movement, although it is not required. As long as the east-west movements for the intersection will actuate every cycle with minimum pedestrian green time, the westbound movement at the intersection will operate acceptably. All individual turning movements at all intersections operate well within capacity with V/C ratios of 0.80 and 0.83 or better during the morning and afternoon peak hour, respectively.

Under future background conditions, during or prior to the construction of Phase 1, all signalized intersection will operate well with overall intersection V/C ratios of 0.70 and 0.63 or better during the morning and afternoon peak hours, respectively. All individual turning movements will operate well with V/C ratios of 0.82 and 0.85 or better during the morning and afternoon peak hours, respectively.

4.4.2 Future Total

The capacity analysis results under future total conditions during Phase 1, Phase 2 Int, Phase 2a, and Phase 2b of the development at area signalized intersections are summarized in Table 18.

TABLE 18 FUTURE TOTAL - SIGNALIZED CAPACITY ANALYSIS SUMMARY

Intersection / Movement	Phase 1		Interim Phase 2		Phase 2a		Phase 2b	
	V/C	Delay	V/C	Delay	V/C	Delay	V/C	Delay
Main St / Queen St								
Overall	0.66 (0.49)	29 (28)	0.66 (0.49)	29 (28)	0.67 (0.50)	29 (28)	0.67 (0.50)	28 (28)
EBTR	0.62 (0.42)	20 (18)	0.62 (0.42)	20 (18)	0.63 (0.42)	21 (18)	0.63 (0.42)	21 (18)
WBTR	0.34 (0.51)	25 (28)	0.34 (0.51)	25 (28)	0.34 (0.52)	25 (28)	0.34 (0.52)	25 (28)
NBTR	0.32 (0.48)	31 (35)	0.32 (0.48)	31 (35)	0.32 (0.48)	31 (35)	0.32 (0.48)	31 (35)
SBTR	0.70 (0.33)	37 (32)	0.70 (0.33)	37 (32)	0.70 (0.33)	38 (32)	0.70 (0.33)	33 (31)
Queen St / Mill St								
Overall	0.36 (0.36)	9 (8)	0.36 (0.36)	9 (8)	0.38 (0.39)	10 (9)	0.38 (0.39)	10 (9)
EBL	0.16 (0.39)	5 (8)	0.16 (0.39)	5 (8)	0.17 (0.41)	5 (9)	0.17 (0.41)	5 (9)
EBT	0.36 (0.24)	6 (5)	0.36 (0.24)	6 (5)	0.36 (0.24)	6 (5)	0.36 (0.24)	6 (5)
WBTR	0.19 (0.34)	4 (4)	0.19 (0.34)	4 (4)	0.20 (0.34)	5 (4)	0.20 (0.34)	5 (4)
SBLR	0.38 (0.20)	55 (53)	0.38 (0.20)	55 (53)	0.50 (0.30)	56 (54)	0.50 (0.30)	56 (54)
Notes: 1. xx (xx) – AM (PM)								

Intersection / Movement	Phase 1		Interim Phase 2		Phase 2a		Phase 2b	
	V/C	Delay	V/C	Delay	V/C	Delay	V/C	Delay
Main St / Church St								
Overall	0.55 (0.65)	24 (26)	0.55 (0.65)	24 (26)	0.55 (0.64)	24 (26)	0.55 (0.64)	24 (26)
EBL	0.34 (0.49)	37 (33)	0.34 (0.49)	37 (33)	0.36 (0.49)	37 (33)	0.36 (0.49)	37 (33)
EBTR	0.43 (0.23)	39 (30)	0.43 (0.23)	39 (30)	0.42 (0.23)	39 (30)	0.42 (0.23)	39 (30)
WBL	0.21 (0.22)	50 (44)	0.21 (0.22)	50 (44)	0.21 (0.22)	50 (44)	0.21 (0.22)	50 (44)
WBTR	0.35 (0.84)	52 (65)	0.35 (0.84)	52 (65)	0.34 (0.84)	52 (65)	0.34 (0.84)	52 (65)
NBTL	0.24 (0.60)	14 (13)	0.24 (0.60)	14 (13)	0.24 (0.58)	14 (12)	0.24 (0.59)	16 (13)
NBTR	0.24 (0.60)	14 (13)	0.24 (0.60)	14 (13)	0.24 (0.58)	14 (12)	0.24 (0.59)	16 (13)
SBTL	0.59 (0.45)	18 (21)	0.59 (0.45)	18 (21)	0.59 (0.45)	18 (21)	0.59 (0.45)	18 (21)
SBTR	0.59 (0.45)	18 (21)	0.59 (0.45)	18 (21)	0.59 (0.45)	18 (21)	0.59 (0.45)	18 (21)
Main St / Nelson St								
Overall	0.71 (0.66)	24 (36)	0.71 (0.66)	24 (36)	0.70 (0.65)	24 (35)	0.70 (0.66)	22 (36)
EBL	0.36 (0.56)	41 (30)	0.36 (0.56)	41 (30)	0.37 (0.56)	41 (31)	0.37 (0.57)	41 (30)
EBTR	0.51 (0.19)	44 (25)	0.51 (0.19)	44 (25)	0.51 (0.20)	45 (26)	0.51 (0.20)	45 (25)
WBL	0.12 (0.13)	50 (46)	0.12 (0.13)	50 (46)	0.12 (0.13)	51 (46)	0.12 (0.13)	51 (46)
WBTR	0.71 (0.83)	65 (71)	0.71 (0.83)	65 (71)	0.71 (0.82)	65 (70)	0.71 (0.84)	65 (72)
NBTL	0.29 (0.46)	19 (47)	0.29 (0.46)	19 (47)	0.28 (0.46)	20 (46)	0.28 (0.47)	20 (48)
NBTR	0.29 (0.46)	19 (47)	0.29 (0.46)	19 (47)	0.28 (0.46)	20 (46)	0.28 (0.47)	20 (48)
SBTL	0.73 (0.62)	15 (15)	0.73 (0.62)	15 (15)	0.72 (0.61)	14 (15)	0.72 (0.63)	10 (16)
SBTR	0.73 (0.62)	15 (15)	0.73 (0.62)	15 (15)	0.72 (0.61)	14 (15)	0.72 (0.63)	10 (16)
George St / Queen St								
Overall	0.49 (0.49)	15 (18)	0.49 (0.49)	15 (18)	0.49 (0.49)	16 (17)	0.49 (0.49)	16 (18)
EBTL	0.50 (0.47)	10 (11)	0.50 (0.47)	10 (11)	0.51 (0.47)	11 (12)	0.51 (0.48)	11 (12)
EBTR	0.50 (0.47)	10 (11)	0.50 (0.47)	10 (11)	0.51 (0.47)	11 (12)	0.51 (0.48)	11 (12)
WBTL	0.43 (0.40)	7 (4)	0.43 (0.40)	7 (4)	0.44 (0.41)	7 (4)	0.44 (0.41)	7 (4)
WBTR	0.43 (0.40)	7 (4)	0.43 (0.40)	7 (4)	0.44 (0.41)	7 (4)	0.44 (0.41)	7 (4)
NBL	0.22 (0.40)	43 (40)	0.22 (0.40)	43 (40)	0.23 (0.40)	43 (40)	0.23 (0.40)	43 (40)
NBTR	0.12 (0.24)	42 (39)	0.12 (0.24)	42 (39)	0.12 (0.24)	42 (39)	0.12 (0.24)	42 (39)
SBL	0.28 (0.40)	53 (54)	0.28 (0.40)	53 (54)	0.40 (0.43)	55 (55)	0.40 (0.51)	55 (57)
SBTR	0.52 (0.61)	56 (59)	0.52 (0.61)	56 (59)	0.51 (0.59)	56 (58)	0.51 (0.60)	56 (59)
Notes: 1. xx (xx) – AM (PM)								

Intersection / Movement	Phase 1		Interim Phase 2		Phase 2a		Phase 2b	
	V/C	Delay	V/C	Delay	V/C	Delay	V/C	Delay
Main St / Wellington St								
Overall	0.53 (0.62)	30 (23)	0.53 (0.62)	30 (23)	0.53 (0.62)	30 (23)	0.53 (0.62)	30 (23)
EBL	0.17 (0.11)	51 (49)	0.17 (0.11)	51 (49)	0.17 (0.11)	51 (49)	0.17 (0.11)	51 (49)
EBTR	0.70 (0.54)	63 (55)	0.70 (0.54)	63 (55)	0.70 (0.53)	63 (54)	0.70 (0.53)	63 (54)
WBL	0.84 (0.85)	102 (92)	0.84 (0.85)	102 (92)	0.85 (0.85)	105 (91)	0.85 (0.85)	105 (91)
WBTR	0.20 (0.39)	51 (52)	0.20 (0.39)	51 (52)	0.20 (0.38)	51 (52)	0.20 (0.38)	51 (52)
NBTL	0.35 (0.55)	6 (8)	0.35 (0.55)	6 (8)	0.35 (0.55)	6 (8)	0.35 (0.55)	6 (8)
NBTR	0.35 (0.55)	6 (8)	0.35 (0.55)	6 (8)	0.35 (0.55)	6 (8)	0.35 (0.55)	6 (8)
SBTL	0.44 (0.22)	27 (17)	0.44 (0.22)	27 (17)	0.44 (0.22)	28 (17)	0.44 (0.22)	27 (18)
SBTR	0.44 (0.22)	27 (17)	0.44 (0.22)	27 (17)	0.44 (0.22)	28 (17)	0.44 (0.22)	27 (18)

Notes:

1. xx (xx) – AM (PM)

Future Total Phase 1 & Interim Phase 2

The rerouting of Phase 1 traffic due to the closure of the secondary site access off of Park Street does not affect the overall or individual movement performance at signalized intersections in the study area. Under future total conditions during Phase 1 and Interim Phase 2, all signalized intersections will continue to operate well with overall V/C ratios of 0.71 and 0.66 or better during the morning and afternoon peak hour, respectively. Individual movement will also continue to operate well with V/C ratios of 0.84 and 0.85 or better at all study area signalized intersections during the morning and afternoon peak hour, respectively.

The proposed development will have a nominal impact of a 0% to 3% and 0% to 1% increase in overall intersection V/C ratios at all signalized study area intersections during the morning and afternoon peak hours. Based on the foregoing, site traffic generated by Phase 1 of the development can be accommodated by the area signalized intersections.

Future Total Phase 2a and 2b

The rerouting of total site traffic due to location of the secondary access off Park Street or off the extension of Denison Avenue does not affect the overall or individual movement performance at signalized intersections in the study area. Under future total conditions during Phase 2a and Phase 2b, all signalized intersections will continue to operate well with overall V/C ratios of 0.70 and 0.66 or better. Individual movement will also continue to operate well with V/C ratios of 0.85 or better at all study area signalized intersections during both peak hours.

The total proposed development will have a nominal impact of a 0% to 5% and 0% to 4% increase in overall intersection V/C ratios at all signalized study area intersections during the morning and afternoon peak hours, respectively. Based on the foregoing, site traffic generated by the total development can be accommodated by the area signalized intersections.



4.5 UNSIGNALIZED INTERSECTIONS

4.5.1 Existing and Future Background

Analysis results under existing and future background conditions during regular operations at area unsignalized intersections are summarized in Table 19. Synchro analysis sheets are attached in **Appendix H**.

TABLE 19 EXISTING AND FUTURE BACKGROUND UNSIGNALIZED ANALYSIS SUMMARY

Intersection / Movement	Existing		Future Background (Base)		Future Background (Cons) ²	
	LOS	Delay	LOS	Delay	LOS	Delay
Mill St / Church St						
WBLR	A (B)	9 (13)	A (B)	9 (13)	A (B)	9 (13)
NBTR	A (B)	9 (13)	A (B)	9 (13)	A (B)	9 (13)
SBTL	B (B)	11 (11)	B (B)	11 (11)	B (B)	11 (11)
Mill St / Nelson St						
EBLTR	A (B)	9 (11)	A (B)	9 (11)	A (B)	9 (11)
WBLTR	A (B)	9 (11)	A (B)	9 (11)	A (B)	9 (11)
NBLTR	A (B)	9 (11)	A (B)	9 (11)	A (B)	9 (11)
SBLTR	A (B)	9 (10)	A (B)	9 (10)	A (B)	9 (10)
Park St / Railroad St						
WBTL	A (A)	1 (1)	A (A)	1 (1)	A (A)	1 (1)
NBLT	A (B)	9 (10)	A (B)	9 (10)	A (B)	0 (11)
Denison Ave / Park St						
EBTL	A (A)	4 (7)	A (A)	4 (7)	A (A)	0 (0)
SBLR	A (A)	9 (9)	A (A)	9 (9)	A (A)	8 (8)
Park St / Nelson St						
EBLTR	A (A)	0 (0)	A (A)	0 (0)	A (A)	0 (0)
WBLTR	A (A)	2 (1)	A (A)	2 (1)	A (A)	2 (1)
NBLTR	A (B)	9 (12)	A (B)	9 (12)	A (B)	9 (12)
SBLTR	B (B)	12 (13)	B (B)	12 (13)	B (B)	12 (13)
GO Access W / Railroad St						
WBTL	A (A)	1 (0)	A (A)	1 (0)	A (A)	3 (0)
NBLR	A (B)	10 (11)	A (B)	10 (11)	A (B)	10 (11)
Site Access 1 / Railroad St						
WBTL	A (A)	2 (0)	A (A)	2 (0)		
NBLR	A (B)	10 (10)	A (B)	10 (10)		

Notes:

1. xx (xx) – AM (PM)
2. Analysis results represent operations during construction of Phase 1 of the proposed development

Under existing traffic conditions during regular operation, all unsignalized intersection movements operate well at level of service LOS B or better during the morning and afternoon peak hours.

Under future background traffic conditions, during or prior to the construction of Phase 1, all unsignalized intersection movements will continue to operate well at LOS B or better during the morning and afternoon peak hours. Impact of the consolidation of GO commuter lot traffic to its west access on Railroad Street during Phase 1 construction of the development at unsignalized area intersections will be negligible.

4.5.2 Future Total

The level of service analysis results under future total conditions during Phase 1, Phase 2a, and Phase 2b of the development at area unsignalized intersections are summarized in Table 20.

TABLE 20 FUTURE TOTAL UNSIGNALIZED ANALYSIS SUMMARY

Intersection / Movement	Phase 1		Interim Phase 2		Phase 2a		Phase 2b	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Mill St / Railroad St								
EBLTR	C (C)	22 (19)	C (C)	24 (19)	C (C)	24 (19)	C (C)	22 (19)
WBLTR	B (B)	14 (13)	B (B)	14 (13)	B (B)	14 (13)	B (B)	14 (13)
NBL	A	0 (0)	A (A)	1 (0)	A (A)	1 (0)	A (A)	0 (0)
SBL	A	0 (1)	A (A)	1 (1)	A (A)	1 (1)	A (A)	1 (1)
Mill St / Church St								
WBLR	A (B)	9 (13)	A (B)	9 (13)	A (B)	9 (13)	A (B)	9 (13)
NBTR	A (B)	9 (13)	A (B)	9 (13)	A (B)	9 (13)	A (B)	9 (13)
SBTL	B (B)	11 (11)	B (B)	11 (11)	B (B)	11 (11)	B (B)	11 (11)
Mill St / Nelson St								
EBLTR	A (B)	10 (12)	A (B)	10 (12)	B (B)	10 (12)	A (B)	10 (12)
WBLTR	A (B)	9 (12)	A (B)	9 (12)	A (B)	9 (12)	A (B)	9 (13)
NBLTR	A (B)	9 (12)	A (B)	9 (12)	A (B)	9 (12)	A (B)	9 (12)
SBLTR	A (B)	9 (11)	A (B)	9 (11)	A (B)	9 (11)	A (B)	10 (12)
Park St / Railroad St								
WBTL	A (A)	1 (1)	A (A)	1 (2)	A (A)	1 (1)	A (A)	1 (1)
NBLT	A (A)	9 (10)	A (A)	9 (10)	A (A)	9 (10)	A (A)	9 (10)
Denison Ave / Park St								
EBTL	A (A)	4 (7)	A (A)	4 (7)	A (A)	4 (7)	A (A)	4 (7)
SBLR	A (A)	9 (9)	A (A)	9 (9)	A (A)	9 (9)	A (A)	9 (9)
Notes: 1. xx (xx) – AM (PM)								

Intersection / Movement	Phase 1		Interim Phase 2		Phase 2a		Phase 2b	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Park St / Nelson St								
EBLTR	A (A)	0 (0)	A (A)	0 (0)	A (A)	0 (0)	A (A)	0 (0)
WBLTR	A (A)	2 (1)	A (A)	2 (1)	A (A)	2 (1)	A (A)	2 (1)
NBLTR	A (B)	9 (13)	A (B)	9 (13)	A (B)	10 (14)	A (B)	10 (14)
SBLTR	B (C)	12 (15)	B (C)	12 (15)	B (C)	13 (18)	B (C)	12 (15)
GO Access W / Railroad St								
WBTL	A (A)	1 (0)	A (A)	1 (0)	A (A)	1 (0)	A (A)	1 (0)
NBLR	A (B)	10 (12)	A (B)	10 (12)	A (B)	10 (12)	A (B)	10 (12)
Site Access 1 / Railroad St								
WBTL	A (A)	3 (1)	A (A)	4 (1)	A (A)	3 (1)	A (A)	3 (1)
NBLR	A (B)	10 (11)	B (B)	10 (12)	A (B)	10 (11)	A (B)	10 (10)
Site Access 2 / Park St								
WBLR	A (A)	9 (9)			A (A)	9 (9)		
SBTL	A (A)	0 (0)			A (A)	2 (0)		
Site Access 2 / Denison Ave								
SBLR							A (A)	9 (10)
EBTL							A (A)	7 (7)

Notes:

1. xx (xx) – AM (PM)

Future Total – Phase 1

Under future total conditions, with development of Phase 1 of the proposal, all unsignalized intersection movements will continue to operate at LOS B or better during regular operations during both peak hours.

Future Total – Interim Phase 2

Under future total conditions, during development of Phase 2 of the proposal, all unsignalized intersection movements will continue to operate at LOS B or better during regular operations during both peak hours. Consolidation of all site traffic at the single access off Railroad Street will have negligible impact on area unsignalized intersection during regular operations.

Future Total – Phase 2a

Under future total conditions, with development of both phases of the proposal and a secondary access off of Park Street, all unsignalized intersection movements will continue to operate at LOS B and LOS C or better during regular operations during the morning and afternoon peak hours, respectively. Impact of the total Phase 1 and Phase 2 development consist of a nominal 1 to 3 seconds of delay over future background conditions.



Future Total – Phase 2b

Under future total conditions, with development of both phases of the proposal and a secondary access off the Denison Avenue extension, all unsignalized intersection movements will again operate at LOS B or better during regular operations during both the morning and afternoon peak hours. Impact of the total Phase 1 and Phase 2 development consist of a nominal 1 seconds of delay over future background conditions.

Based on the foregoing, new site related traffic can be acceptably and appropriately accommodated at the area unsignalized road intersections during normal operations. The proposed site driveways will provide an acceptable level of service for vehicles entering and exiting the site.

4.6 MILL STREET / RAILROAD STREET SENSITIVITY ANALYSIS

A separate sensitivity analysis was undertaken for the Mill Street / Railroad Street intersection during the morning peak hour to model the operations of the east-west legs immediately after a train crossing event during the peak hour as queued up traffic disperses. Level of service, delay, and queuing results during the morning peak hour are summarized in Table 21. Synchro analysis sheets are attached in **Appendix I**.

TABLE 21 MILL STREET / RAILROAD STREET UNSIGNALIZED ANALYSIS SUMMARY (AM)

Intersection / Movement	Normal			GO			Overall	
	LOS	Delay	95Queue ²	LOS	Delay	95Queue ²	LOS	Delay
Existing								
EBLTR	C	18	10	E	38	21	C	19
WBLTR	B	13	1	D	33	6	B	14
Future Background								
EBLTR	C	18	11	E	38	21	C	19
WBLTR	B	13	2	D	33	6	B	14
Future Total – Phase 1								
EBLTR	C	22	18	F	72	45	C	26
WBLTR	B	14	2	E	38	7	C	16
Future Total – Phase 2 Interim								
EBLTR	C	24	21	F	77	50	C	28
WBLTR	B	14	2	E	38	7	C	16
Future Total – Phase 2a								
EBLTR	C	24	20	F	83	51	C	28
WBLTR	B	14	2	E	38	7	C	16
Future Total – Phase 2b								
EBLTR	C	22	18	F	77	32	C	26
WBLTR	B	14	2	E	39	7	C	16

Notes:

1. Analysis for AM peak hour only
2. Results in metres

The storage length between the Mill Street / Railroad Street intersection to the site access driveway off Railroad Street is approximately 50 metres. This storage length is sufficient to store the anticipated 95th percentile eastbound queues during the morning peak hour under all future conditions taking into consideration outbound site traffic. In addition, inbound site traffic is not impeded from entering and exiting the site and therefore will not add to the eastbound queues at the Mill Street / Railroad Street during the morning peak hour.

The intersection will have increased delay due to site traffic where the eastbound movement will experience LOS F. However, the train crossing is not a frequent condition and the intersection will have an acceptable overall level of service of LOS C during the morning peak hour. Based on the foregoing, new site related traffic can be acceptably and appropriately accommodated at the area unsignalized intersections during the morning train crossing periods.

During the afternoon peak hour, the eastbound queue at Mill Street / Railroad Street will extend beyond the 50 metre storage between the intersection the Railroad Street site access driveway (Table 22). Under all future conditions, except for the Interim Phase 2 scenario, site traffic during the afternoon peak hour will reroute to the secondary access on Park Street and thereby not add additional traffic onto Railroad Street nor cross the Mill Street / Railroad Street intersection. However, during the afternoon peak hour under Interim Phase 2, inbound site traffic must route along Railroad Street from the west to enter the site, thereby adding to eastbound queue that have extended pass the access driveway. The impact of site traffic on the eastbound queue is analyzed by adding the inbound site traffic to the eastbound right turn movement at Mill Street / Railroad Street. The level of service, delay, and queue results during the afternoon peak hour are summarized in Table 22.

TABLE 22 MILL STREET / RAILROAD STREET UNSIGNALIZED ANALYSIS SUMMARY (PM)

Intersection / Movement	Normal			GO			CN			Overall	
	LOS	Delay	95 th Queue ²	LOS	Delay	95 th Queue ²	LOS	Delay	95 th Queue ²	LOS	Delay
Existing											
EBLTR	C	19	9	F	218	63	F	399	79	F	101
WBLTR	B	13	2	F	65	21	C	24	12	C	21
Future Total – Interim Phase 2											
EBLTR	C	24	9	F	279	96	F	700	133	F	166
WBLTR	B	14	2	F	82	25	D	29	14	C	24

Notes:

1. Analysis for PM peak hour only
2. Results in metres

Given the additional inbound site traffic during the Interim Phase 2 condition, delays for the eastbound movement will be increased by approximately 60 seconds and 300 seconds after a GO crossing and CN crossing, respectively. Overall eastbound delay will be increased by 66 seconds in the afternoon peak hour during this interim period.

This increase in delay is substantial. This increase represents a worst case scenario because in reality, the additional volumes on Railroad Street will turn right into the site earlier than the presumed right turn at the Mill Street / Railroad Street intersection, which would reduce the overall delay for eastbound movements. Also, the delay will only occur during the train crossing periods which only amount to 27.3% of the afternoon peak hour of each weekday. In addition, the increase in site traffic activity on Railroad Street will occur only during the interim period for the construction of Phase 2 of the development and is only a temporary condition. Under other future conditions, site traffic will divert from Railroad Street and from the Railroad Street / Mill Street intersection to access to / from the site via the Park Street access and thereby not affect operating conditions at Mill Street / Railroad Street.

During the interim Phase 2 period, a “do not block driveway” sign will be installed at the Railroad Street site access driveway to provide courtesy gaps for outbound traffic to exit the site without undue delay, particularly during the afternoon peak period at train crossing events.

4.7 SUMMARY

Based on the foregoing, new site related traffic can be acceptably and appropriately accommodated at the area signalized intersections. The various site traffic rerouting with respect to various phases of the development will only impact overall signalized intersection performance nominally, at increase to overall V/C ratio of 1% to 3% in Phase 1 and 4% to 5% in Phase 2. All individual movement V/C ratios will continue to operate well at 0.85 or better under all scenarios at every signalized intersection.

Unsignalized road intersections and site access driveways will operate well with LOS B or better for all future conditions, given normal operations without train crossing events. Given train crossing events during the morning peak hour and typical routing of site traffic, all unsignalized intersections will continue to operate acceptably at LOS E during a crossing event and overall at LOS C throughout the morning peak hour under all future conditions.

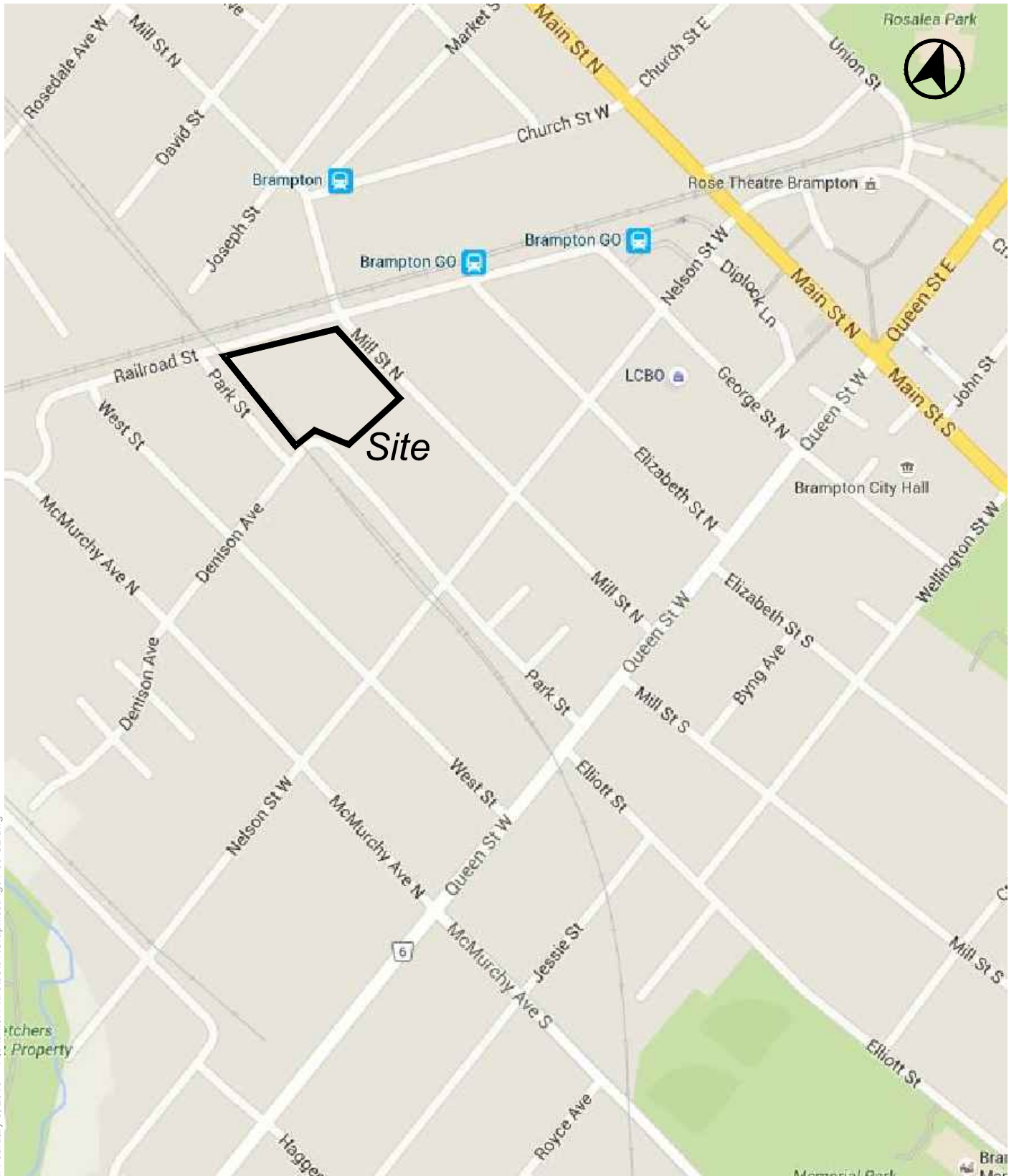
During the afternoon peak hour, existing traffic already experiences significant delays due to the GO train and CN train crossing events. Under all future conditions, with the exception of during the construction of Phase 2, all site traffic will divert from Railroad Street and from the Railroad Street / Mill Street intersection to access to / from the site via the Park Street access, thereby not worsening the operations of the intersection during the afternoon peak hour. During the brief and temporary period of Phase 2 construction in the afternoon peak hour, eastbound vehicles at Mill Street / Railroad Street may be subject to an average 66 seconds of additional delay. This increase represents a worst case scenario because the additional volumes on Railroad Street would turn right into the site earlier, reducing the overall delay for eastbound movements.

During the interim Phase 2 period, a “do not block driveway” sign will be installed at the Railroad Street site access driveway to provide gaps for outbound traffic to exit the site without undue delay.



APPENDIX A: Figures

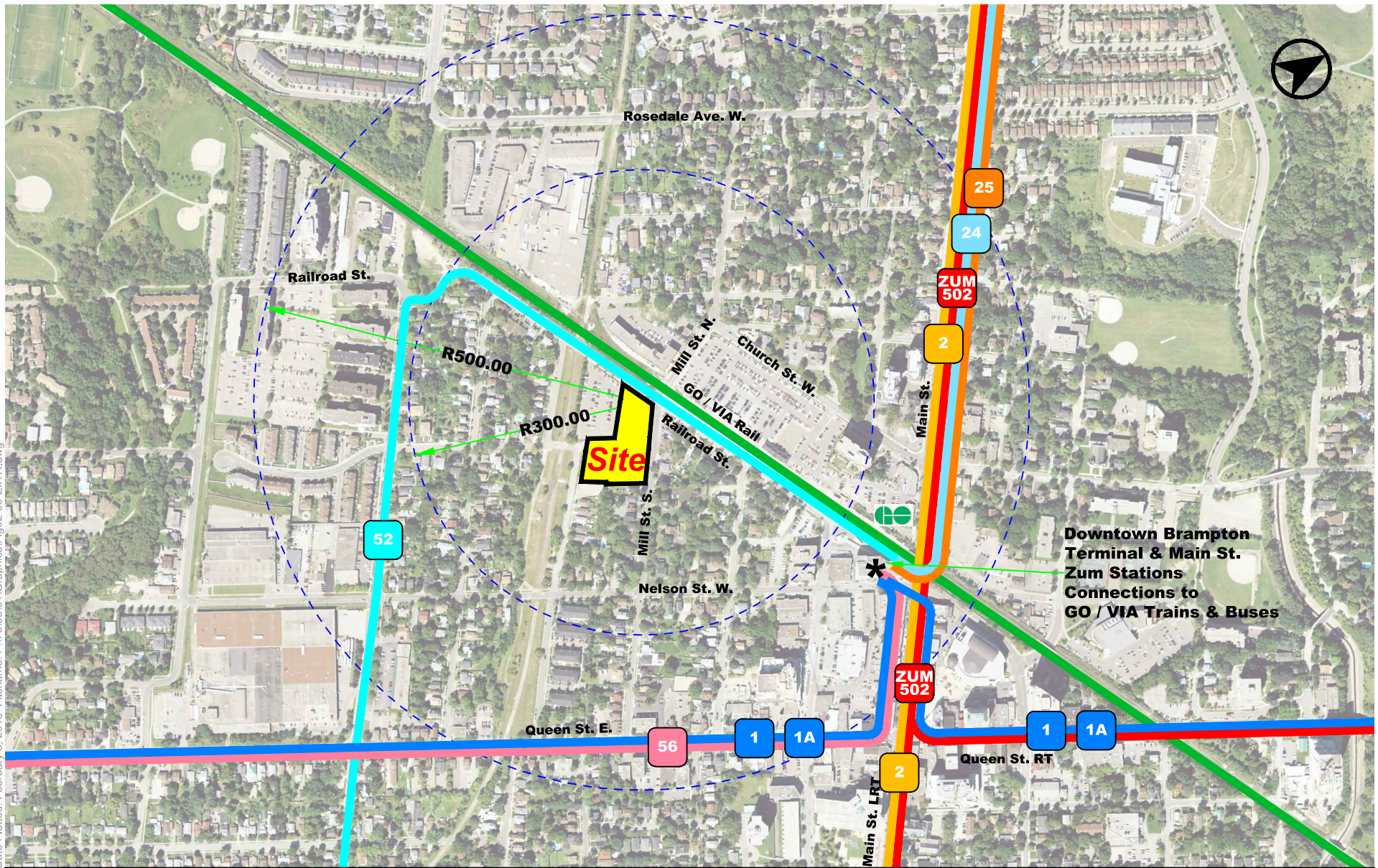




Date Plotted: February 8, 2016
Filename: P:\76198\01\Graphics\Fig01-00-SL.dwg

SITE LOCATION

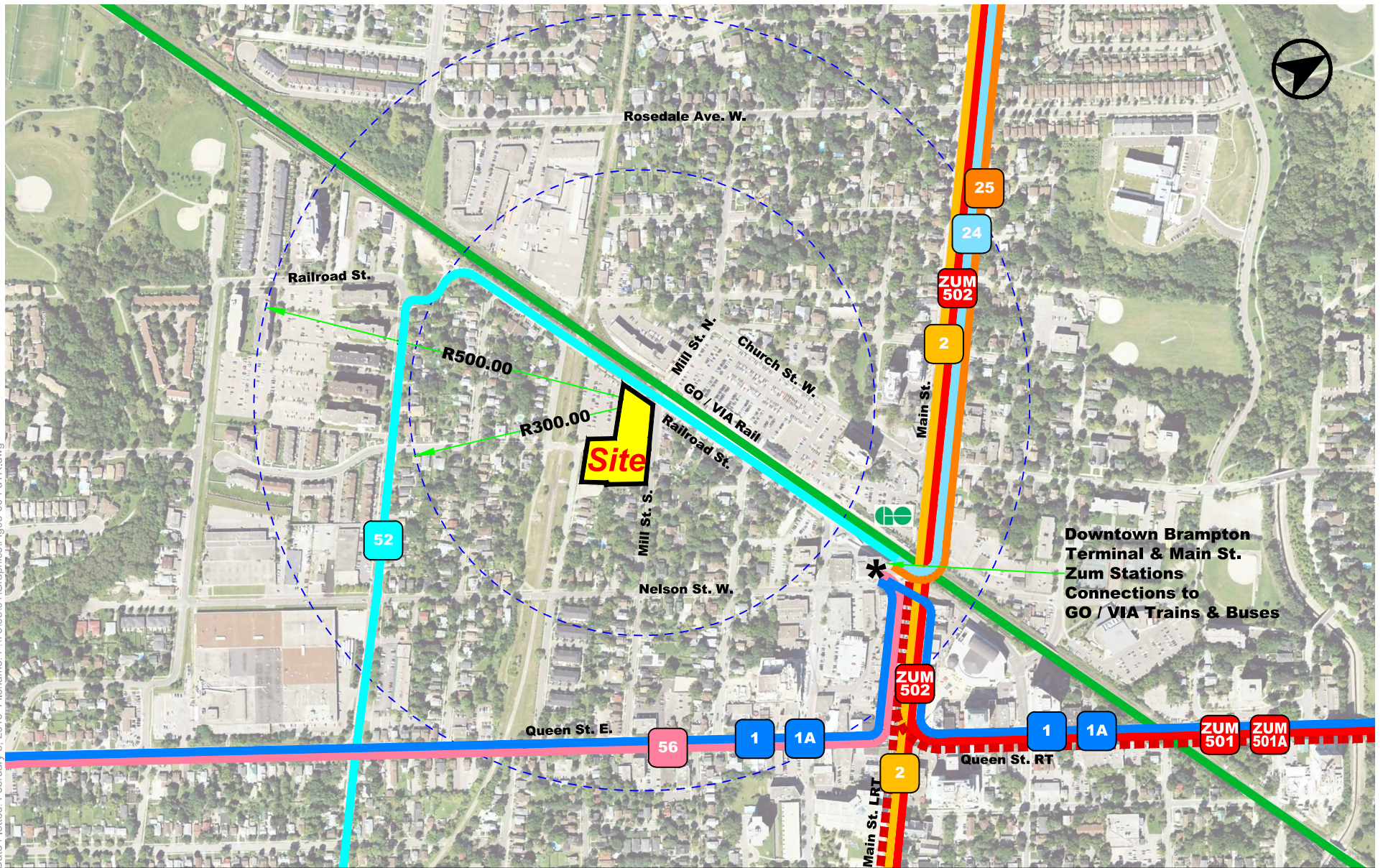
Date Plotted: February 8, 2016 Filename: P:\76198\01\Graphics\Fig02-00-ExTR.dwg



EXISTING AREA TRANSIT NETWORK

- Zum Service
- Other Transit Route 2
- Other Transit Route 25
- Other Transit Route 56
- Transit Route 1 / 1A
- Other Transit Route 24
- Other Transit Route 52
- GO / VIA Rail

Date Plotted: February 8, 2016 Filename: P:\76198\01\Graphics\Fig03-00-FuTR.dwg



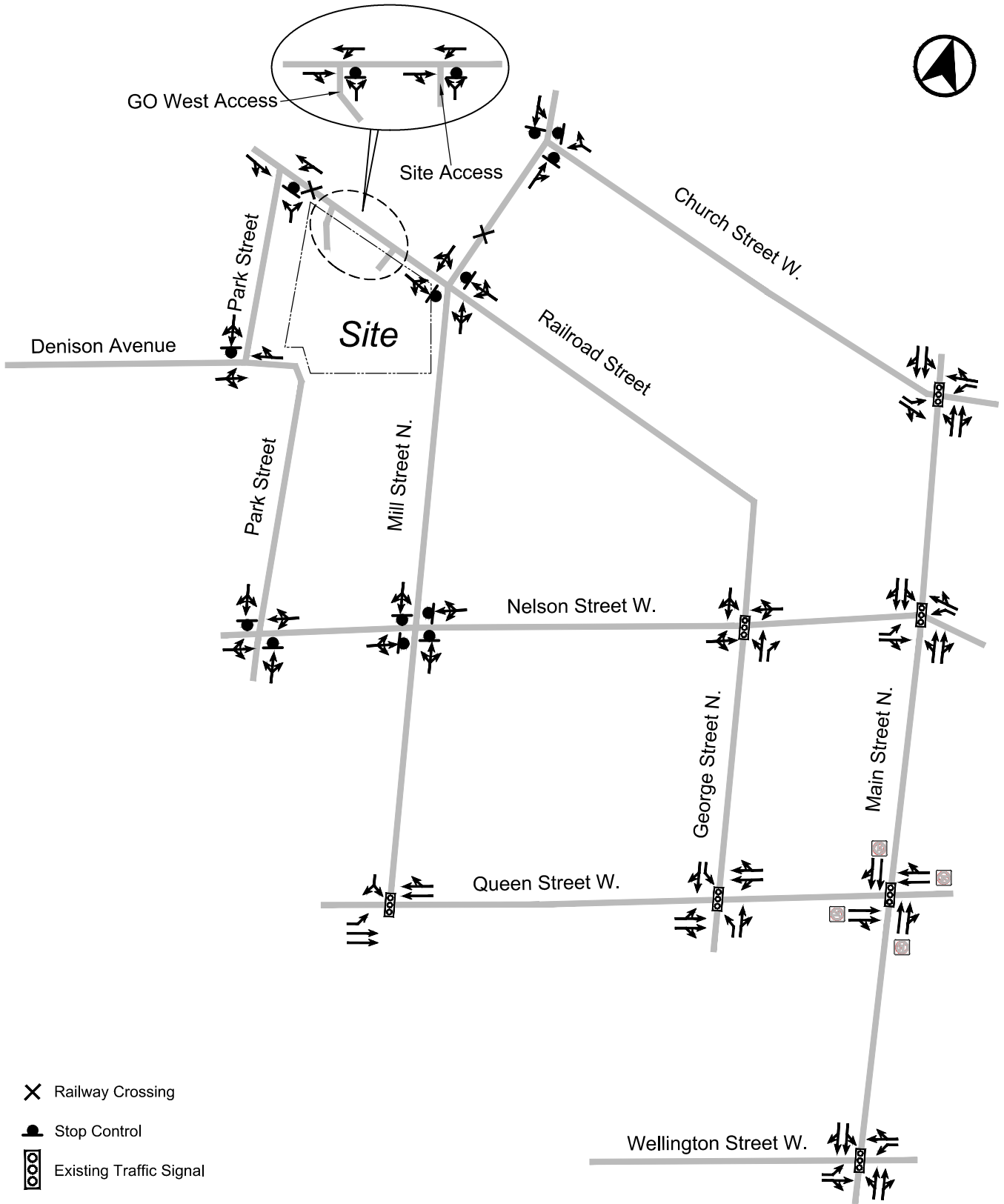
FUTURE AREA TRANSIT NETWORK

- Zum Service
- Other Transit Route 2
- Other Transit Route 25
- Other Transit Route 56
- GO / VIA Rail
- Transit Route 1 / 1A
- Other Transit Route 24
- Other Transit Route 52
- Metrolinx Proposed Transit



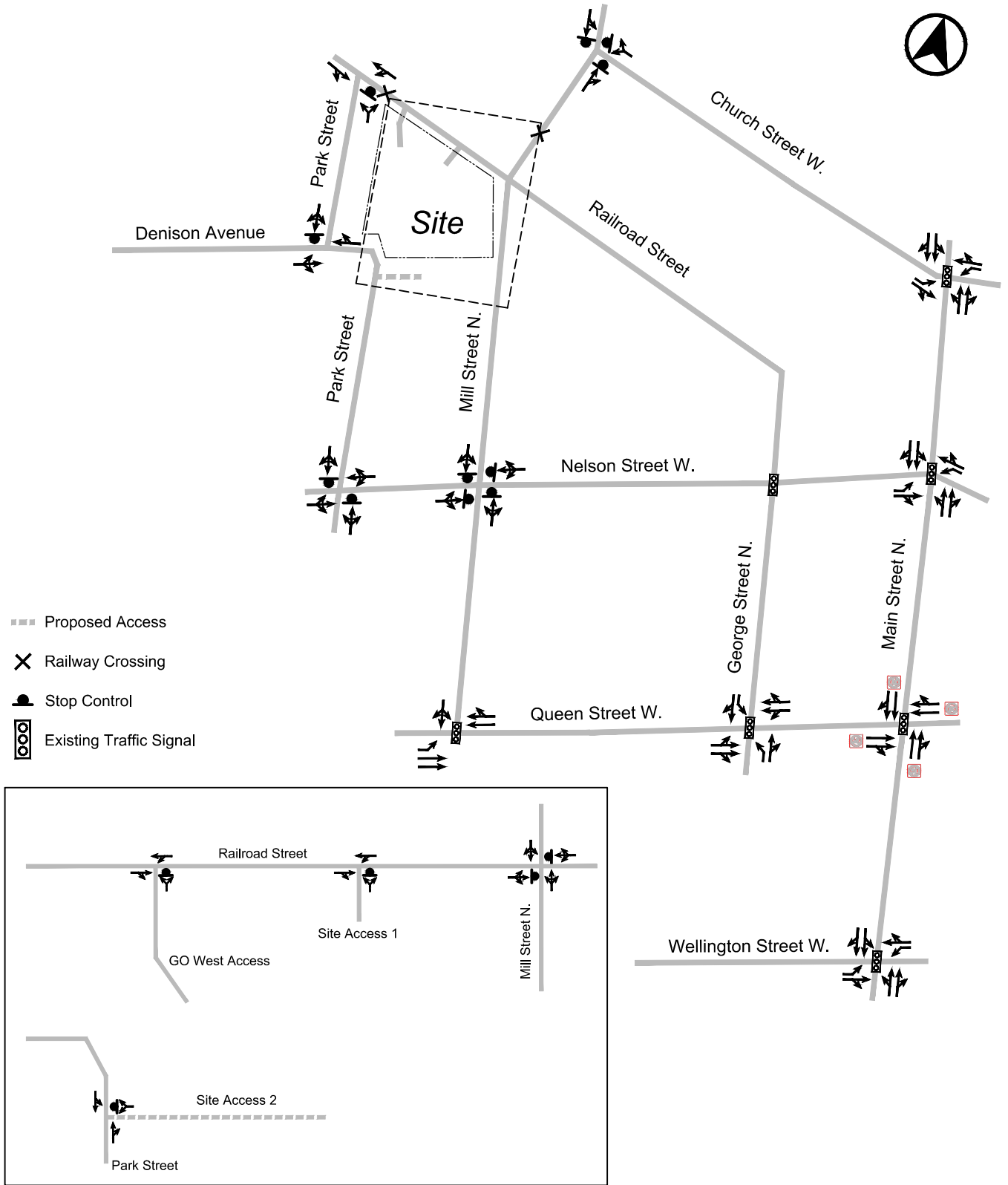
45 Railroad Street
7698-01 June 2015

Figure 3



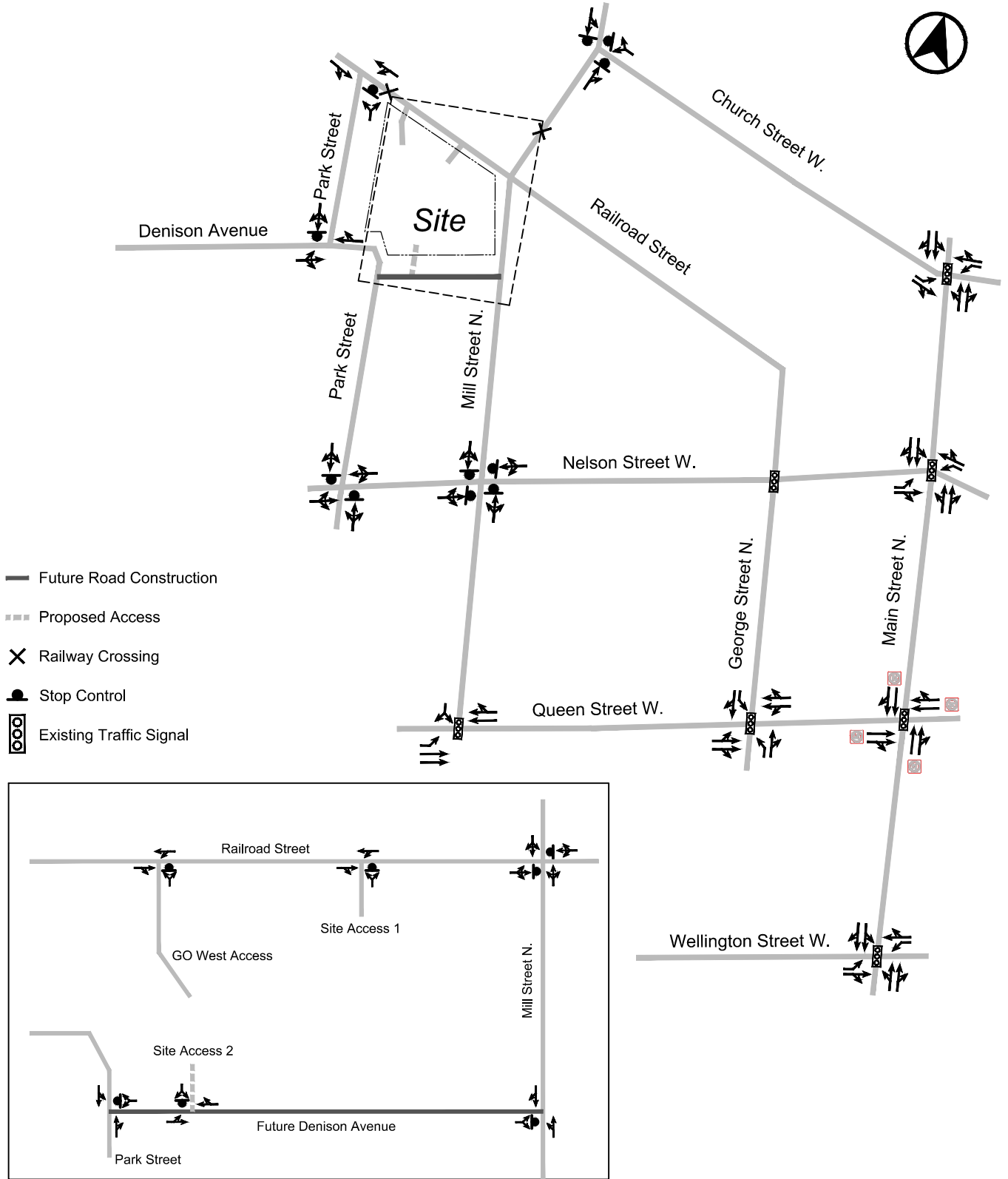
EXISTING LANE CONFIGURATION AND TRAFFIC CONTROL

Date Plotted: February 8, 2016 File name: P:\76198\01\Graphics\Fig05-00-FuLC-1+2a.dwg

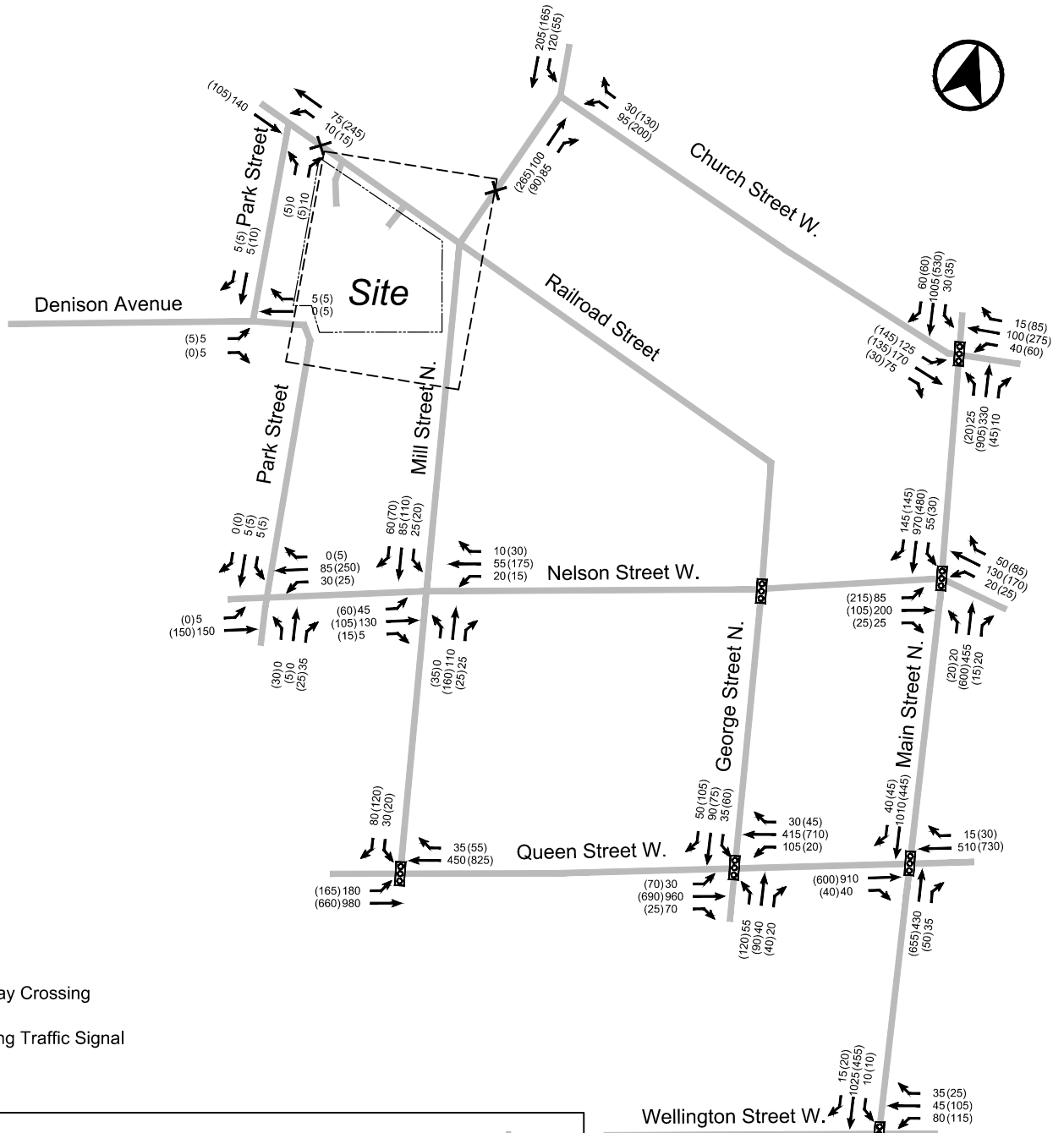


FUTURE (PHASE 1 & PHASE 2a) LANE CONFIGURATIONS AND TRAFFIC CONTROLS

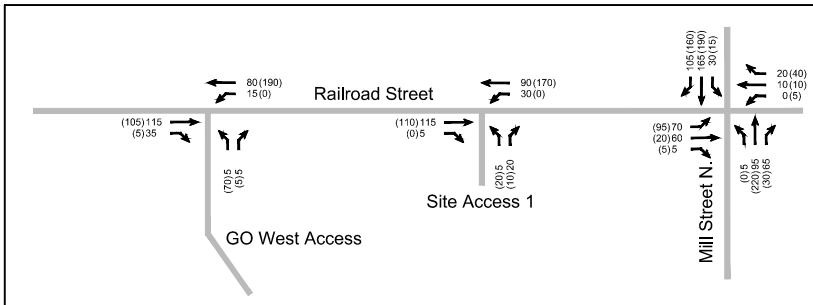
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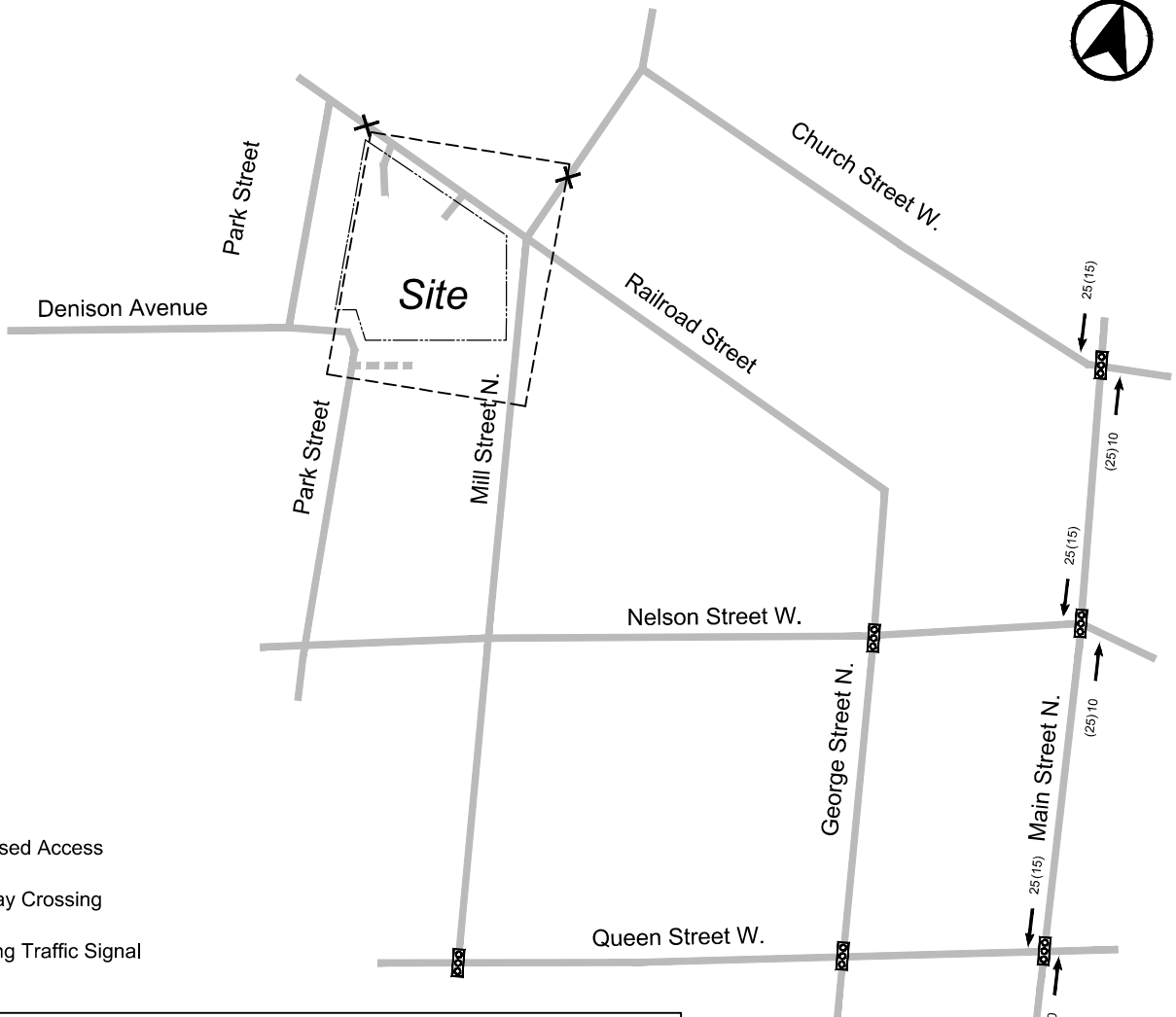
FUTURE (PHASE 2b) LANE CONFIGURATIONS AND TRAFFIC CONTROLS



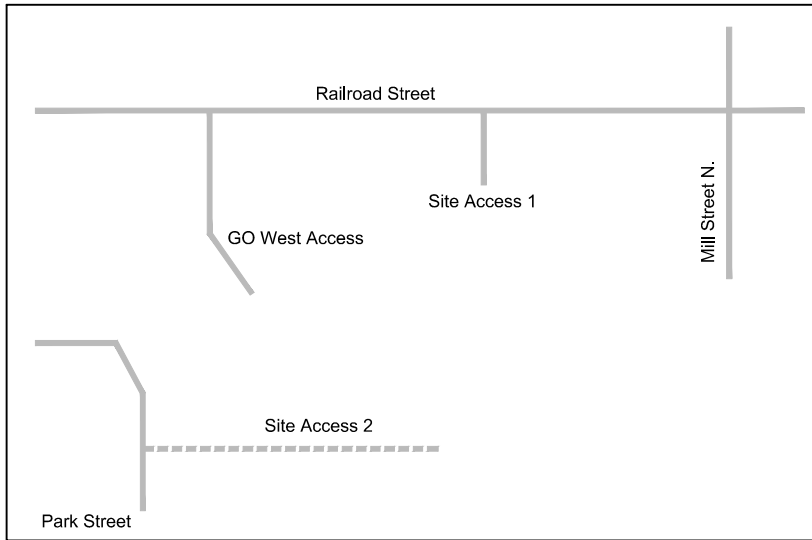
- Railway Crossing
- Existing Traffic Signal



EXISTING TRAFFIC VOLUME

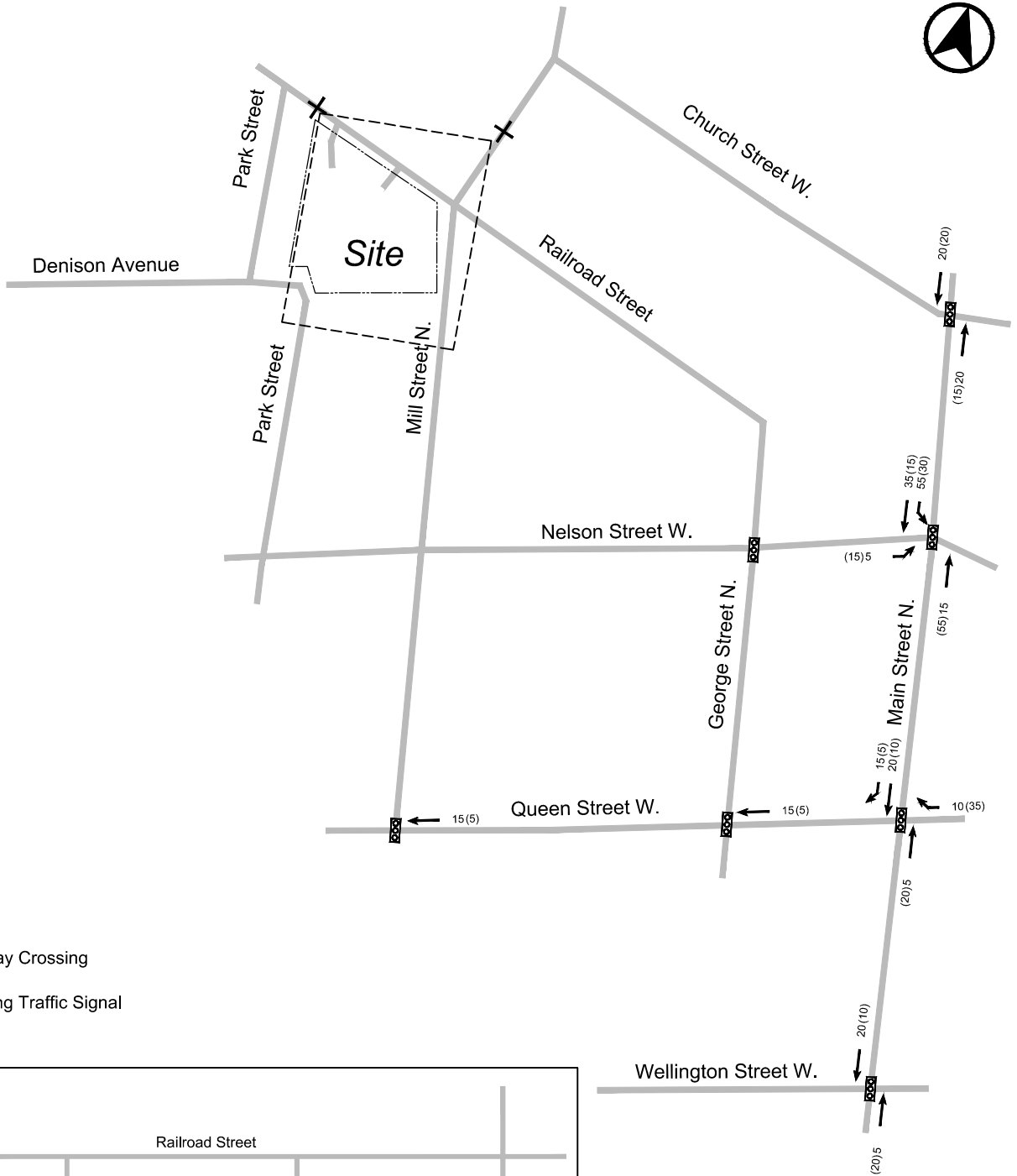


- Proposed Access
- X Railway Crossing
- Existing Traffic Signal

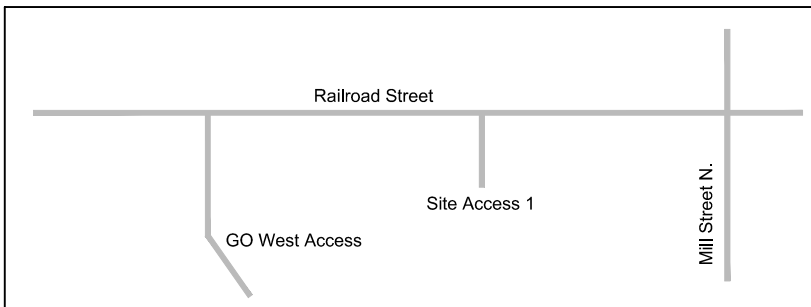


Date Plotted: February 8, 2016 File: P:\76198\01\Graphics\Fig08-00-CGT.dwg

CORRIDOR GROWTH

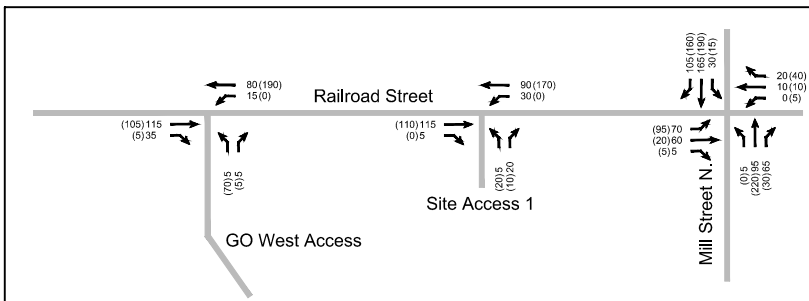
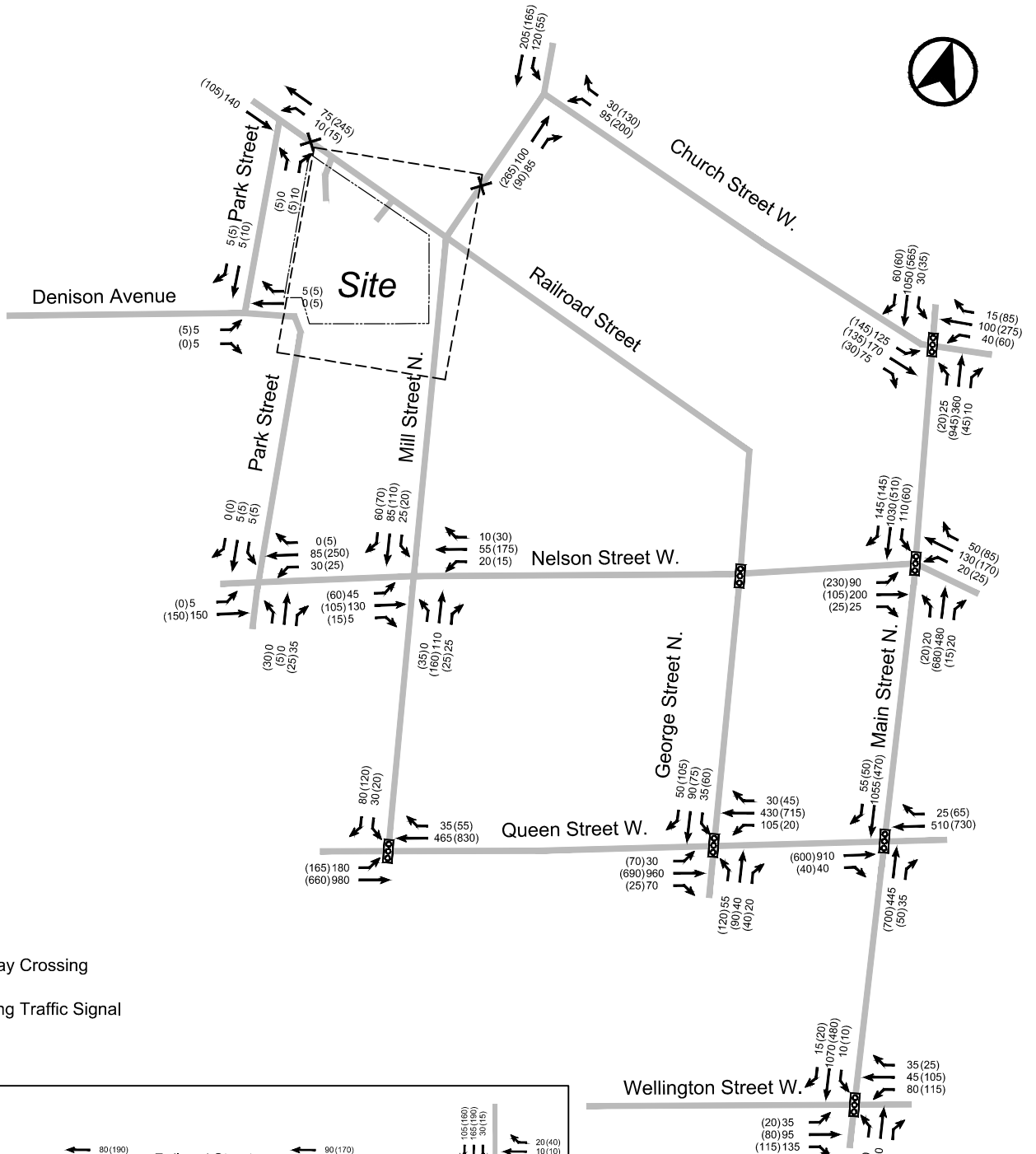


- ✕ Railway Crossing
- ◻ Existing Traffic Signal

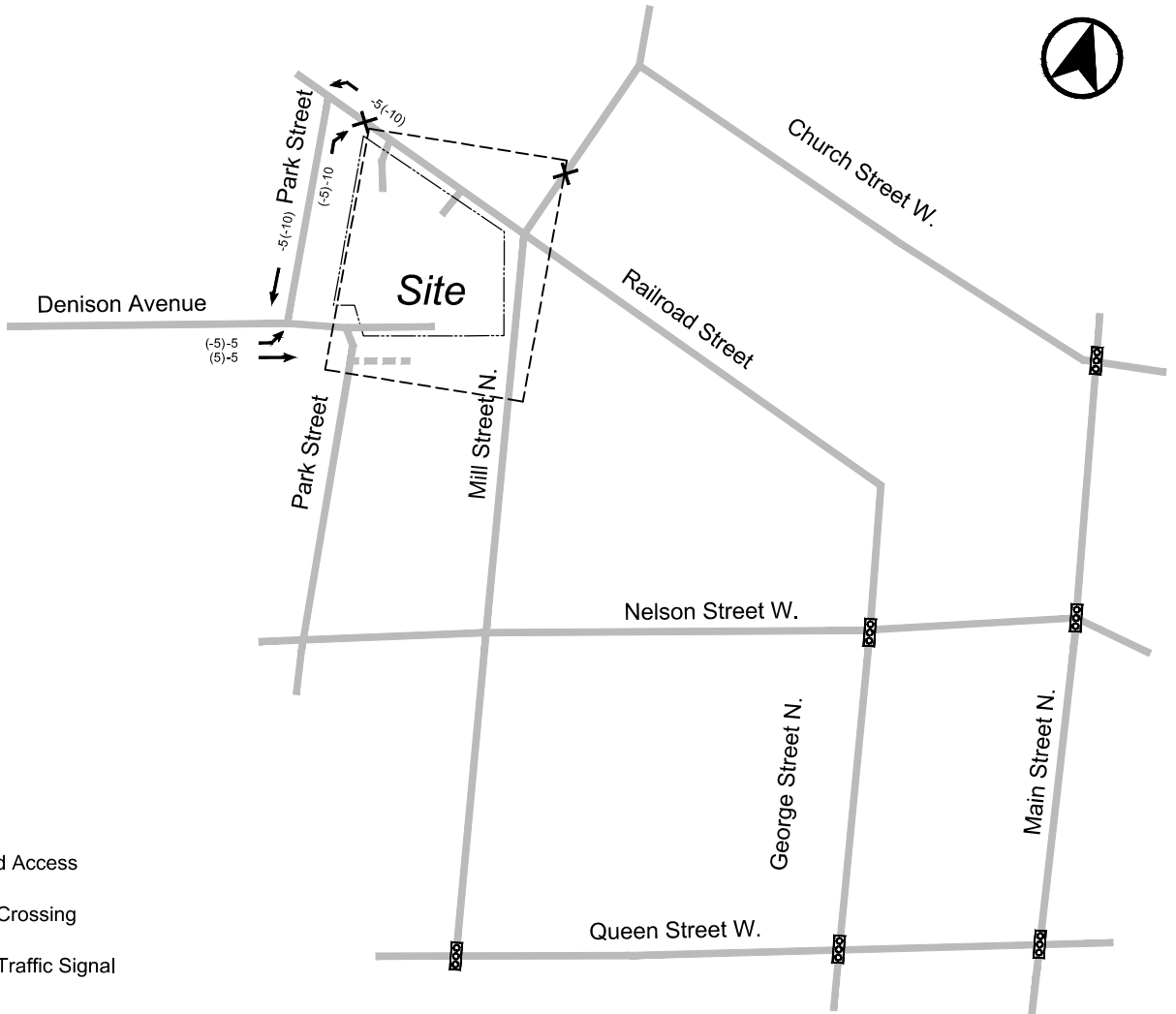


Date Plotted: February 8, 2016 File: P:\76198\01\Graphics\Fig09-00-MainSt.dwg

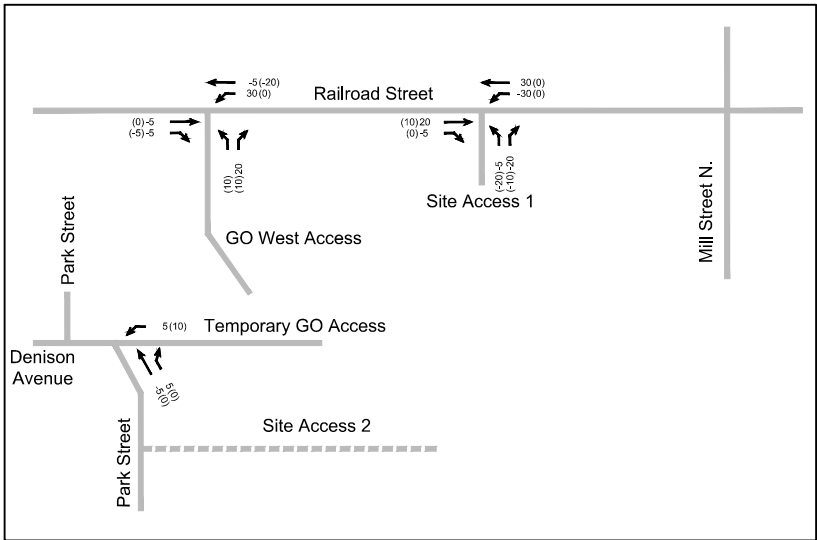
TRAFFIC ALLOWANCE FOR 122 MAIN STREET NORTH



FUTURE BACKGROUND (BASELINE) TRAFFIC VOLUMES

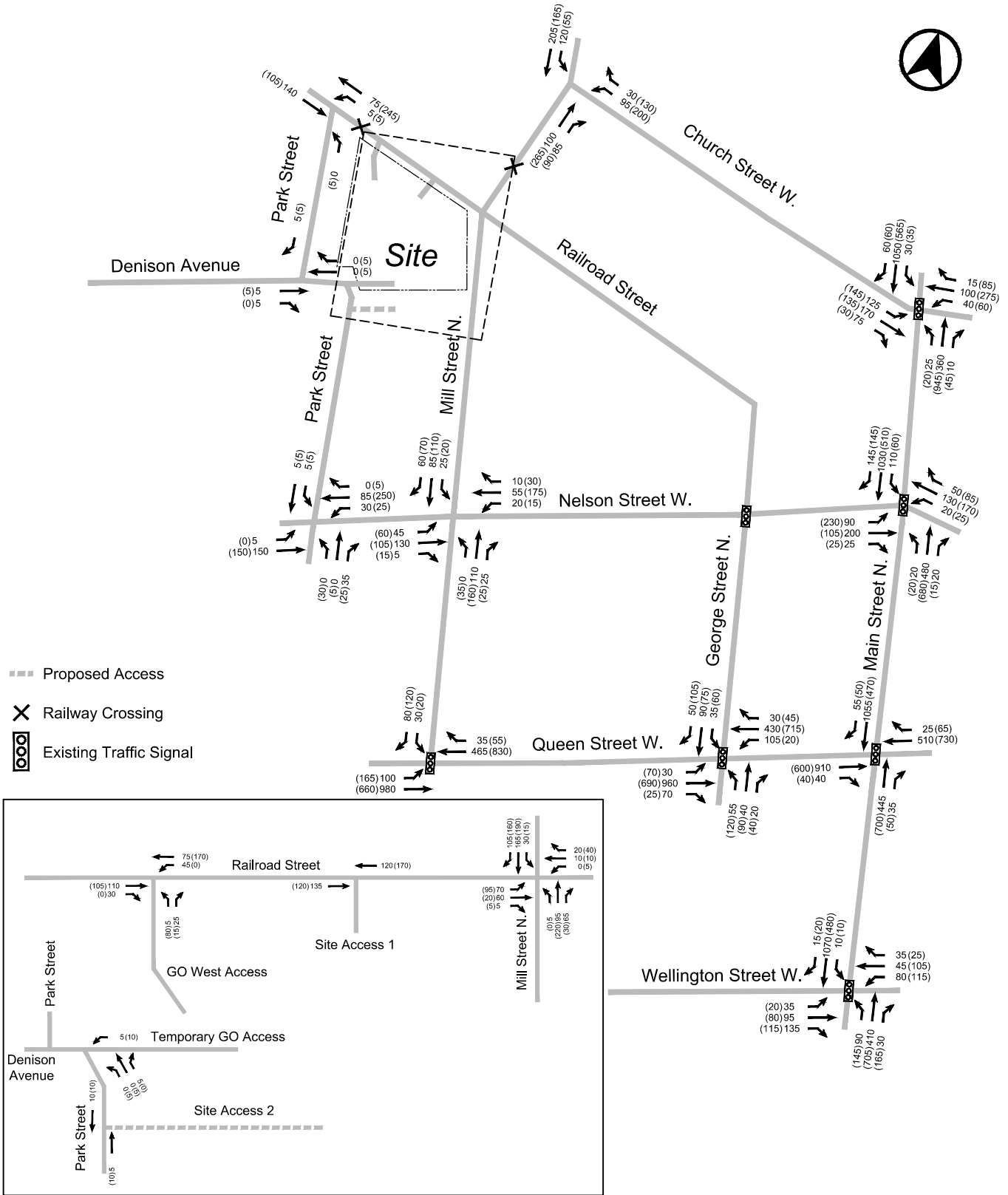


- Proposed Access
- X Railway Crossing
- Existing Traffic Signal

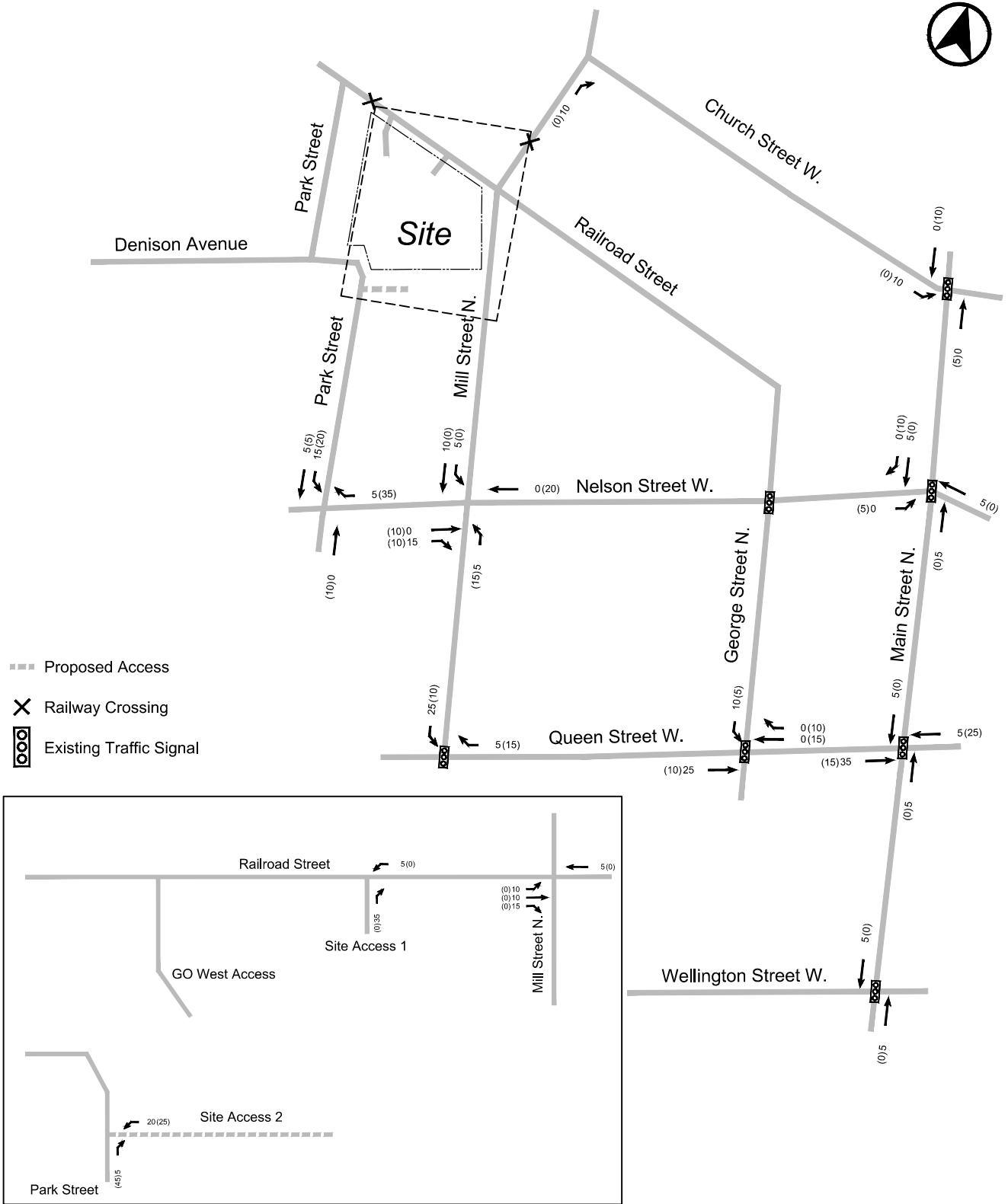


Date Plotted: February 8, 2016 File: P:\76198\01\Graphics\Fig11-00-TR-PH1.dwg

INTERIM PHASE 1 TRAFFIC REDISTRIBUTION

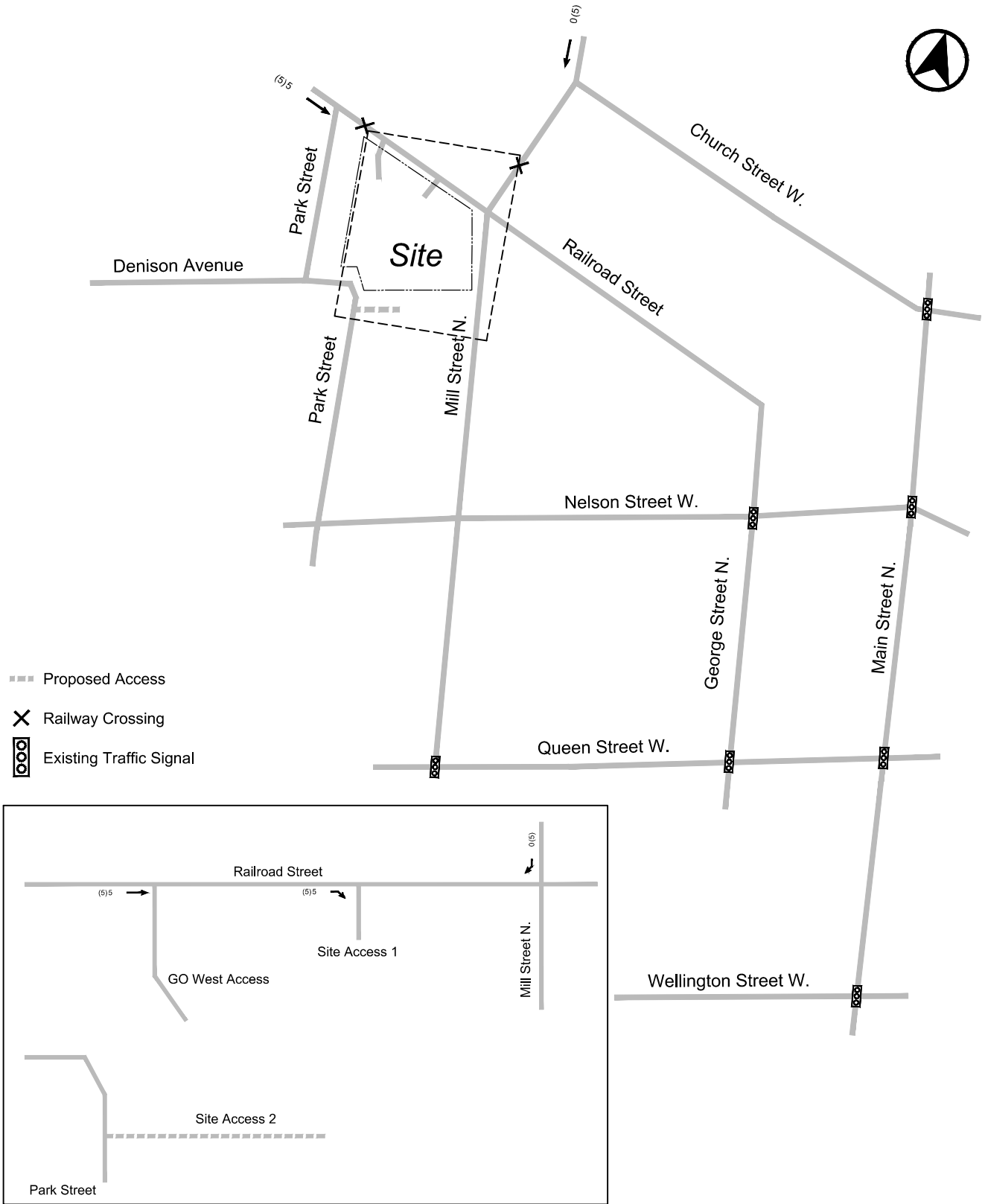


FUTURE BACKGROUND (INTERIM PHASE 1) TRAFFIC VOLUMES

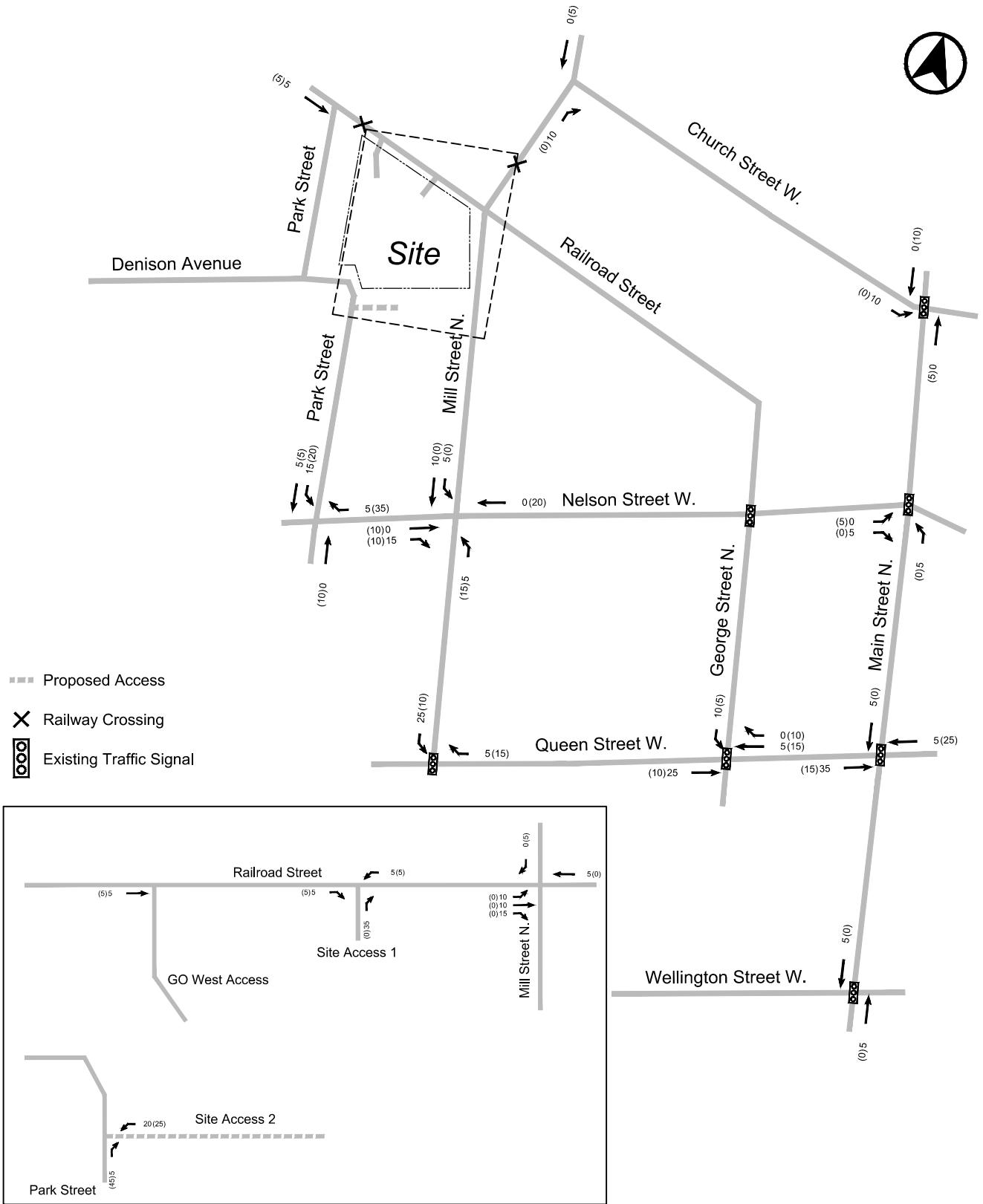


Date Plotted: February 8, 2016 File name: P:\76198\01\Graphics\Fig13-00-ResST-Ph1.dwg

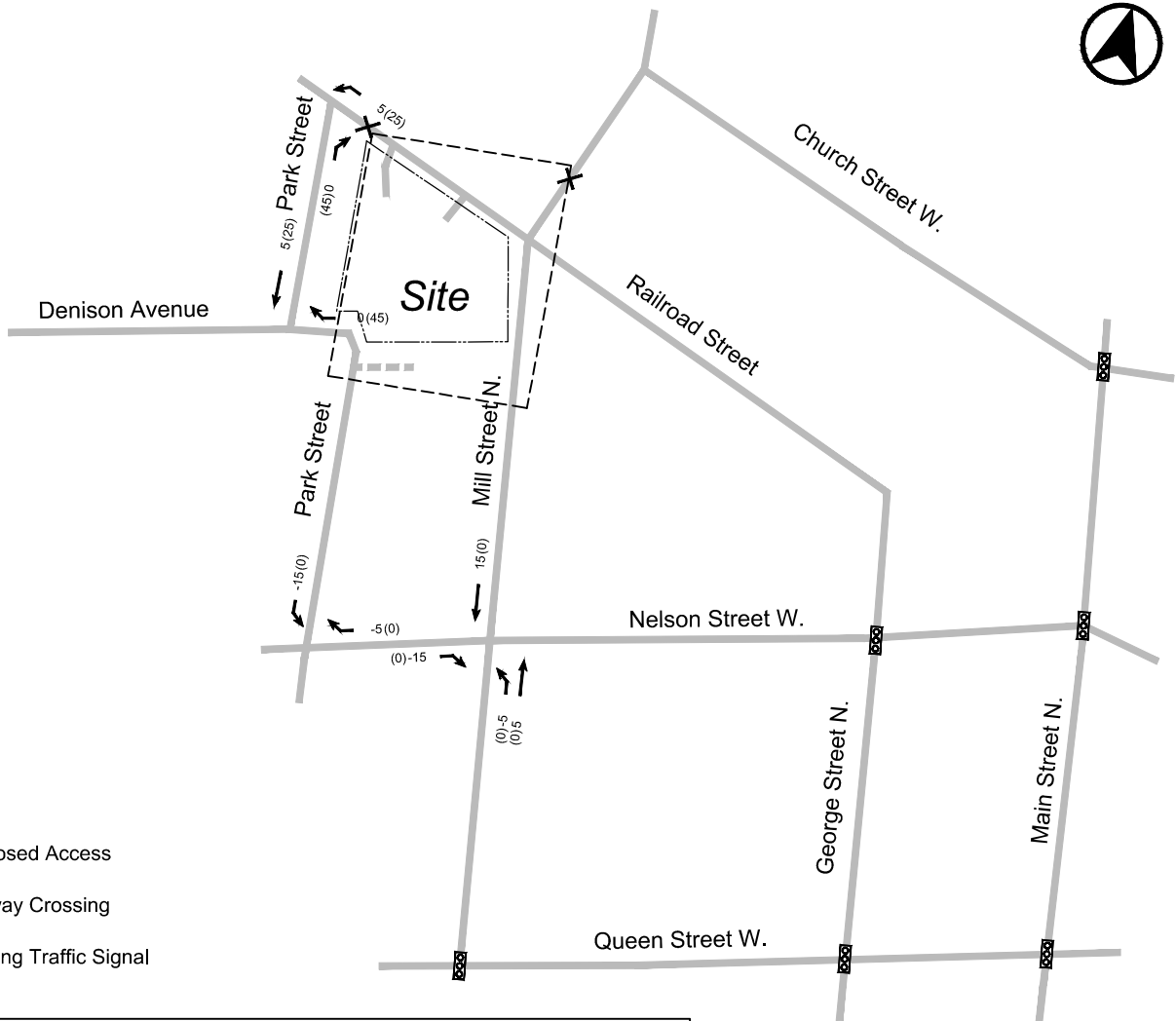
PHASE 1 RESIDENTIAL SITE TRAFFIC VOLUMES



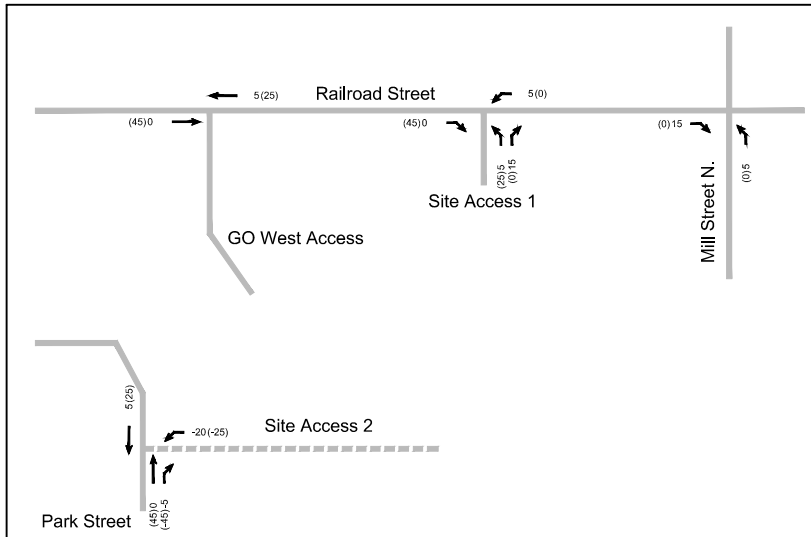
PHASE 1 RETAIL SITE TRAFFIC VOLUMES



PHASE 1 TOTAL SITE TRAFFIC VOLUMES

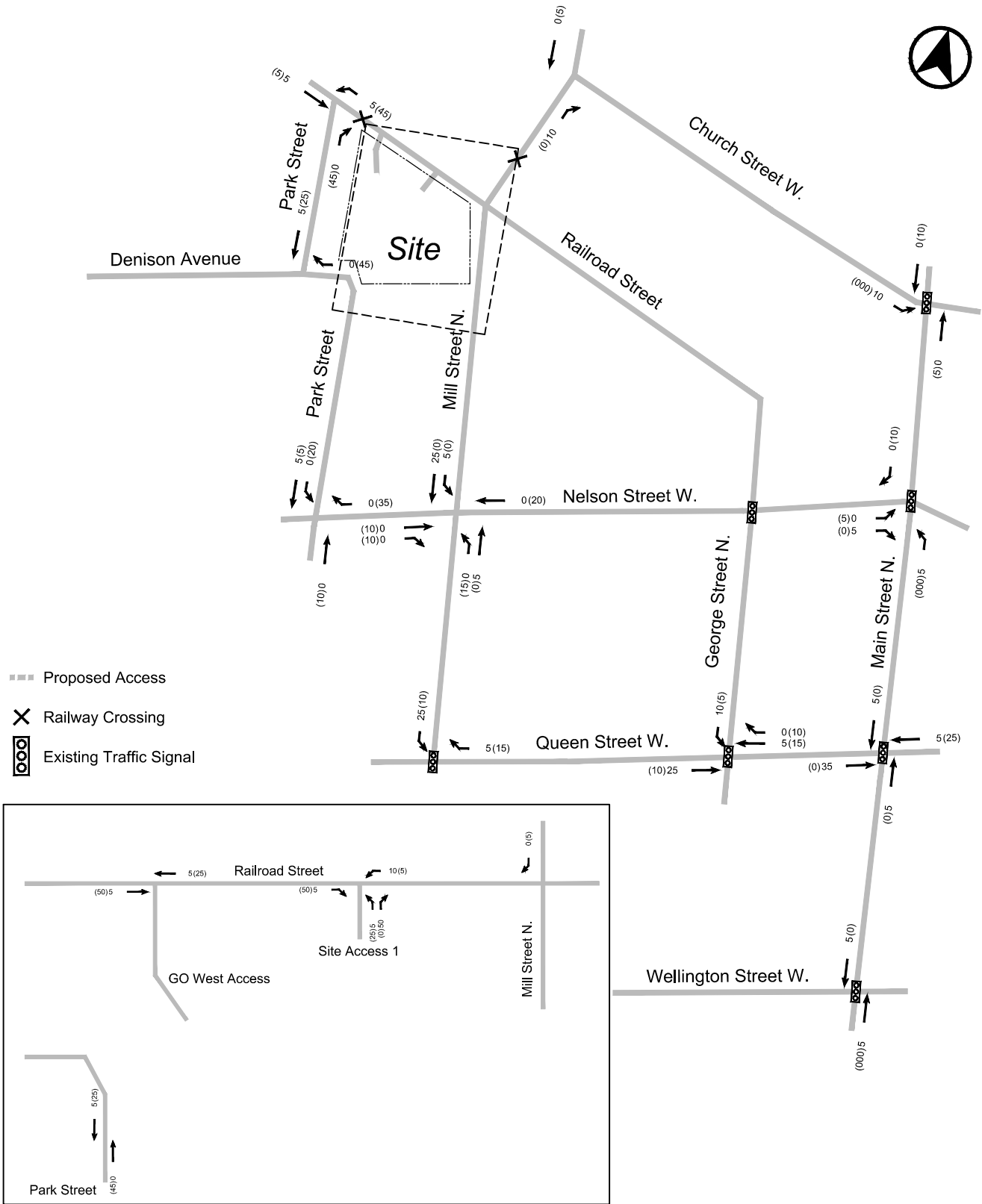


- Proposed Access
- X Railway Crossing
- Existing Traffic Signal

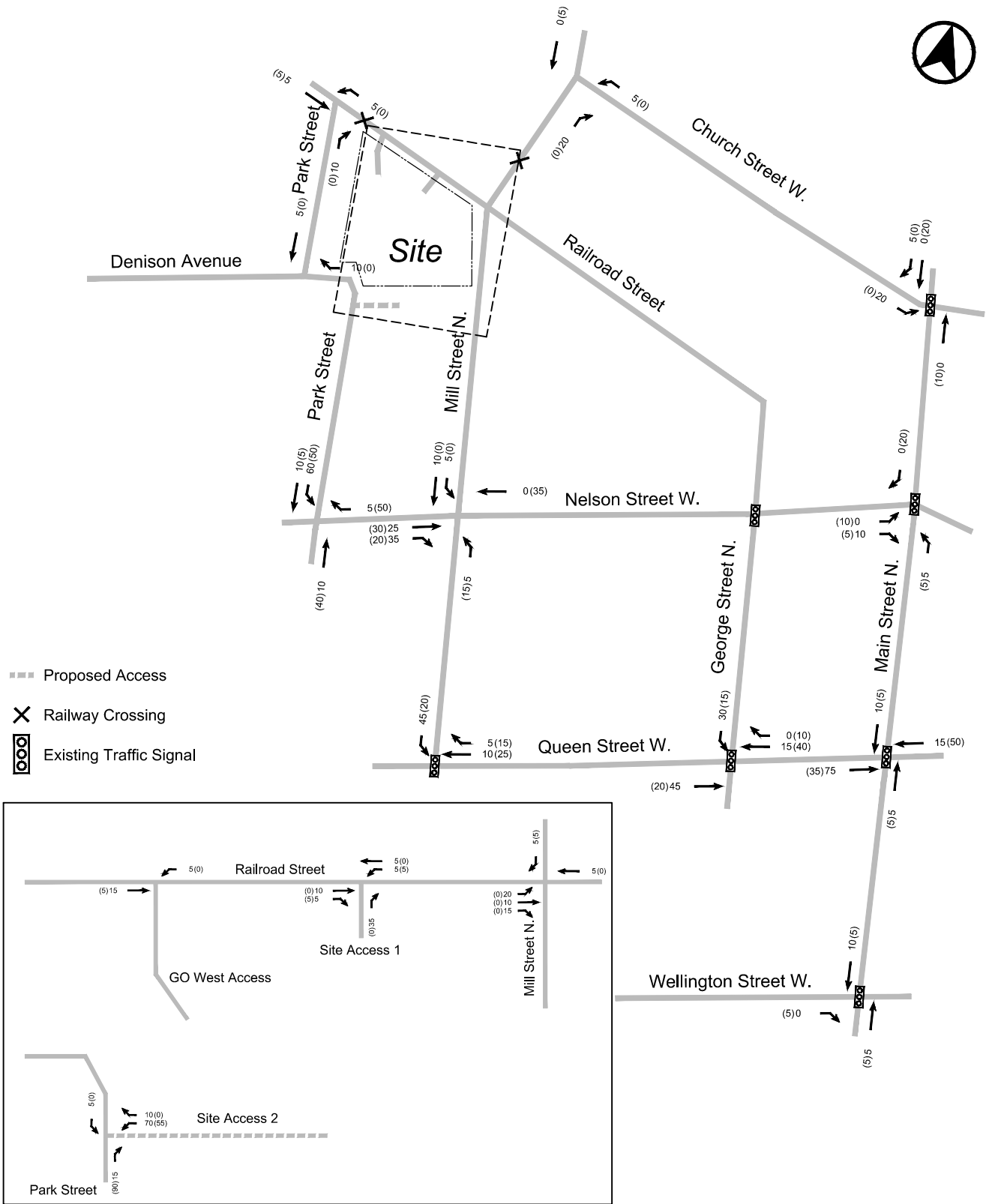


Date Plotted: February 8, 2016 File name: P:\76198\01\Graphics\Fig16-00-TR-Ph2.dwg

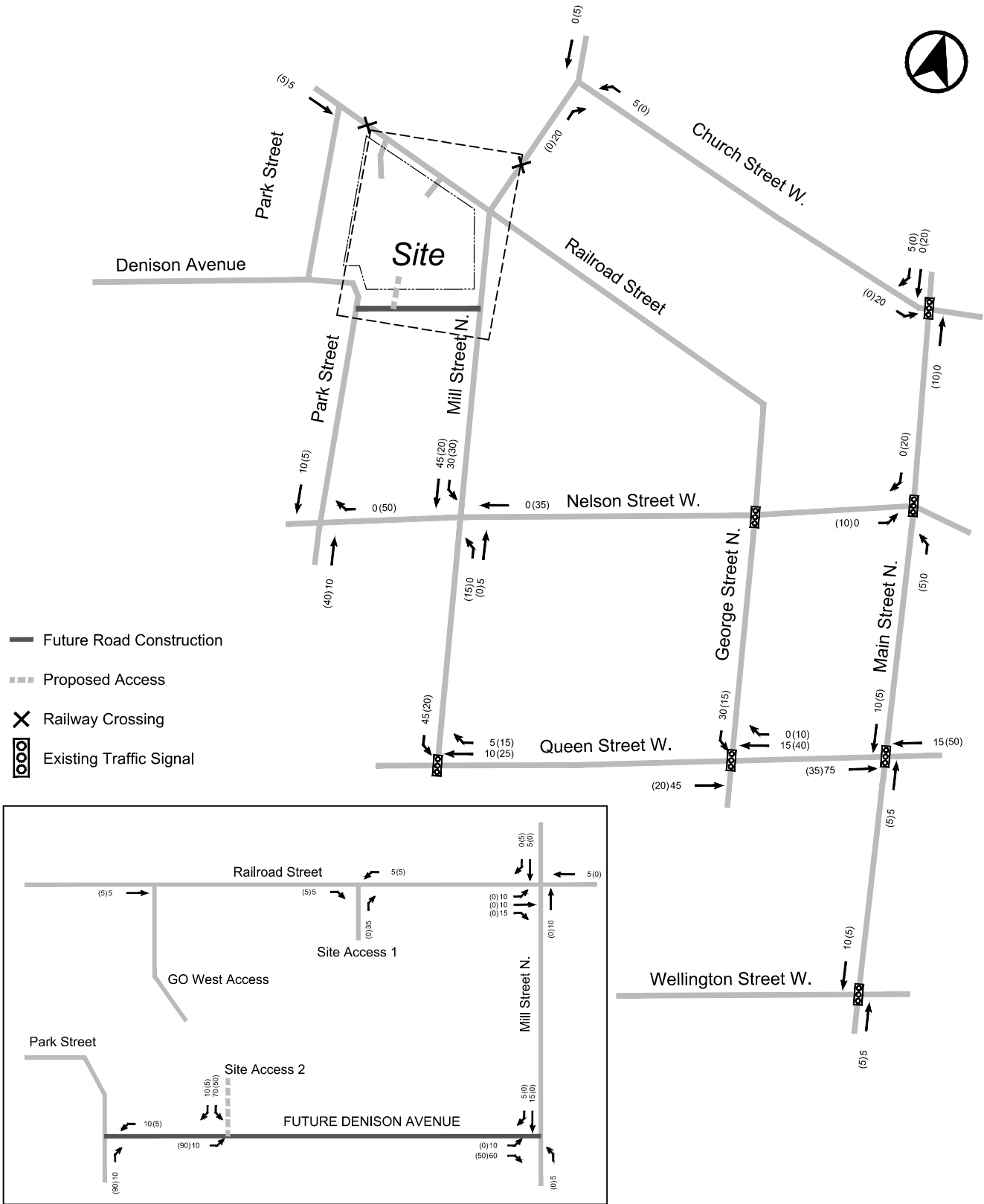
INTERIM PHASE 2 TRAFFIC REDISTRIBUTION



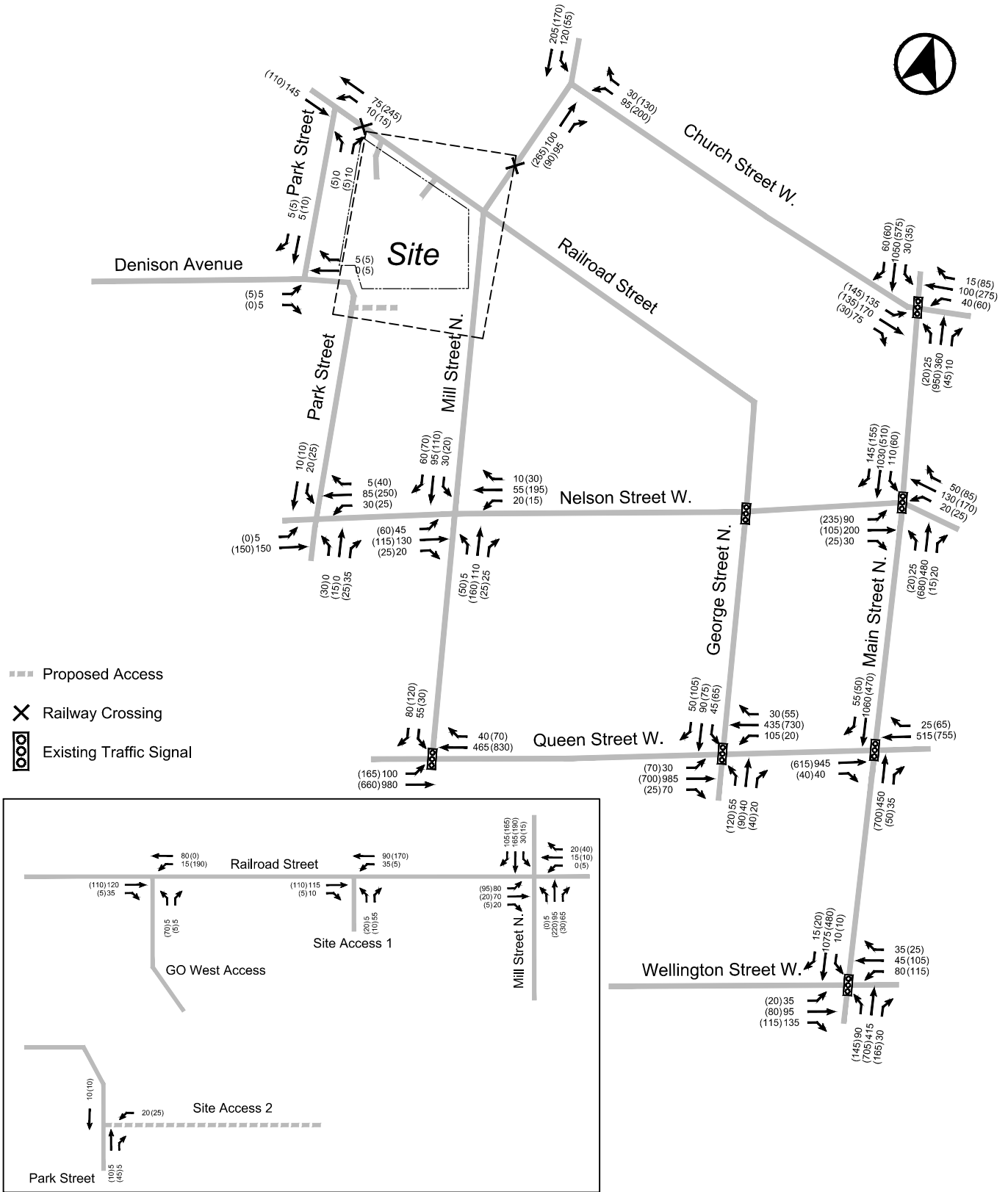
INTERIM PHASE 2 TOTAL SITE TRAFFIC VOLUMES



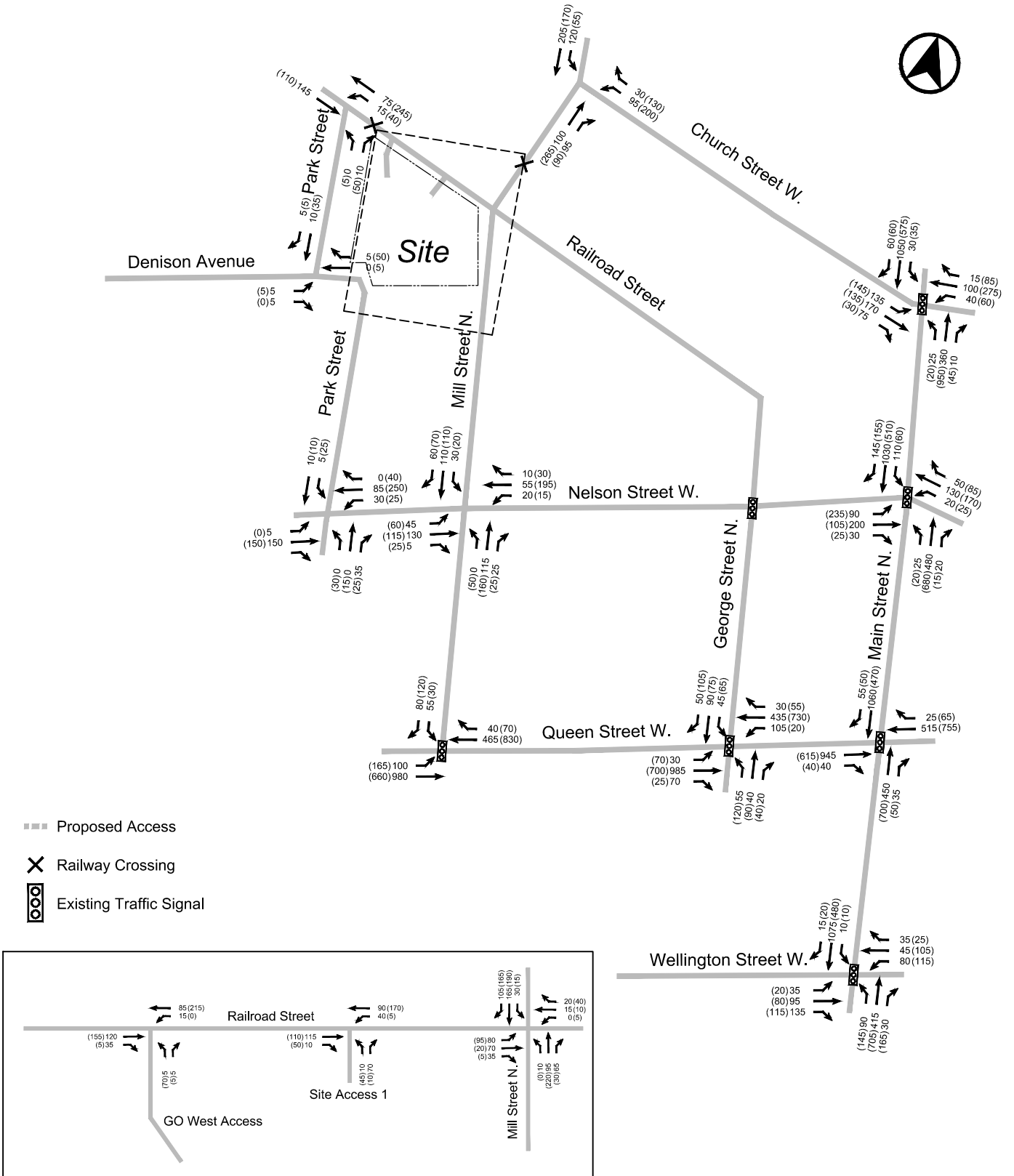
PHASE 2a SITE TRAFFIC VOLUMES



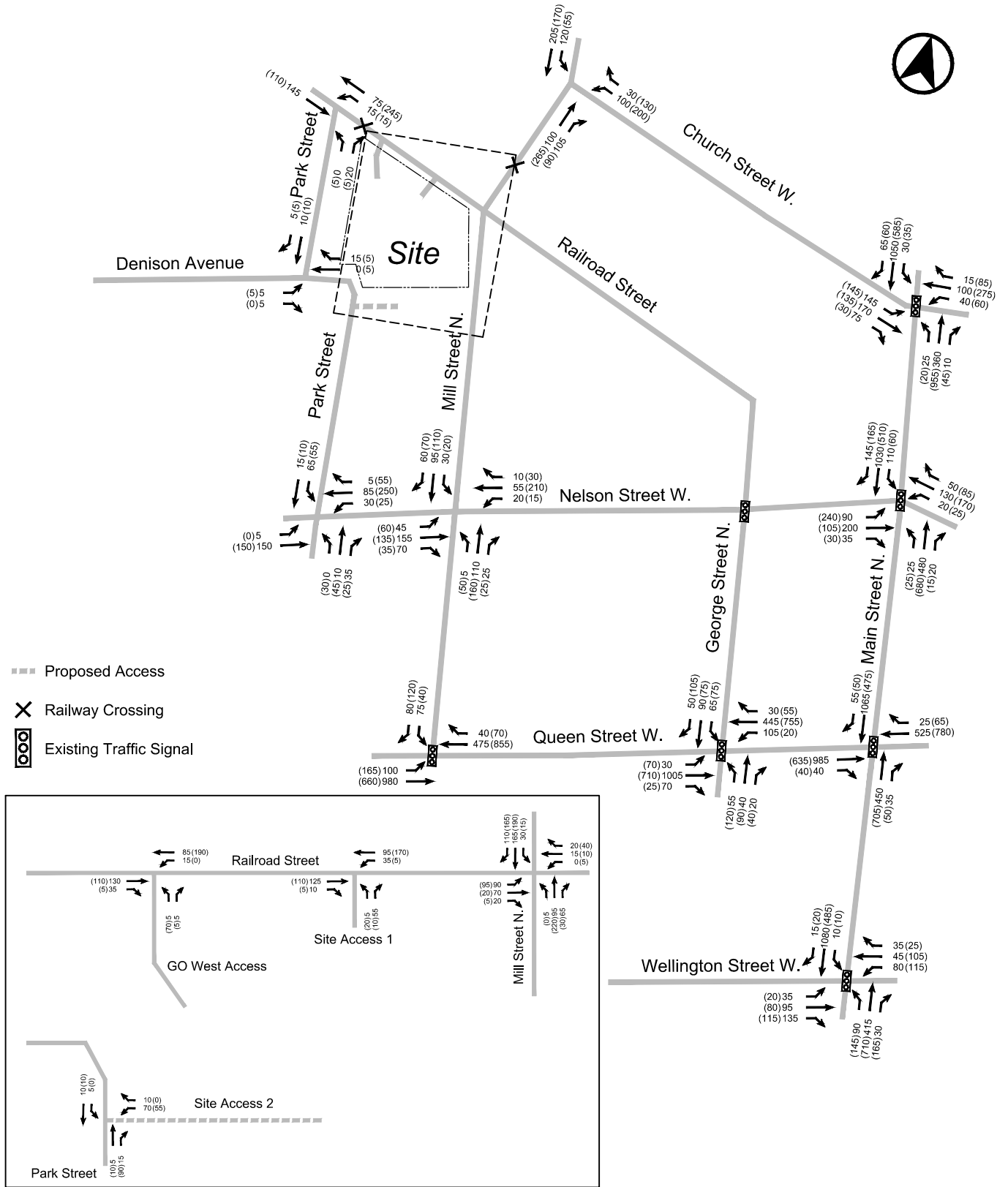
PHASE 2b SITE TRAFFIC VOLUMES



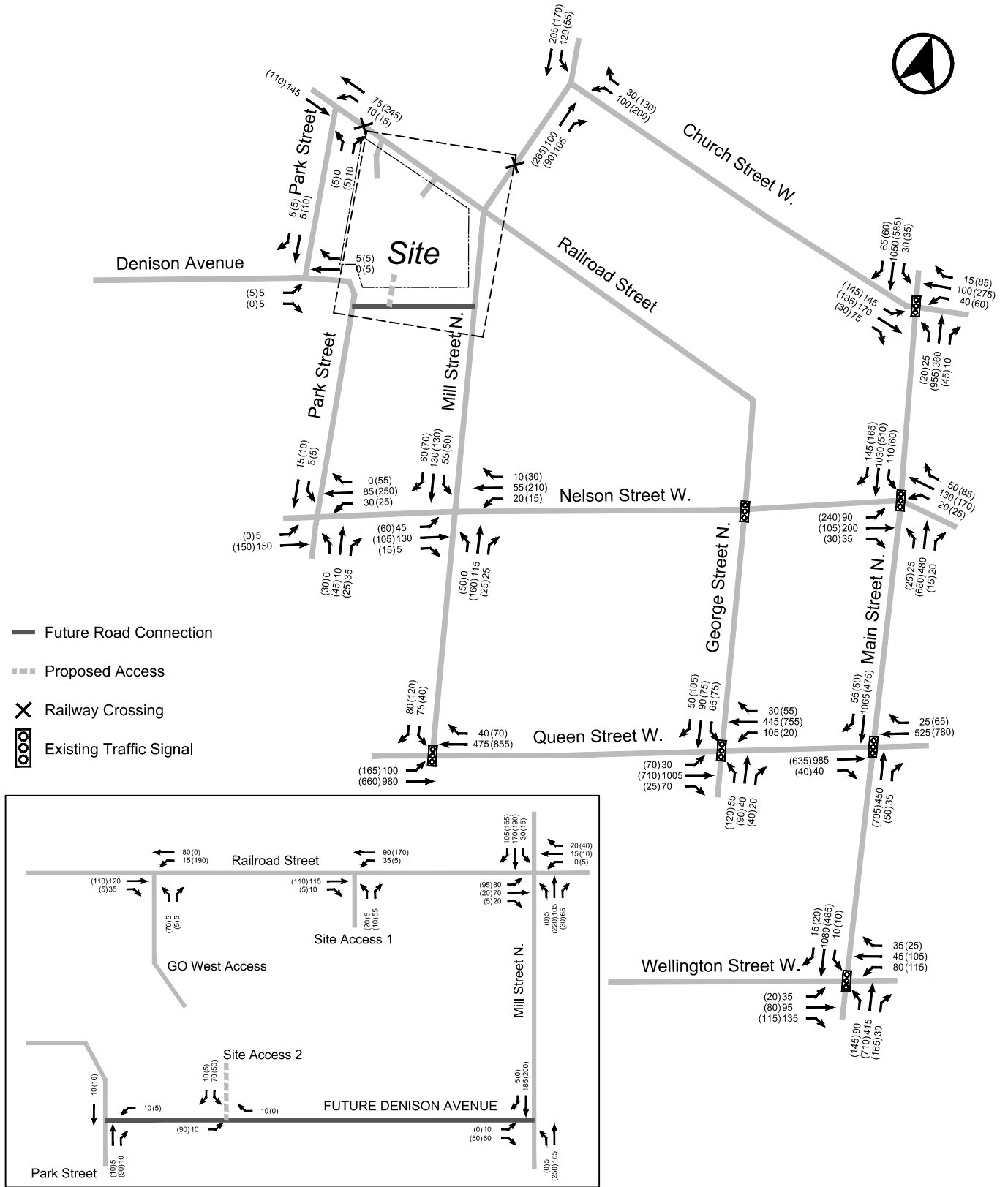
FUTURE TOTAL TRAFFIC VOLUMES (PHASE 1)



FUTURE TOTAL TRAFFIC VOLUMES (INTERIM PHASE 2)



FUTURE TOTAL TRAFFIC VOLUMES (PHASE 2a)



FUTURE TOTAL TRAFFIC VOLUMES (PHASE 2b)

APPENDIX B: Reduced Scale Site Plans



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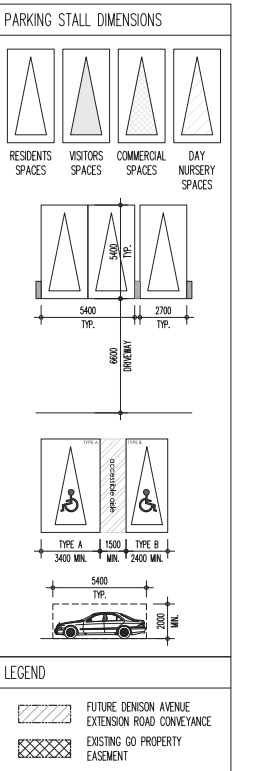
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Phone: 905.795.2801 Fax: 905.795.2844 www.gc-architects.com

PROPOSED MIXED USE DEVELOPMENT

45 Railroad Street

TORONTO ONTARIO

Project Architect: E. Corazza

Assistant Designer: L. Wong

Drawn By: L. Wong

Checked By: D. Biase

Plot Date: Oct. 1, 2015

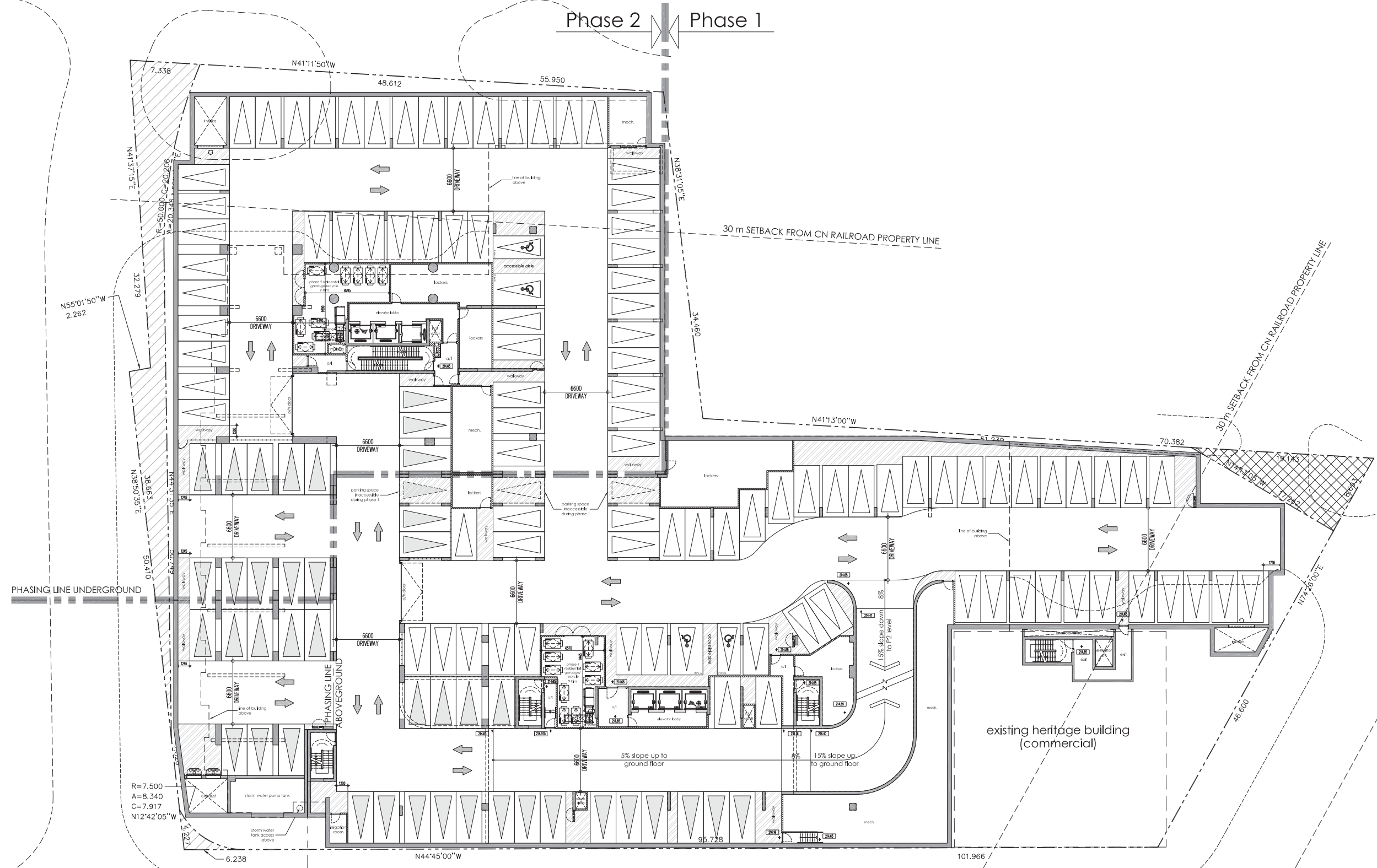
Job # 890.102

P1 UNDERGROUND

PLAN

1:200 A201

TITLEBLOCK SIZE: 610 x 950



P1 Underground

PHASE 1
30 visitors parking spaces
47 residents parking spaces
2 of which are barrier free

PHASE 2
14 visitors parking spaces
50 residents parking spaces
2 of which are barrier free

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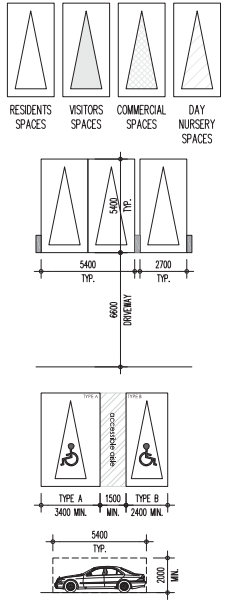
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PARKING STALL DIMENSIONS



LEGEND

- FUTURE DENISON AVENUE EXTENSION ROAD CONVEYANCE
- EXISTING GO PROPERTY EASEMENT

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PROPOSED MIXED USE DEVELOPMENT
45 Railroad Street

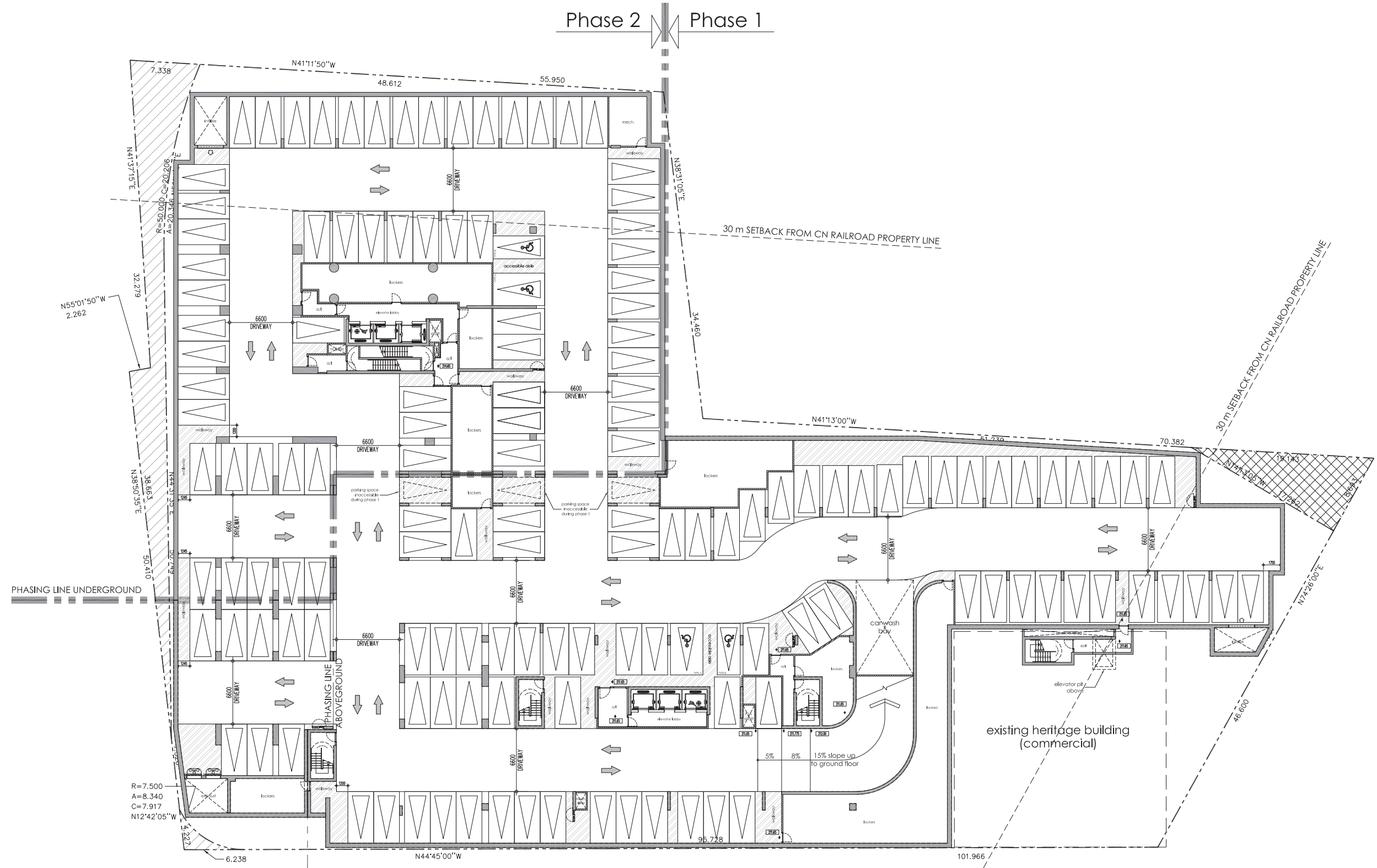
TORONTO ONTARIO

Project Architect: E. Corazza
 Assistant Designer: L. Wong
 Drawn By: L. Wong
 Checked By: D. Biase
 Plot Date: Oct. 1, 2015
 Job #: 890.102

P2 UNDERGROUND PLAN

1:200 A202

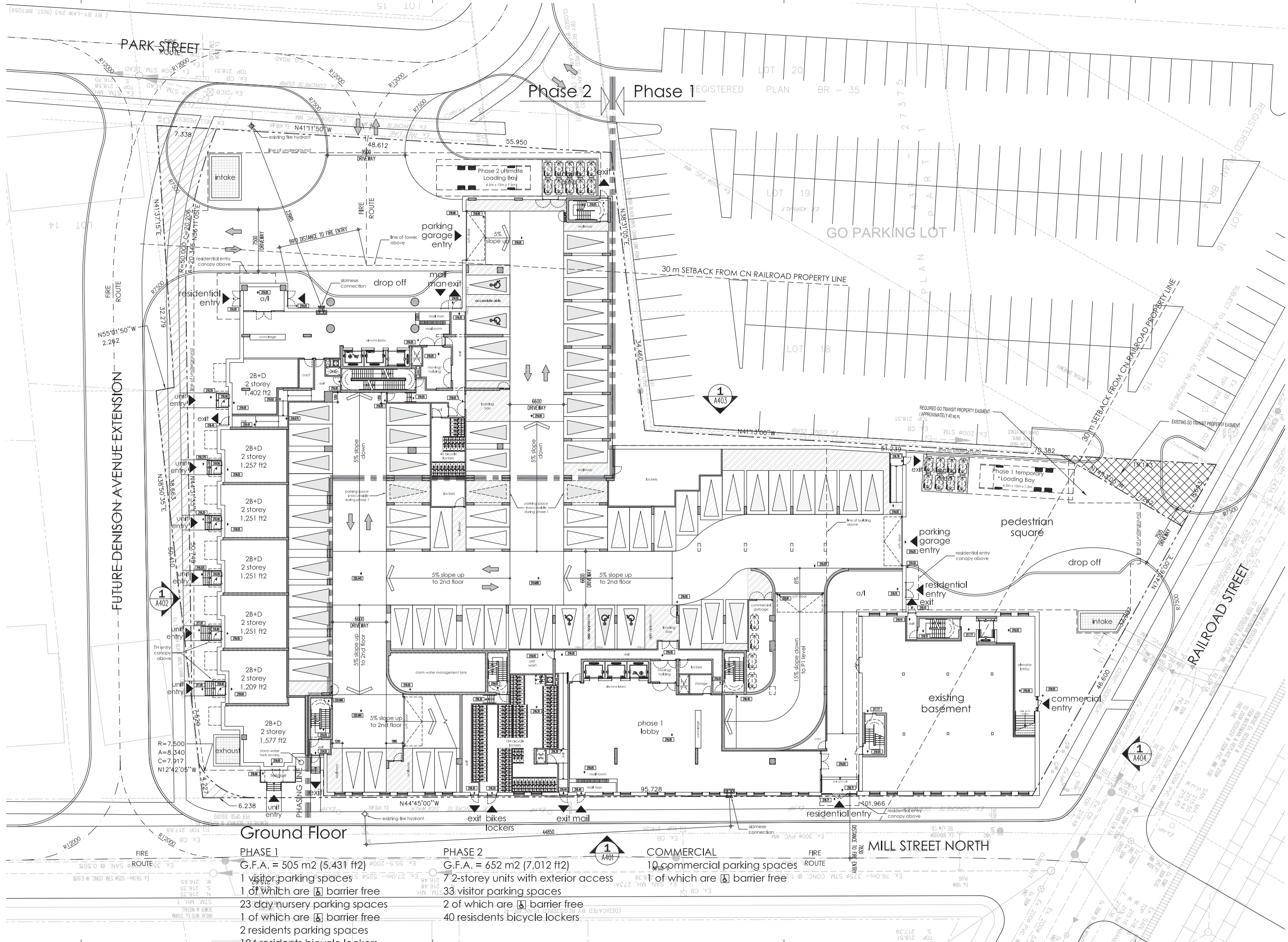
TITLEBLOCK SIZE: 610 x 950



P2 Underground

PHASE 1
 80 residents parking spaces
 2 of which are barrier free

PHASE 2
 65 residents parking spaces
 2 of which are barrier free

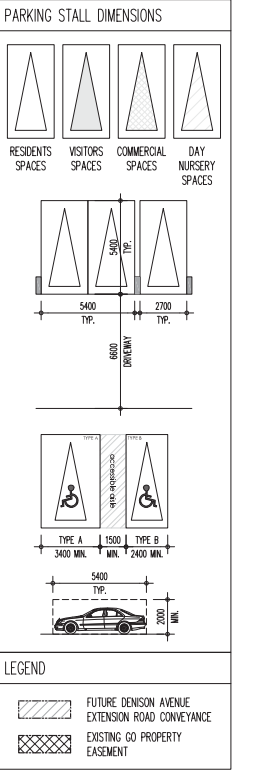


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PROPOSED MIXED USE DEVELOPMENT
45 Railroad Street
 TORONTO ONTARIO
 Project Architect: E. Corazza
 Assistant Designer: L. Wong
 Drawn By: L. Wong
 Checked By: D. Biase
 Plot Date: Oct. 1, 2015
 Job #: 890.102

GROUND FLOOR PLAN
 1:200 A301
 TITLEBLOCK SIZE: 610 x 950

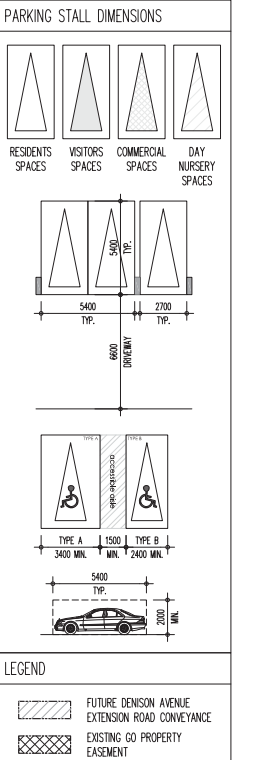
PHASE 1	PHASE 2	COMMERCIAL
G.F.A. = 505 m ² (5,431 ft ²)	G.F.A. = 652 m ² (7,012 ft ²)	10 commercial parking spaces
1 visitor parking spaces	7 2-storey units with exterior access	of which are 4 barrier free
1 of which are 4 barrier free	33 visitor parking spaces	
23 day nursery parking spaces	2 of which are 4 barrier free	
1 of which are 4 barrier free	40 residents bicycle lockers	
2 residents parking spaces		
184 residents bicycle lockers		

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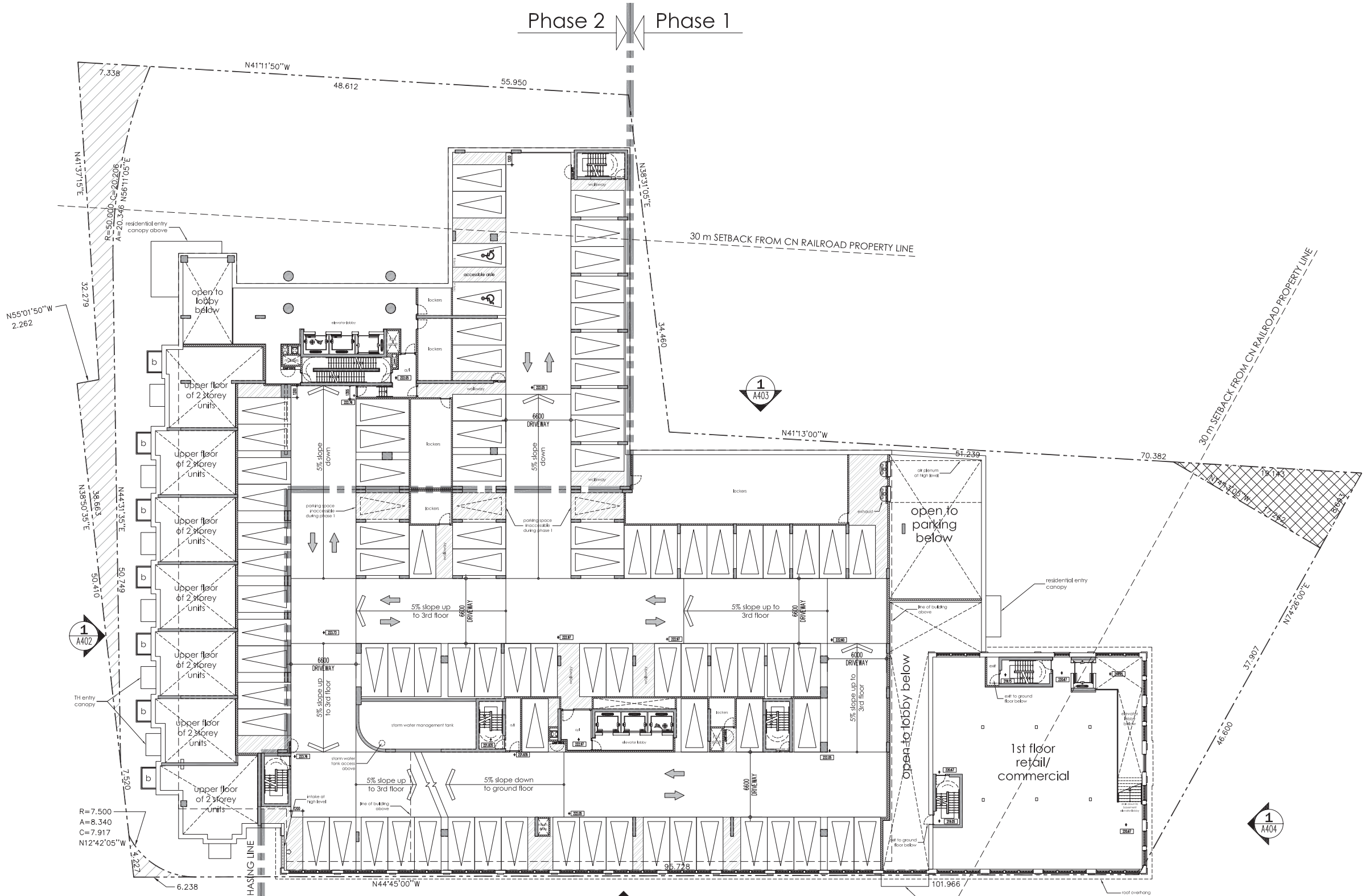
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 1320 Sheppard Ave. E., Suite 100, Mississauga, Ontario L4W 1C3
 Phone: 905.795.2801 Fax: 905.795.2844 www.gc-architects.com

PROPOSED MIXED USE DEVELOPMENT
45 Railroad Street
 TORONTO ONTARIO
 Project Architect: E. Corazza
 Assistant Designer: L. Wong
 Drawn By: L. Wong
 Checked By: D. Biase
 Plot Date: Oct. 1, 2015
 Job #: 890.102

2ND FLOOR PLAN

1:200 A302

TITLEBLOCK SIZE: 610 x 950



2nd Floor

PHASE 1
 G.F.A. = 0 m2 (0 ft2)
 54 residents parking spaces

PHASE 2
 G.F.A. = 611 m2 (6,582 ft2)
 36 residents parking spaces
 2 of which are barrier free

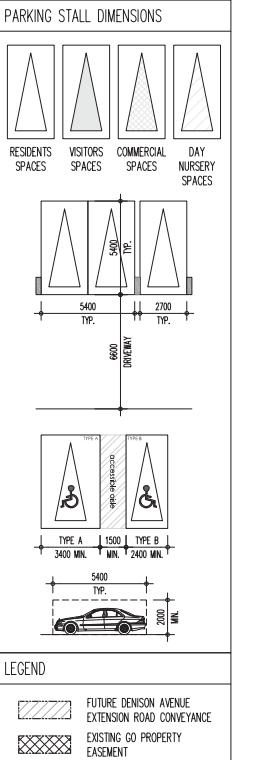
COMMERCIAL
 G.F.A. = 495.5 m2 (5,334 ft2)

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| 02. | JUN.08.2015 | RE-ISSUED FOR SPA | E.C. |
| 03. | SEP.30.2015 | RE-ISSUED FOR SPA | E.C. |



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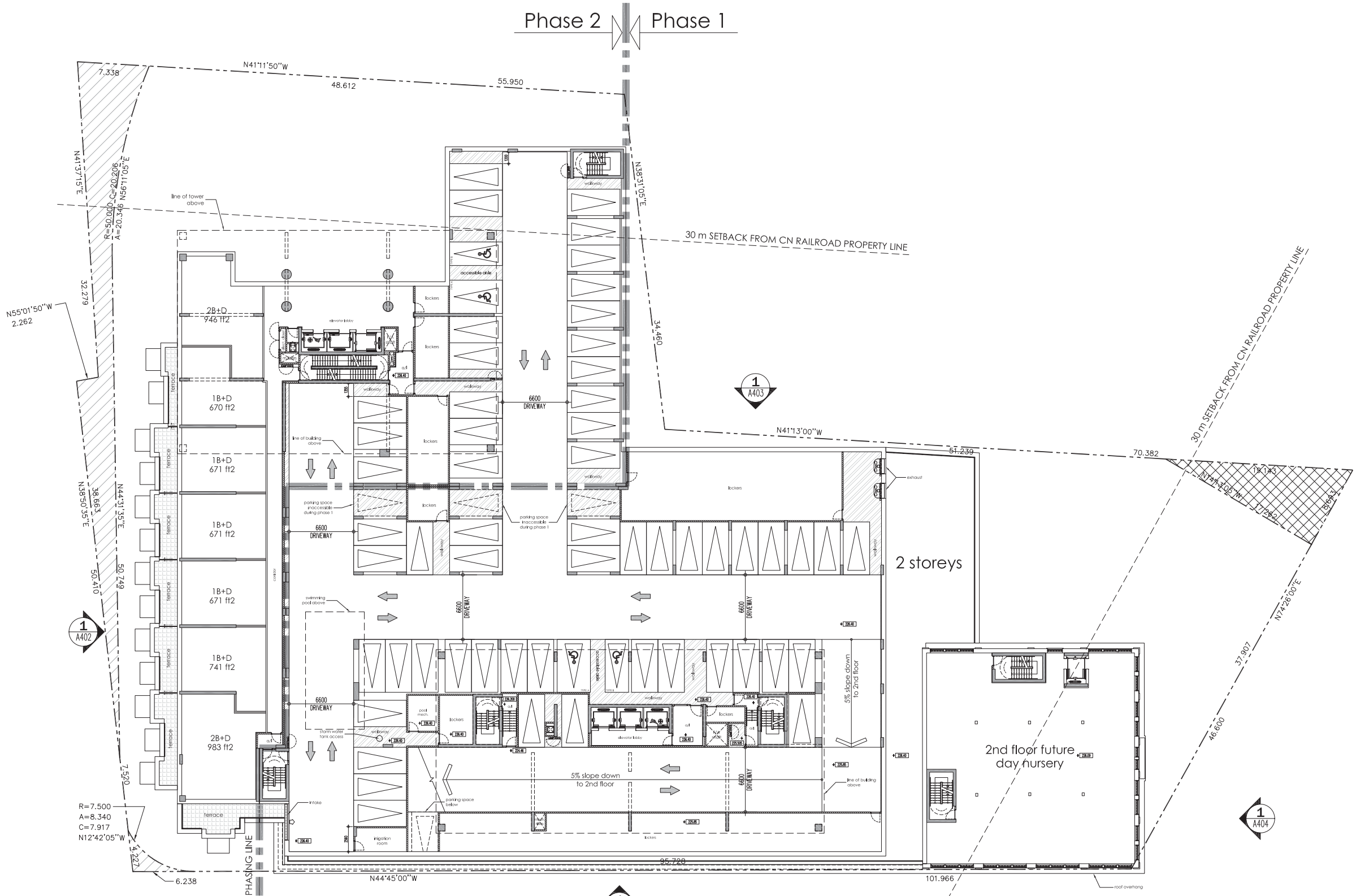
GRAZIANI + CORAZZA ARCHITECTS INC.
 1320 Sheppard Ave. E., Suite 100, Toronto, Ontario M4N 3L7
 Phone: 905.795.2801 Fax: 905.795.2844 www.gc-architects.com

PROPOSED MIXED USE DEVELOPMENT
45 Railroad Street
 TORONTO ONTARIO
 Project Architect: E. Corazza
 Assistant Designer: L. Wong
 Drawn By: L. Wong
 Checked By: D. Biase
 Plot Date: Oct. 1, 2015
 Job #: 890.102

3RD FLOOR PLAN

1:200 A303

TITLEBLOCK SIZE: 610 x 950



3rd Floor

PHASE 1
 G.F.A. = 0 m2 (0 ft2)
 38 residents parking spaces
 2 of which are barrier free

PHASE 2
 G.F.A. = 706 m2 (7,597 ft2)
 7 units
 25 residents parking spaces
 2 of which are barrier free

COMMERCIAL
 G.F.A. = 495.5 m2 (5,334 ft2)

APPENDIX C: Corridor Growth Analysis



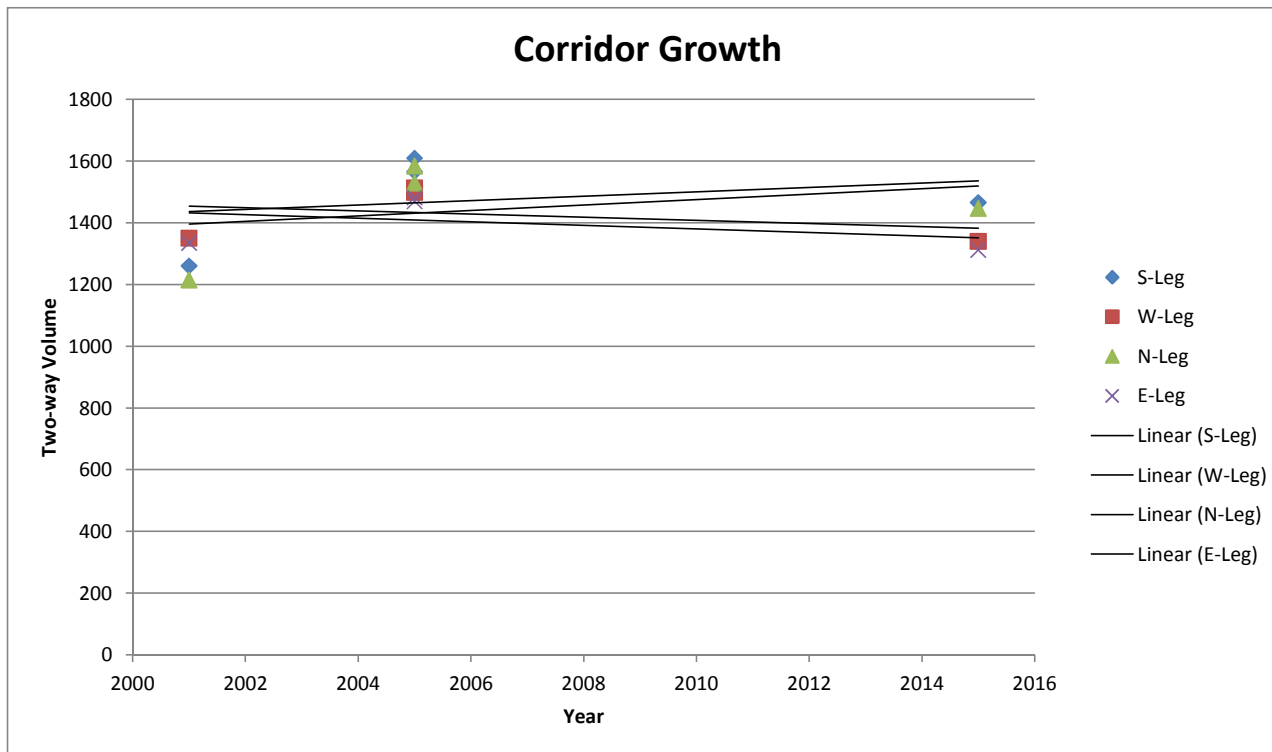
Corridor Growth - AM

Project 45 Railroad St

Project No 7698-01

Date 2016-03-02

Intersection:		Main St / Queen St															
Year	SBL	SBT	SBR	WBL	WBT	WBR	NBL	NBT	NBR	EBL	EBT	EBR	S-Leg	W-Leg	N-Leg	E-Leg	
2001	2	838	32	1	338	26	0	317	47	1	922	58	1261	1351	1216	1336	
2005	0	1061	57	2	495	28	1	382	60	2	898	61	1567	1514	1530	1483	
2005	4	1114	56	0	458	21	0	390	54	0	933	52	1610	1499	1585	1470	
2015	0	1044	41	2	450	16	0	346	35	1	810	39	1466	1341	1448	1313	
			Slope			7.102804	-5.15421	8.85514	-5.76636								
			Rate			0%	0%	1%	0%								



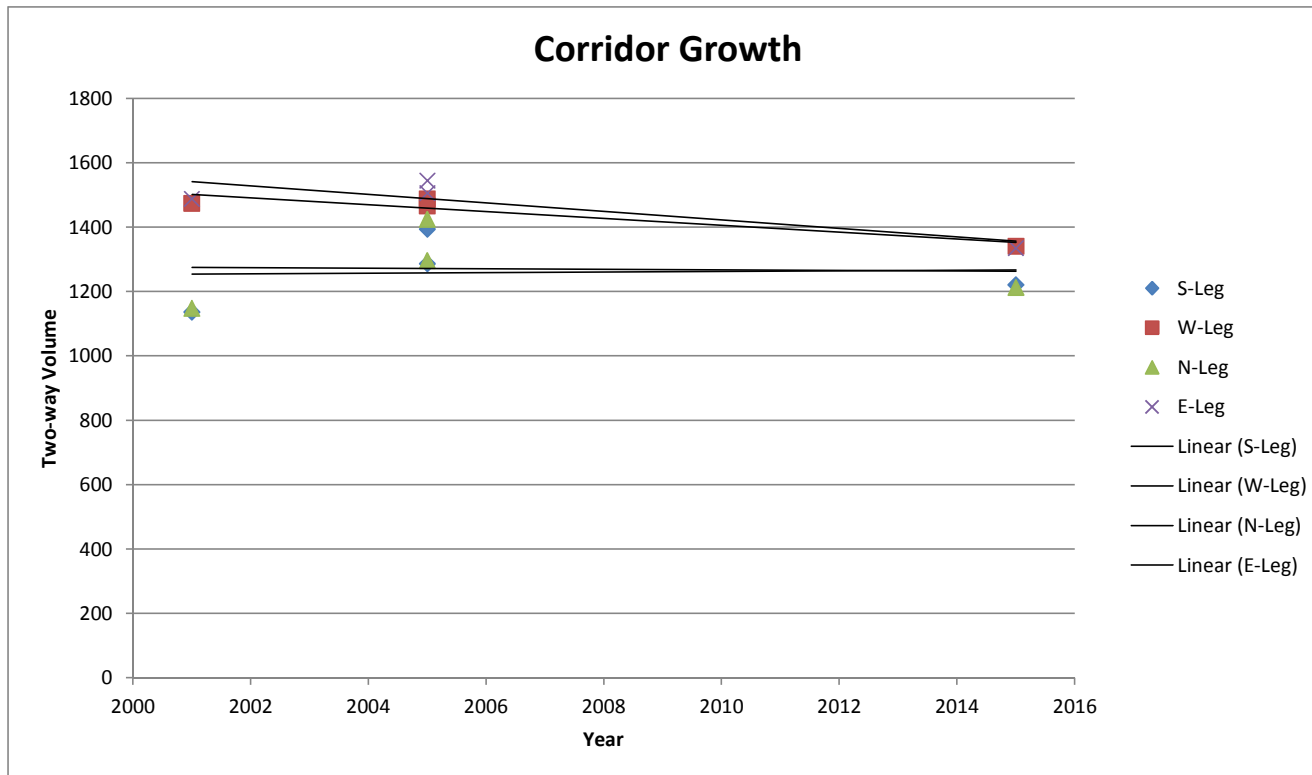
Corridor Growth - PM

Project 45 Railroad St

Project No 7698-01

Date 2016-03-02

Intersection:		Main St / Queen St															
Year	SBL	SBT	SBR	WBL	WBT	WBR	NBL	NBT	NBR	EBL	EBT	EBR	S-Leg	W-Leg	N-Leg	E-Leg	
2001	10	435	54	9	817	45	3	604	47	1	561	39	1137	1475	1149	1489	
2005	0	556	51	6	838	80	0	737	59	1	563	36	1394	1489	1425	1546	
2005	3	495	43	1	837	49	3	705	59	2	558	24	1287	1467	1297	1507	
2015	0	414	47	0	679	30	0	722	48	0	579	37	1221	1342	1213	1336	
Slope			0.96729	-10.6495	-0.85981	-13.2056											
Rate			0%	-1%	0%	-1%											



APPENDIX D: Commercial Trip Generation Surveys



Source		Date	a.m. peak hour			p.m. peak hour		
			In	Out	Total	In	Out	Total
Dundas Parkade	trips per stall	April 23-26, 2004	0.16	0.02	0.18	0.07	0.16	0.23
Dundas Parkade	trips per stall	April 29- May 1, 2004	0.17	0.04	0.21	0.07	0.20	0.27
Dundas Parkade	trips per stall	November 1993	0.19	0.02	0.21	0.15	0.23	0.38
Yonge Parkade	trips per stall	November 2002 and December 2003	0.24	0.01	0.25	0.06	0.27	0.33
Ryerson Garage	trips per occupied stall	February 1998	0.32	0.01	0.33	0.30	0.15	0.45
Average			0.22	0.02	0.24	0.13	0.20	0.33
(July 2004) Bay/Dundas Redevelopment	trips per stall		0.35	0.05	0.40	0.20	0.35	0.55
Hayden Street TPA Lot #1	trips per occupied stall	November 13-20,2002	0.14	0.01	0.15	0.12	0.19	0.31
	trips per occupied stall	January 15-22,2003	0.32	0.02	0.34	0.11	0.25	0.36
	trips per occupied stall	March 19-26, 2003	0.35	0.05	0.40	0.12	0.35	0.47
Lot Average	trips per occupied stall		0.27	0.03	0.30	0.12	0.26	0.38
Cumberland TPA Lot #15	trips per occupied stall	peak period counts between	0.19	0.01	0.20	0.23	0.35	0.58
	trips per occupied stall	7:00-8:00 a.m.	0.36	0.03	0.39	0.19	0.36	0.55
	trips per occupied stall	8:00-9:00 a.m.	0.41	0.07	0.48	0.15	0.47	0.62
Lot Average	trips per occupied stall	9:00-10:00a.m.	0.32	0.04	0.36	0.19	0.39	0.58
Bedford TPA Lot #58	trips per occupied stall	4:00-5:00p.m.	0.14	0.05	0.19	0.24	0.34	0.58
	trips per occupied stall	5:00-6:00p.m.	0.28	0.09	0.37	0.30	0.36	0.66
	trips per occupied stall	6:00-7:00p.m.	0.33	0.12	0.45	0.31	0.41	0.72
Lot Average	trips per occupied stall		0.25	0.09	0.34	0.28	0.37	0.65
Yorkville Avenue TPA Lot #215	trips per occupied stall		0.20	0.03	0.23	0.27	0.40	0.67
	trips per occupied stall		0.15	0.03	0.18	0.23	0.33	0.56
	trips per occupied stall		0.31	0.09	0.40	0.17	0.38	0.55
Lot Average	trips per occupied stall		0.22	0.05	0.27	0.22	0.37	0.59
Toronto Parking Authority Average			0.27	0.05	0.32	0.20	0.35	0.55
(April 2003) Yonge/Bloor Redevelopment	trips per stall		0.35	0.05	0.40	0.30	0.40	0.70
Simcoe Place	trips per stall	September 18, 2003	0.29	0.01	0.30	0.04	0.20	0.24
The Broadcast Centre	trips per stall		0.50	0.05	0.55	0.10	0.45	0.55
			0.40	0.03	0.43	0.07	0.33	0.40
(October 2003) Simcoe Place	trips per stall		0.35	0.05	0.40	0.05	0.35	0.40
Existing Parking Lot -Block 5 (December 2004 counts)	trips per stall		0.25	0.00	0.25	0.15	0.25	0.40
Existing Parking Lot -Block 2 (December 2004 counts)	trips per stall		0.30	0.02	0.32	0.15	0.20	0.35
Average of Survey Data			0.29	0.02	0.31	0.14	0.27	0.41
Average of Published Rates			0.35	0.05	0.40	0.18	0.37	0.55
Selected Rate	trips per stall		0.25	0.10	0.35	0.50	0.50	1.00

**APPENDIX E:
Wellington Street / Main Street Intergreen Study**



Westbound Left Turn Intergreen Study - Wellington and Main

Job No: 7698.01
 Project: 45 Railroad
 Location: Wellington and Main
 Date: Thursday December 10, 2015
 Time: 7:00-9:00, 16:00-18:00
 WBL Intergreen

Time	Cycle No.	Signal Phases	
		Amber	Red
7:00	1	0	0
7:02	2	0	0
7:04	3	0	0
7:06	4	0	0
7:08	5	0	0
7:10	6	0	0
7:12	7	0	0
7:14	8	0	0
7:17	9	1	0
7:18	10	0	0
7:21	11	0	0
7:22	12	0	0
7:24	13	0	0
7:26	14	0	0
7:28	15	0	0
7:30	16	0	0
7:32	17	0	0
7:35	18	0	0
7:36	19	0	0
7:38	20	0	0
7:41	21	1	0
7:43	22	0	0
7:44	23	0	0
7:47	24	0	0
7:49	25	0	0
7:51	26	0	0
7:53	27	1	0
7:54	28	0	0
7:57	29	1	0
7:59	30	0	0
8:01	31	0	0
8:03	32	2	0
8:04	33	0	0
8:06	34	0	0
8:08	35	0	0
8:11	36	0	0
8:12	37	0	0
8:15	38	2	0
8:16	39	0	0
8:18	40	0	0
8:21	41	0	1
8:22	42	0	0
8:24	43	0	0
8:27	44	1	0
8:28	45	0	0
8:31	46	1	0
8:32	47	0	0
8:34	48	0	0
8:37	49	0	0
8:38	50	0	0
8:40	51	0	0
8:42	52	0	0
8:44	53	0	0
8:46	54	0	0
8:48	55	0	0
8:50	56	0	0
8:52	57	0	0
8:54	58	0	0
8:56	59	0	0
8:58	60	0	0
Total		10	1

Peak Hour			
7:30-8:30		8	1
Number Cycles in Hour (CL = 140s)		26	
Peak Hour WBLT on Intergreen per Cycle		0.35	

Time	Cycle No.	Signal Phases	
		Amber	Red
16:00	1	0	0
16:01	2	0	0
16:03	3	0	0
16:06	4	0	0
16:07	5	0	1
16:09	6	0	0
16:12	7	0	0
16:14	8	1	0
16:15	9	0	0
16:18	10	0	0
16:19	11	0	0
16:22	12	1	0
16:23	13	0	0
16:25	14	0	0
16:27	15	0	0
16:29	16	0	0
16:32	17	1	0
16:34	18	0	0
16:35	19	1	0
16:38	20	0	0
16:40	21	0	0
16:42	22	0	0
16:44	23	0	1
16:46	24	0	0
16:48	25	0	0
16:50	26	0	0
16:52	27	0	0
16:53	28	1	1
16:56	29	0	0
16:58	30	0	0
17:00	31	0	0
17:02	32	0	0
17:04	33	0	0
17:06	34	1	0
17:08	35	0	0
17:10	36	0	0
17:12	37	1	2
17:14	38	0	0
17:16	39	1	0
17:18	40	0	0
17:20	41	0	0
17:22	42	0	0
17:24	43	0	0
17:26	44	0	0
17:28	45	0	0
17:30	46	0	0
17:32	47	0	0
17:34	48	0	0
17:36	49	0	0
17:38	50	0	1
17:40	51	0	0
17:42	52	0	0
17:44	53	0	0
17:46	54	0	0
17:49	55	0	0
17:50	56	0	0
17:52	57	0	0
17:54	58	2	0
17:56	59	0	0
17:58	60	1	1
18:00	61	1	1
Total		12	8

Peak Hour			
17:00-18:00		7	5
Number Cycles in Hour (CL = 135s)		27	
Peak Hour WBLT on Intergreen per Cycle		0.45	

**APPENDIX F:
Peak 5 Minute Train Crossing Volume and Hourly Scaling**



Mill Street / Railroad Street Effective Peak 5 min Traffic Demand at Gate Lift (AM)

Project 45 Railroad

Project # 7698-01

Study Date Wednesday, November 11, 2015

Start Time	Duration (s)	Vehicular Traffic											Pedestrian Traffic				
		SBL	SBT	SBR	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBT	EBR	SB	NB	WB	EB
7:03:00	300	1	6	24	1	16	4	0	1	0	5	8	2	0	16	18	1
7:18:20	300	2	9	6	0	21	3	0	2	3	6	4	0	1	3	4	0
7:30:10	300	2	12	12	0	7	1	0	1	2	3	4	0	0	1	2	0
8:02:40	300	3	15	12	0	18	4	1	0	2	5	1	0	0	6	6	2
8:23:33	300	1	13	8	0	15	2	0	0	2	6	2	0	0	0	1	0
8:31:04	300	3	15	5	0	3	2	1	1	1	9	0	0	0	1	0	3

Adjusted Volumes (Study Hour)

Start Time	Multiplier	Vehicular Traffic											Pedestrian Traffic				
		SBL	SBT	SBR	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBT	EBR	SB	NB	WB	EB
7:03:00	12.0	12	72	288	12	192	48	0	12	0	60	96	24	0	192	216	12
7:18:20	12.0	24	108	72	0	252	36	0	24	36	72	48	0	12	36	48	0
7:30:10	12.0	24	144	144	0	84	12	0	12	24	36	48	0	0	12	24	0
8:02:40	12.0	36	180	144	0	216	48	12	0	24	60	12	0	0	72	72	24
8:23:33	12.0	12	156	96	0	180	24	0	0	24	72	24	0	0	0	12	0
8:31:04	12.0	36	180	60	0	36	24	12	12	12	108	0	0	0	12	0	36

Average Adjusted Volumes (Study Hour - 7:00-8:00)

Type	Vehicular Traffic											Pedestrian Traffic				
	SBL	SBT	SBR	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBT	EBR	SB	NB	WB	EB
GO Train	20	108	168	4	176	32	0	16	20	56	64	8	4	80	96	4

Mill Street / Railroad Street Effective Peak 5 min Traffic Demand at Gate Lift (PM)

Project 45 Railroad

Project # 7698-01

Study Date Wednesday, November 11, 2015

Start Time	Duration (s)	Vehicular Traffic											Pedestrian Traffic				
		SBL	SBT	SBR	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBT	EBR	SB	NB	WB	EB
16:21:04	66	0	7	3	0	7	0	0	0	3	2	0	0	1	9	4	0
16:24:59	300	0	22	26	0	23	0	0	0	5	11	1	0	0	0	6	5
17:06:23	157	0	12	6	0	23	1	0	0	3	3	0	0	0	25	26	1
17:09:56	300	2	38	14	0	28	0	0	0	4	8	2	1	1	4	3	3
17:36:09	129	2	9	18	0	15	3	0	1	3	4	1	0	0	29	25	2
17:39:32	300	2	32	22	0	34	5	1	2	7	14	5	0	1	1	1	1
17:48:13	132	0	12	11	0	9	2	0	1	2	0	0	0	0	7	9	0
17:51:29	300	3	17	22	0	18	2	1	2	2	7	4	0	1	1	1	0

Adjusted Volumes (Study Hour)

Start Time	Multiplier	Vehicular Traffic											Pedestrian Traffic				
		SBL	SBT	SBR	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBT	EBR	SB	NB	WB	EB
16:21:04	54.5	0	382	164	0	382	0	0	0	164	109	0	0	55	491	218	0
16:24:59	12.0	0	264	312	0	276	0	0	0	60	132	12	0	0	0	72	60
17:06:23	22.9	0	275	138	0	527	23	0	0	69	69	0	0	0	573	596	23
17:09:56	12.0	24	456	168	0	336	0	0	0	48	96	24	12	12	48	36	36
17:36:09	27.9	56	251	502	0	419	84	0	28	84	112	28	0	0	809	698	56
17:39:32	12.0	24	384	264	0	408	60	12	24	84	168	60	0	12	12	12	12
17:48:13	27.3	0	327	300	0	245	55	0	27	55	0	0	0	0	191	245	0
17:51:29	12.0	36	204	264	0	216	24	12	24	24	84	48	0	12	12	12	0

Average Adjusted Volumes (Study Hour - 16:45-17:45)

Type	Vehicular Traffic											Pedestrian Traffic				
	SBL	SBT	SBR	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBT	EBR	SB	NB	WB	EB
GO Train	16	372	190	0	424	28	4	8	67	111	28	4	8	211	215	24
CN Train	56	251	502	0	419	84	0	28	84	112	28	0	0	809	698	56

APPENDIX G:
Synchro Analysis Sheets – Signalized Intersections



HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Existing AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑			↑↑			↑↑			↑↑		
Traffic Volume (vph)	0	910	40	0	510	15	0	430	35	0	1010	40	
Future Volume (vph)	0	910	40	0	510	15	0	430	35	0	1010	40	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	
Total Lost time (s)		6.0			6.0			6.0			6.0		
Lane Util. Factor		0.95			0.95			0.95			0.95		
Frbp, ped/bikes		1.00			1.00			1.00			1.00		
Flpb, ped/bikes		1.00			1.00			1.00			1.00		
Frt		0.99			1.00			0.99			0.99		
Flt Protected		1.00			1.00			1.00			1.00		
Satd. Flow (prot)		3549			3521			3311			3509		
Flt Permitted		1.00			1.00			1.00			1.00		
Satd. Flow (perm)		3549			3521			3311			3509		
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj. Flow (vph)	0	910	40	0	510	15	0	430	35	0	1010	40	
RTOR Reduction (vph)	0	2	0	0	2	0	0	4	0	0	2	0	
Lane Group Flow (vph)	0	948	0	0	523	0	0	461	0	0	1048	0	
Confl. Peds. (#/hr)	36		50	50		36	43		11	11		43	
Heavy Vehicles (%)	0%	2%	0%	0%	3%	6%	0%	9%	6%	0%	3%	7%	
Turn Type		NA			NA			NA			NA		
Protected Phases		4			8			2			6		
Permitted Phases													
Actuated Green, G (s)		64.0			64.0			64.0			64.0		
Effective Green, g (s)		64.0			64.0			64.0			64.0		
Actuated g/C Ratio		0.46			0.46			0.46			0.46		
Clearance Time (s)		6.0			6.0			6.0			6.0		
Lane Grp Cap (vph)		1622			1609			1513			1604		
v/s Ratio Prot		c0.27			0.15			0.14			c0.30		
v/s Ratio Perm													
v/c Ratio		0.58			0.33			0.30			0.65		
Uniform Delay, d1		28.1			24.2			24.0			29.4		
Progression Factor		0.64			1.00			1.26			1.25		
Incremental Delay, d2		1.4			0.5			0.5			1.7		
Delay (s)		19.4			24.8			30.7			38.4		
Level of Service		B			C			C			D		
Approach Delay (s)		19.4			24.8			30.7			38.4		
Approach LOS		B			C			C			D		
Intersection Summary													
HCM 2000 Control Delay		28.8			HCM 2000 Level of Service							C	
HCM 2000 Volume to Capacity ratio		0.62											
Actuated Cycle Length (s)		140.0			Sum of lost time (s)						12.0		
Intersection Capacity Utilization		71.0%			ICU Level of Service						C		
Analysis Period (min)		15											
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Existing AM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↔	↑↑	↑↑		↔	↔	
Traffic Volume (vph)	100	980	450	35	30	80	
Future Volume (vph)	100	980	450	35	30	80	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5	
Total Lost time (s)	6.0	6.0	6.0		6.0		
Lane Util. Factor	1.00	0.95	0.95		1.00		
Frbp, ped/bikes	1.00	1.00	1.00		0.99		
Flpb, ped/bikes	1.00	1.00	1.00		1.00		
Frt	1.00	1.00	0.99		0.99		
Flt Protected	0.95	1.00	1.00		0.99		
Satd. Flow (prot)	1777	3579	3443		1597		
Flt Permitted	0.48	1.00	1.00		0.99		
Satd. Flow (perm)	889	3579	3443		1597		
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	
Adj. Flow (vph)	100	980	450	35	30	80	
RTOR Reduction (vph)	0	0	3	0	68	0	
Lane Group Flow (vph)	100	980	482	0	42	0	
Confl. Peds. (#/hr)	2			2	5	4	
Heavy Vehicles (%)	0%	2%	5%	0%	0%	4%	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		4	8				
Permitted Phases		4			6		
Actuated Green, G (s)	107.0	107.0	107.0		21.0		
Effective Green, g (s)	107.0	107.0	107.0		21.0		
Actuated g/C Ratio	0.76	0.76	0.76		0.15		
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)	679	2735	2631		239		
v/s Ratio Prot		c0.27	0.14				
v/s Ratio Perm	0.11				c0.03		
v/c Ratio	0.15	0.36	0.18		0.18		
Uniform Delay, d1	4.4	5.4	4.5		51.9		
Progression Factor	1.00	1.00	0.92		1.00		
Incremental Delay, d2	0.5	0.4	0.1		0.4		
Delay (s)	4.8	5.7	4.3		52.3		
Level of Service	A	A	A		D		
Approach Delay (s)	5.6	4.3			52.3		
Approach LOS	A	A			D		
Intersection Summary							
HCM 2000 Control Delay		8.3			HCM 2000 Level of Service		A
HCM 2000 Volume to Capacity ratio		0.33					
Actuated Cycle Length (s)		140.0			Sum of lost time (s)		12.0
Intersection Capacity Utilization		59.4%			ICU Level of Service		B
Analysis Period (min)		15					
c Critical Lane Group							

HCM Signalized Intersection Capacity Analysis
 5: Main St S/Main St N & Queen St W/Queen St E

Existing PM
 Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑			↑↑			↑↑	
Traffic Volume (vph)	0	600	40	0	730	30	0	655	50	0	445	45
Future Volume (vph)	0	600	40	0	730	30	0	655	50	0	445	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Flpb, ped/bikes		0.99			1.00			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3491			3582			3445			3436	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3491			3582			3445			3436	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	600	40	0	730	30	0	655	50	0	445	45
RTOR Reduction (vph)	0	3	0	0	2	0	0	4	0	0	5	0
Lane Group Flow (vph)	0	637	0	0	758	0	0	701	0	0	485	0
Confl. Peds. (#/hr)	69		72	72		69	74		185	185		74
Heavy Vehicles (%)	0%	3%	3%	0%	1%	0%	0%	3%	0%	0%	4%	0%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1595			1637			1574			1570	
v/s Ratio Prot		0.18			c0.21			c0.20			0.14	
v/s Ratio Perm												
v/c Ratio		0.40			0.46			0.45			0.31	
Uniform Delay, d1		25.2			26.2			25.9			24.0	
Progression Factor		0.65			1.00			1.31			1.58	
Incremental Delay, d2		0.7			0.9			0.8			0.5	
Delay (s)		17.2			27.1			34.7			38.5	
Level of Service		B			C			C			D	
Approach Delay (s)		17.2			27.1			34.7			38.5	
Approach LOS		B			C			C			D	
Intersection Summary												
HCM 2000 Control Delay		28.9			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.45										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		65.8%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Existing PM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕↕	↕↕		↕	↕
Traffic Volume (vph)	165	660	825	55	20	120
Future Volume (vph)	165	660	825	55	20	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frpb, ped/bikes	1.00	1.00	0.99		0.98	
Flpb, ped/bikes	0.98	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.88	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1733	3579	3528		1615	
Flt Permitted	0.31	1.00	1.00		0.99	
Satd. Flow (perm)	559	3579	3528		1615	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	660	825	55	20	120
RTOR Reduction (vph)	0	0	3	0	102	0
Lane Group Flow (vph)	165	660	877	0	38	0
Confl. Peds. (#/hr)	18			18	9	5
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	427	2735	2696		242	
v/s Ratio Prot		0.18	0.25			
v/s Ratio Perm	c0.30				c0.02	
v/c Ratio	0.39	0.24	0.33		0.16	
Uniform Delay, d1	5.5	4.8	5.2		51.8	
Progression Factor	1.00	1.00	0.65		1.00	
Incremental Delay, d2	2.6	0.2	0.3		0.3	
Delay (s)	8.1	5.0	3.7		52.1	
Level of Service	A	A	A		D	
Approach Delay (s)		5.6	3.7		52.1	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Existing PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕↕	↕↕	↔	↕↕	↕↕		↕↕	↕↕	↕↕	↕↕	↕↕
Traffic Volume (vph)	145	135	30	60	275	85	20	905	45	35	530	60
Future Volume (vph)	145	135	30	60	275	85	20	905	45	35	530	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		0.95	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1767	1819		1696	1829			3488			3414	
Flt Permitted	0.17	1.00		0.65	1.00			0.93			0.83	
Satd. Flow (perm)	318	1819		1165	1829			3252			2849	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	135	30	60	275	85	20	905	45	35	530	60
RTOR Reduction (vph)	0	5	0	0	8	0	0	3	0	0	7	0
Lane Group Flow (vph)	145	160	0	60	352	0	0	967	0	0	619	0
Confl. Peds. (#/hr)	25		36	36		25	42		62	62		42
Heavy Vehicles (%)	1%	1%	3%	0%	0%	0%	0%	3%	0%	3%	4%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			2	
Permitted Phases	4				8			2			6	
Actuated Green, G (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Effective Green, g (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Actuated g/C Ratio	0.38	0.38		0.23	0.23			0.54			0.54	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	293	688		268	421			1742			1526	
v/s Ratio Prot	c0.06	0.09			c0.19							
v/s Ratio Perm	0.13			0.05				c0.30			0.22	
v/c Ratio	0.49	0.23		0.22	0.84			0.56			0.41	
Uniform Delay, d1	32.0	29.6		43.7	51.3			21.5			19.3	
Progression Factor	1.00	1.00		1.00	1.00			0.75			1.00	
Incremental Delay, d2	1.3	0.2		0.4	13.5			1.2			0.8	
Delay (s)	33.4	29.8		44.1	64.8			17.2			20.1	
Level of Service	C	C		D	E			B			C	
Approach Delay (s)		31.5			61.9			17.2			20.1	
Approach LOS		C			E			B			C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

15: Main St N & Nelson St W/Theatre Ln

Existing PM
Baseline

Movement														
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘		
Traffic Volume (vph)	215	105	25	25	170	85	20	600	15	30	480	145		
Future Volume (vph)	215	105	25	25	170	85	20	600	15	30	480	145		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5		
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0			
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95			
Frpb, ped/bikes	1.00	0.94		1.00	0.88			1.00			0.91			
Flpb, ped/bikes	0.96	1.00		0.76	1.00			1.00			1.00			
Frt	1.00	0.97		1.00	0.95			1.00			0.97			
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00			
Satd. Flow (prot)	1654	1525		1350	1439			3497			3041			
Flt Permitted	0.30	1.00		0.67	1.00			0.92			0.89			
Satd. Flow (perm)	519	1525		958	1439			3216			2726			
Peak-hour factor, PHF	1.00	1.00		1.00	1.00			1.00			1.00			
Adj. Flow (vph)	215	105		25	170			600			480			
RTOR Reduction (vph)	0	5		0	14			1			0			
Lane Group Flow (vph)	215	125		0	25			634			634			
Confl. Peds. (#/hr)	241			132	132			241			53			
Heavy Vehicles (%)	4%	19%		0%	14%			8%			3%			
Turn Type	pm+pt	NA		Perm	NA			Perm			NA			
Protected Phases	7	4			8			2			6			
Permitted Phases	4			8				2			6			
Actuated Green, G (s)	55.6	55.6		28.5	28.5			72.4			72.4			
Effective Green, g (s)	55.6	55.6		28.5	28.5			72.4			72.4			
Actuated g/C Ratio	0.40	0.40		0.20	0.20			0.52			0.52			
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0			
Lane Grp Cap (vph)	393	605		195	292			1663			1409			
v/s Ratio Prot	c0.09	0.08			c0.17									
v/s Ratio Perm	0.13			0.03				0.20			c0.23			
v/c Ratio	0.55	0.21		0.13	0.83			0.38			0.45			
Uniform Delay, d1	30.4	27.7		45.6	53.4			20.3			21.3			
Progression Factor	1.00	1.00		1.00	1.00			1.89			0.48			
Incremental Delay, d2	1.6	0.2		0.3	17.2			0.6			1.0			
Delay (s)	32.0	27.9		45.9	70.6			39.0			11.2			
Level of Service	C	C		D	E			D			B			
Approach Delay (s)		30.5			68.4			39.0			11.2			
Approach LOS		C			E			D			B			

Intersection Summary				
HCM 2000 Control Delay	32.2	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	89.0%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

16: George St S/George St N & Queen St W

Existing PM
Baseline

Movement														
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘		
Traffic Volume (vph)	70	690	25	20	710	45	120	90	40	60	75	105		
Future Volume (vph)	70	690	25	20	710	45	120	90	40	60	75	105		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5		
Total Lost time (s)		6.0			6.0			4.0			6.0			
Lane Util. Factor		0.95			0.95			1.00			1.00			
Frpb, ped/bikes		0.99			0.98			1.00			0.96			
Flpb, ped/bikes		0.99			1.00			0.99			1.00			
Frt		1.00			0.99			1.00			0.95			
Flt Protected		1.00			1.00			0.95			1.00			
Satd. Flow (prot)		3513			3536			1747			1743			
Flt Permitted		0.78			0.92			0.37			1.00			
Satd. Flow (perm)		2742			3251			676			1743			
Peak-hour factor, PHF	1.00	1.00			1.00			1.00			1.00			
Adj. Flow (vph)	70	690			25			20			75			
RTOR Reduction (vph)	0	2			0			3			0			
Lane Group Flow (vph)	0	783			0			772			0			
Confl. Peds. (#/hr)	92				57			57			92			
Heavy Vehicles (%)	9%	1%			0%			0%			7%			
Turn Type	Perm	NA			Perm			NA			pm+pt			
Protected Phases		4						8			5			
Permitted Phases		4						8			2			
Actuated Green, G (s)		88.0						88.0			40.0			
Effective Green, g (s)		88.0						88.0			40.0			
Actuated g/C Ratio		0.63						0.63			0.29			
Clearance Time (s)		6.0						6.0			4.0			
Vehicle Extension (s)		3.0						3.0			3.0			
Lane Grp Cap (vph)		1723						2043			301			
v/s Ratio Prot											c0.04			
v/s Ratio Perm		c0.29						0.24			0.07			
v/c Ratio		0.45						0.38			0.40			
Uniform Delay, d1		13.5						12.7			38.8			
Progression Factor		0.73						0.31			1.00			
Incremental Delay, d2		0.9						0.5			0.9			
Delay (s)		10.8						4.4			39.7			
Level of Service		B						A			D			
Approach Delay (s)		10.8						4.4			39.1			
Approach LOS		B						A			D			

Intersection Summary				
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	99.0%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕↕	↕↕		↕	
Traffic Volume (vph)	100	980	465	35	30	80
Future Volume (vph)	100	980	465	35	30	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frpb, ped/bikes	1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.90	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1777	3579	3444		1597	
Flt Permitted	0.47	1.00	1.00		0.99	
Satd. Flow (perm)	877	3579	3444		1597	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	100	980	465	35	30	80
RTOR Reduction (vph)	0	0	3	0	68	0
Lane Group Flow (vph)	100	980	497	0	42	0
Confl. Peds. (#/hr)	2			2	5	4
Heavy Vehicles (%)	0%	2%	5%	0%	0%	4%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	670	2735	2632		239	
v/s Ratio Prot		c0.27	0.14			
v/s Ratio Perm	0.11				c0.03	
v/c Ratio	0.15	0.36	0.19		0.18	
Uniform Delay, d1	4.4	5.4	4.5		51.9	
Progression Factor	1.00	1.00	0.88		1.00	
Incremental Delay, d2	0.5	0.4	0.1		0.4	
Delay (s)	4.9	5.7	4.1		52.3	
Level of Service	A	A	A		D	
Approach Delay (s)		5.6	4.1		52.3	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕	↕	↕↕	↕	↕	↕	↕
Traffic Volume (vph)	125	170	75	40	100	15	25	360	10	30	1150	60
Future Volume (vph)	125	170	75	40	100	15	25	360	10	30	1150	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00			0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.98			1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1780	1803		1722	1879			3243			3458	
Flt Permitted	0.54	1.00		0.61	1.00			0.82			0.93	
Satd. Flow (perm)	1009	1803		1100	1879			2663			3232	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	125	170	75	40	100	15	25	360	10	30	1150	60
RTOR Reduction (vph)	0	12	0	0	4	0	0	1	0	0	3	0
Lane Group Flow (vph)	125	233	0	40	111	0	0	394	0	0	1237	0
Confl. Peds. (#/hr)	4		5	5		4	31		29	29		31
Heavy Vehicles (%)	0%	1%	1%	3%	0%	0%	8%	12%	0%	6%	4%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			2	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		24.0	24.0			86.0			86.0	
Effective Green, g (s)	42.0	42.0		24.0	24.0			86.0			86.0	
Actuated g/C Ratio	0.30	0.30		0.17	0.17			0.61			0.61	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	379	540		188	322			1635			1985	
v/s Ratio Prot	0.03	c0.13			0.06							
v/s Ratio Perm	0.07			0.04				0.15			c0.38	
v/c Ratio	0.33	0.43		0.21	0.34			0.24			0.62	
Uniform Delay, d1	37.0	39.4		49.9	51.1			12.2			16.9	
Progression Factor	1.00	1.00		1.00	1.00			1.25			1.00	
Incremental Delay, d2	0.5	0.6		0.6	0.6			0.3			1.5	
Delay (s)	37.5	40.0		50.4	51.7			15.6			18.4	
Level of Service	D	D		D	D			B			B	
Approach Delay (s)		39.1			51.4			15.6			18.4	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	90	200	25	20	130	50	20	480	20	110	1030	145
Future Volume (vph)	90	200	25	20	130	50	20	480	20	110	1030	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.91			1.00			0.98	
Flpb, ped/bikes	0.94	1.00		0.96	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.96			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1598	1687		1628	1483			3391			3377	
Flt Permitted	0.38	1.00		0.62	1.00			0.86			0.81	
Satd. Flow (perm)	635	1687		1059	1483			2937			2759	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	200	25	20	130	50	20	480	20	110	1030	145
RTOR Reduction (vph)	0	4	0	0	11	0	0	2	0	0	6	0
Lane Group Flow (vph)	90	221	0	20	169	0	0	518	0	0	1279	0
Confl. Peds. (#/hr)	170		26	26		170	40		22	22		40
Heavy Vehicles (%)	5%	12%	4%	5%	15%	8%	0%	7%	0%	0%	4%	6%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.5	37.5		22.7	22.7			90.5			90.5	
Effective Green, g (s)	37.5	37.5		22.7	22.7			90.5			90.5	
Actuated g/C Ratio	0.27	0.27		0.16	0.16			0.65			0.65	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	244	451		171	240			1898			1783	
v/s Ratio Prot	0.03	c0.13			c0.11							
v/s Ratio Perm	0.07			0.02				0.18			c0.46	
v/c Ratio	0.37	0.49		0.12	0.70			0.27			0.72	
Uniform Delay, d1	40.2	43.2		50.1	55.5			10.6			16.3	
Progression Factor	1.00	1.00		1.00	1.00			1.77			0.57	
Incremental Delay, d2	0.9	0.8		0.3	9.0			0.3			2.1	
Delay (s)	41.2	44.0		50.4	64.5			19.2			11.4	
Level of Service	D	D		D	E			B			B	
Approach Delay (s)		43.2			63.1			19.2			11.4	
Approach LOS		D			E			B			B	
Intersection Summary												
HCM 2000 Control Delay		21.9										
HCM 2000 Volume to Capacity ratio		0.70										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		107.5%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	30	960	70	105	430	30	55	40	20	35	90	50
Future Volume (vph)	30	960	70	105	430	30	55	40	20	35	90	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0		4.0	6.0			6.0	6.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		0.99			1.00		1.00	0.98			1.00	0.99
Flpb, ped/bikes		1.00			1.00		1.00	1.00			0.95	1.00
Frt		0.99			0.99		1.00	0.95			1.00	0.95
Flt Protected		1.00			0.99		0.95	1.00			0.95	1.00
Satd. Flow (prot)		3482			3388		1708	1651			1522	1672
Flt Permitted		0.92			0.58		0.46	1.00			0.72	1.00
Satd. Flow (perm)		3209			1988		819	1651			1150	1672
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	960	70	105	430	30	55	40	20	35	90	50
RTOR Reduction (vph)	0	4	0	0	3	0	0	13	0	0	15	0
Lane Group Flow (vph)	0	1056	0	0	562	0	55	47	0	35	125	0
Confl. Peds. (#/hr)	22		34	34		22	8		29	29		8
Heavy Vehicles (%)	27%	2%	3%	1%	6%	7%	4%	5%	14%	11%	3%	16%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases		4			8		2				6	
Actuated Green, G (s)		94.6			94.6		33.4	33.4			21.2	21.2
Effective Green, g (s)		94.6			94.6		33.4	33.4			21.2	21.2
Actuated g/C Ratio		0.68			0.68		0.24	0.24			0.15	0.15
Clearance Time (s)		6.0			6.0		4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		2168			1343		247	393		174	253	
v/s Ratio Prot							c0.01	0.03				c0.07
v/s Ratio Perm		c0.33			0.28		0.04			0.03		
v/c Ratio		0.49			0.42		0.22	0.12		0.20	0.49	
Uniform Delay, d1		11.0			10.3		42.2	41.8		52.0	54.5	
Progression Factor		0.66			0.54		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			0.9		0.5	0.1		0.6	1.5	
Delay (s)		8.0			6.5		42.6	41.9		52.6	56.0	
Level of Service		A			A		D	D		D	E	
Approach Delay (s)		8.0			6.5		42.3			55.3		
Approach LOS		A			A		D			E		
Intersection Summary												
HCM 2000 Control Delay		13.9										
HCM 2000 Volume to Capacity ratio		0.47										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		104.8%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	35	95	135	80	45	35	90	410	30	10	1070	15
Future Volume (vph)	35	95	135	80	45	35	90	410	30	10	1070	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		5.5	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.99			0.99			1.00	
Flpb, ped/bikes	0.99	1.00		0.97	1.00			1.00			1.00	
Frt	1.00	0.91		1.00	0.93			0.99			1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1707	1656		1698	1761			3315			3558	
Flt Permitted	0.70	1.00		0.33	1.00			0.62			0.95	
Satd. Flow (perm)	1266	1656		581	1761			2059			3378	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	95	135	80	45	35	90	410	30	10	1070	15
RTOR Reduction (vph)	0	40	0	0	22	0	0	2	0	0	1	0
Lane Group Flow (vph)	35	190	0	80	58	0	0	528	0	0	1094	0
Confl. Peds. (#/hr)	3		27	27		3	23		50	50		23
Heavy Vehicles (%)	4%	1%	2%	2%	2%	0%	6%	7%	5%	0%	2%	10%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.1	23.1		23.1	23.1		104.9			104.9		
Effective Green, g (s)	23.1	23.1		23.6	23.1		104.9			104.9		
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75			0.75		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0			6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	208	273		97	290		1542			2531		
v/s Ratio Prot		0.11			0.03							
v/s Ratio Perm	0.03			c0.14			0.26			c0.32		
v/c Ratio	0.17	0.70		0.82	0.20		0.34			0.43		
Uniform Delay, d1	50.2	55.1		56.2	50.5		5.9			6.5		
Progression Factor	1.00	1.00		1.00	1.00		1.00			4.19		
Incremental Delay, d2	0.4	7.5		40.9	0.3		0.1			0.4		
Delay (s)	50.6	62.6		97.1	50.8		6.1			27.7		
Level of Service	D	E		F	D		A			C		
Approach Delay (s)		61.0			74.0		6.1			27.7		
Approach LOS		E			E		A			C		
Intersection Summary												
HCM 2000 Control Delay		30.0								C		
HCM 2000 Volume to Capacity ratio		0.52										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)		16.0					
Intersection Capacity Utilization		98.8%			ICU Level of Service		F					
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	0	600	40	0	730	65	0	700	50	0	470	50
Future Volume (vph)	0	600	40	0	730	65	0	700	50	0	470	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3491			3547			3451			3433	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3491			3547			3451			3433	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	600	40	0	730	65	0	700	50	0	470	50
RTOR Reduction (vph)	0	3	0	0	5	0	0	4	0	0	6	0
Lane Group Flow (vph)	0	637	0	0	790	0	0	746	0	0	514	0
Confl. Peds. (#/hr)		69		72	72		69	74		185	185	74
Heavy Vehicles (%)		0%	3%	0%	1%	0%	0%	3%	0%	0%	4%	0%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1595			1621			1577			1569	
v/s Ratio Prot		0.18			c0.22			c0.22			0.15	
v/s Ratio Perm												
v/c Ratio		0.40			0.49			0.47			0.33	
Uniform Delay, d1		25.2			26.5			26.3			24.3	
Progression Factor		0.65			1.00			1.28			1.41	
Incremental Delay, d2		0.7			1.1			0.9			0.5	
Delay (s)		17.1			27.6			34.6			34.8	
Level of Service		B			C			C			C	
Approach Delay (s)		17.1			27.6			34.6			34.8	
Approach LOS		B			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		28.5			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.48										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		65.8%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕↕	↕↕		↕	
Traffic Volume (vph)	165	660	830	55	20	120
Future Volume (vph)	165	660	830	55	20	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frpb, ped/bikes	1.00	1.00	0.99		0.98	
Flpb, ped/bikes	0.98	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.88	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1734	3579	3528		1615	
Flt Permitted	0.30	1.00	1.00		0.99	
Satd. Flow (perm)	556	3579	3528		1615	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	660	830	55	20	120
RTOR Reduction (vph)	0	0	2	0	102	0
Lane Group Flow (vph)	165	660	883	0	38	0
Confl. Peds. (#/hr)	18			18	9	5
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	424	2735	2696		242	
v/s Ratio Prot		0.18	0.25			
v/s Ratio Perm	c0.30				c0.02	
v/c Ratio	0.39	0.24	0.33		0.16	
Uniform Delay, d1	5.5	4.8	5.2		51.8	
Progression Factor	1.00	1.00	0.64		1.00	
Incremental Delay, d2	2.7	0.2	0.3		0.3	
Delay (s)	8.2	5.0	3.6		52.1	
Level of Service	A	A	A		D	
Approach Delay (s)		5.6	3.6		52.1	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕		↕↕		↕	↕	↕
Traffic Volume (vph)	145	135	30	60	275	85	20	945	45	35	565	60
Future Volume (vph)	145	135	30	60	275	85	20	945	45	35	565	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		0.95	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1767	1819		1696	1829			3491			3420	
Flt Permitted	0.17	1.00		0.65	1.00			0.93			0.82	
Satd. Flow (perm)	318	1819		1165	1829			3252			2825	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	135	30	60	275	85	20	945	45	35	565	60
RTOR Reduction (vph)	0	5	0	0	8	0	0	3	0	0	6	0
Lane Group Flow (vph)	145	160	0	60	352	0	0	1007	0	0	654	0
Confl. Peds. (#/hr)	25		36	36		25	42		62	62		42
Heavy Vehicles (%)	1%	1%	3%	0%	0%	0%	0%	3%	0%	3%	4%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			2	
Permitted Phases	4				8			2			6	
Actuated Green, G (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Effective Green, g (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Actuated g/C Ratio	0.38	0.38		0.23	0.23			0.54			0.54	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	293	688		268	421			1742			1513	
v/s Ratio Prot	c0.06	0.09			c0.19							
v/s Ratio Perm	0.13			0.05				c0.31			0.23	
v/c Ratio	0.49	0.23		0.22	0.84			0.58			0.43	
Uniform Delay, d1	32.0	29.6		43.7	51.3			21.9			19.6	
Progression Factor	1.00	1.00		1.00	1.00			0.49			1.00	
Incremental Delay, d2	1.3	0.2		0.4	13.5			1.3			0.9	
Delay (s)	33.4	29.8		44.1	64.8			11.9			20.5	
Level of Service	C	C		D	E			B			C	
Approach Delay (s)		31.5			61.9			11.9			20.5	
Approach LOS		C			E			B			C	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔		↔	↔	
Traffic Volume (vph)	230	105	25	25	170	85	20	680	15	60	510	145
Future Volume (vph)	230	105	25	25	170	85	20	680	15	60	510	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.88			1.00			0.92	
Flpb, ped/bikes	0.96	1.00		0.76	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.95			1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1654	1525		1350	1439			3504			3070	
Flt Permitted	0.30	1.00		0.67	1.00			0.92			0.78	
Satd. Flow (perm)	521	1525		958	1439			3223			2412	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	230	105	25	25	170	85	20	680	15	60	510	145
RTOR Reduction (vph)	0	5	0	0	14	0	0	1	0	0	18	0
Lane Group Flow (vph)	230	125	0	25	241	0	0	714	0	0	697	0
Confl. Peds. (#/hr)	241		132	132		241	133		53	53		133
Heavy Vehicles (%)	4%	19%	0%	0%	14%	8%	5%	3%	0%	3%	4%	8%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	57.4	57.4		28.6	28.6			70.6			70.6	
Effective Green, g (s)	57.4	57.4		28.6	28.6			70.6			70.6	
Actuated g/C Ratio	0.41	0.41		0.20	0.20			0.50			0.50	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	414	625		195	293			1625			1216	
v/s Ratio Prot	c0.10	0.08			c0.17							
v/s Ratio Perm	0.13			0.03			0.22				c0.29	
v/c Ratio	0.56	0.20		0.13	0.82			0.44			0.57	
Uniform Delay, d1	29.5	26.5		45.5	53.3			22.1			24.2	
Progression Factor	1.00	1.00		1.00	1.00			1.98			0.48	
Incremental Delay, d2	1.6	0.2		0.3	16.9			0.8			1.9	
Delay (s)	31.1	26.7		45.8	70.2			44.6			13.4	
Level of Service	C	C		D	E			D			B	
Approach Delay (s)		29.5			68.0			44.6			13.4	
Approach LOS		C			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔		↔	↔	
Traffic Volume (vph)	70	690	25	20	715	45	120	90	40	60	75	105
Future Volume (vph)	70	690	25	20	715	45	120	90	40	60	75	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.98		1.00	0.96		1.00	0.96	
Flpb, ped/bikes		0.99			1.00		0.99	1.00		0.89	1.00	
Frt		1.00			0.99		1.00	0.95		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3513			3537		1747	1743		1563	1566	
Flt Permitted		0.78			0.92		0.37	1.00		0.67	1.00	
Satd. Flow (perm)		2737			3253		676	1743		1108	1566	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	690	25	20	715	45	120	90	40	60	75	105
RTOR Reduction (vph)	0	2	0	0	3	0	0	11	0	0	37	0
Lane Group Flow (vph)	0	783	0	0	777	0	120	119	0	60	143	0
Confl. Peds. (#/hr)	92		57	57		92	30		64	64		30
Heavy Vehicles (%)	9%	1%	0%	0%	0%	7%	1%	1%	0%	2%	5%	9%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases		4			8		2				6	
Actuated Green, G (s)		88.0			88.0		40.0	40.0		21.9	21.9	
Effective Green, g (s)		88.0			88.0		40.0	40.0		21.9	21.9	
Actuated g/C Ratio		0.63			0.63		0.29	0.29		0.16	0.16	
Clearance Time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1720			2044		301	498		173	244	
v/s Ratio Prot							c0.04	0.07			c0.09	
v/s Ratio Perm		c0.29			0.24		0.07			0.05		
v/c Ratio		0.46			0.38		0.40	0.24		0.35	0.59	
Uniform Delay, d1		13.5			12.7		38.8	38.3		52.7	54.8	
Progression Factor		0.73			0.30		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9			0.5		0.9	0.3		1.2	3.6	
Delay (s)		10.8			4.3		39.7	38.6		53.9	58.4	
Level of Service		B			A		D	D		D	E	
Approach Delay (s)		10.8			4.3		39.1			57.3		
Approach LOS		B			A		D			E		

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	↔
Traffic Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Future Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.99			0.95			0.99	
Flpb, ped/bikes	0.98	1.00		0.97	1.00			0.99			1.00	
Frt	1.00	0.91		1.00	0.97			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1612	1656		1701	1843			3286			3468	
Flt Permitted	0.59	1.00		0.43	1.00			0.76			0.93	
Satd. Flow (perm)	1007	1656		770	1843			2517			3226	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	20	80	115	115	105	25	145	705	165	10	480	20
RTOR Reduction (vph)	0	40	0	0	7	0	0	9	0	0	1	0
Lane Group Flow (vph)	20	155	0	115	123	0	0	1006	0	0	509	0
Confl. Peds. (#/hr)	15		22	22		15	30		69	69		30
Heavy Vehicles (%)	8%	1%		2%	0%		3%	2%	0%	0%	4%	3%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Effective Green, g (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.74			0.74	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	178	293		136	326			1855			2378	
v/s Ratio Prot		0.09			0.07							
v/s Ratio Perm	0.02			c0.15				c0.40			0.16	
v/c Ratio	0.11	0.53		0.85	0.38			0.54			0.21	
Uniform Delay, d1	48.4	52.3		55.7	50.8			8.1			5.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			2.97	
Incremental Delay, d2	0.3	1.7		35.6	0.7			0.3			0.2	
Delay (s)	48.6	54.0		91.4	51.5			8.4			17.3	
Level of Service	D	D		F	D			A			B	
Approach Delay (s)		53.5			70.2			8.4			17.3	
Approach LOS		D			E			A			B	
Intersection Summary												
HCM 2000 Control Delay		23.2									C	
HCM 2000 Volume to Capacity ratio		0.62										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		98.1%			ICU Level of Service			F				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	↔
Traffic Volume (vph)	0	910	40	0	510	25	0	445	35	0	1055	55
Future Volume (vph)	0	910	40	0	510	25	0	445	35	0	1055	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3549			3506			3312			3498	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3549			3506			3312			3498	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	910	40	0	510	25	0	445	35	0	1055	55
RTOR Reduction (vph)	0	2	0	0	3	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	948	0	0	532	0	0	476	0	0	1107	0
Confl. Peds. (#/hr)		36		50	50		36	43		11	11	43
Heavy Vehicles (%)		0%		2%	0%		3%	6%		0%	9%	7%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1622			1602			1514			1599	
v/s Ratio Prot		c0.27			0.15			0.14			c0.32	
v/s Ratio Perm												
v/c Ratio		0.58			0.33			0.31			0.69	
Uniform Delay, d1		28.1			24.3			24.1			30.2	
Progression Factor		0.64			1.00			1.27			1.18	
Incremental Delay, d2		1.4			0.6			0.5			1.8	
Delay (s)		19.4			24.9			31.1			37.4	
Level of Service		B			C			C			D	
Approach Delay (s)		19.4			24.9			31.1			37.4	
Approach LOS		B			C			C			D	
Intersection Summary												
HCM 2000 Control Delay		28.7						HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio		0.64										
Actuated Cycle Length (s)		140.0						Sum of lost time (s)			12.0	
Intersection Capacity Utilization		72.8%						ICU Level of Service			C	
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Background AM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕↕	↕↕		↕	
Traffic Volume (vph)	100	980	465	35	30	80
Future Volume (vph)	100	980	465	35	30	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frpb, ped/bikes	1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.90	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1777	3579	3444		1597	
Flt Permitted	0.47	1.00	1.00		0.99	
Satd. Flow (perm)	877	3579	3444		1597	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	100	980	465	35	30	80
RTOR Reduction (vph)	0	0	3	0	68	0
Lane Group Flow (vph)	100	980	497	0	42	0
Confl. Peds. (#/hr)	2			2	5	4
Heavy Vehicles (%)	0%	2%	5%	0%	0%	4%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	670	2735	2632		239	
v/s Ratio Prot		c0.27	0.14			
v/s Ratio Perm	0.11				c0.03	
v/c Ratio	0.15	0.36	0.19		0.18	
Uniform Delay, d1	4.4	5.4	4.5		51.9	
Progression Factor	1.00	1.00	0.88		1.00	
Incremental Delay, d2	0.5	0.4	0.1		0.4	
Delay (s)	4.9	5.7	4.1		52.3	
Level of Service	A	A	A		D	
Approach Delay (s)		5.6	4.1		52.3	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕	↕	↕↕	↕	↕	↕	↕
Traffic Volume (vph)	125	170	75	40	100	15	25	360	10	30	1150	60
Future Volume (vph)	125	170	75	40	100	15	25	360	10	30	1150	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00			0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.98			1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1780	1803		1722	1879			3243			3458	
Flt Permitted	0.54	1.00		0.61	1.00			0.82			0.93	
Satd. Flow (perm)	1009	1803		1100	1879			2663			3232	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	125	170	75	40	100	15	25	360	10	30	1150	60
RTOR Reduction (vph)	0	12	0	0	4	0	0	1	0	0	3	0
Lane Group Flow (vph)	125	233	0	40	111	0	0	394	0	0	1237	0
Confl. Peds. (#/hr)	4		5	5		4	31		29	29		31
Heavy Vehicles (%)	0%	1%	1%	3%	0%	0%	8%	12%	0%	6%	4%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			2	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.0	42.0		24.0	24.0			86.0			86.0	
Effective Green, g (s)	42.0	42.0		24.0	24.0			86.0			86.0	
Actuated g/C Ratio	0.30	0.30		0.17	0.17			0.61			0.61	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	379	540		188	322			1635			1985	
v/s Ratio Prot	0.03	c0.13			0.06							
v/s Ratio Perm	0.07			0.04				0.15			c0.38	
v/c Ratio	0.33	0.43		0.21	0.34			0.24			0.62	
Uniform Delay, d1	37.0	39.4		49.9	51.1			12.2			16.9	
Progression Factor	1.00	1.00		1.00	1.00			1.25			1.00	
Incremental Delay, d2	0.5	0.6		0.6	0.6			0.3			1.5	
Delay (s)	37.5	40.0		50.4	51.7			15.6			18.4	
Level of Service	D	D		D	D			B			B	
Approach Delay (s)		39.1			51.4			15.6			18.4	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	↔
Traffic Volume (vph)	90	200	25	20	130	50	20	480	20	110	1030	145
Future Volume (vph)	90	200	25	20	130	50	20	480	20	110	1030	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.91			1.00			0.98	
Flpb, ped/bikes	0.94	1.00		0.96	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.96			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1598	1687		1628	1483			3391			3377	
Flt Permitted	0.38	1.00		0.62	1.00			0.86			0.81	
Satd. Flow (perm)	635	1687		1059	1483			2937			2759	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	200	25	20	130	50	20	480	20	110	1030	145
RTOR Reduction (vph)	0	4	0	0	11	0	0	2	0	0	6	0
Lane Group Flow (vph)	90	221	0	20	169	0	0	518	0	0	1279	0
Confl. Peds. (#/hr)	170		26	26		170	40		22	22		40
Heavy Vehicles (%)	5%	12%	4%	5%	15%	8%	0%	7%	0%	0%	4%	6%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.5	37.5		22.7	22.7			90.5			90.5	
Effective Green, g (s)	37.5	37.5		22.7	22.7			90.5			90.5	
Actuated g/C Ratio	0.27	0.27		0.16	0.16			0.65			0.65	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	244	451		171	240			1898			1783	
v/s Ratio Prot	0.03	c0.13			c0.11							
v/s Ratio Perm	0.07			0.02				0.18			c0.46	
v/c Ratio	0.37	0.49		0.12	0.70			0.27			0.72	
Uniform Delay, d1	40.2	43.2		50.1	55.5			10.6			16.3	
Progression Factor	1.00	1.00		1.00	1.00			1.77			0.57	
Incremental Delay, d2	0.9	0.8		0.3	9.0			0.3			2.1	
Delay (s)	41.2	44.0		50.4	64.5			19.2			11.4	
Level of Service	D	D		D	E			B			B	
Approach Delay (s)		43.2			63.1			19.2			11.4	
Approach LOS		D			E			B			B	
Intersection Summary												
HCM 2000 Control Delay		21.9										
HCM 2000 Volume to Capacity ratio		0.70										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		107.5%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	↔
Traffic Volume (vph)	30	960	70	105	430	30	55	40	20	35	90	50
Future Volume (vph)	30	960	70	105	430	30	55	40	20	35	90	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			4.0			6.0	6.0
Lane Util. Factor		0.95			0.95			1.00			1.00	1.00
Frpb, ped/bikes		0.99			1.00			1.00			0.98	0.99
Flpb, ped/bikes		1.00			1.00			1.00			0.95	1.00
Frt		0.99			0.99			1.00			0.95	0.95
Flt Protected		1.00			0.99			0.95			0.95	1.00
Satd. Flow (prot)		3482			3388			1708			1651	1522
Flt Permitted		0.92			0.58			0.46			1.00	0.72
Satd. Flow (perm)		3209			1988			819			1651	1150
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	960	70	105	430	30	55	40	20	35	90	50
RTOR Reduction (vph)	0	4	0	0	3	0	0	13	0	0	15	0
Lane Group Flow (vph)	0	1056	0	0	562	0	55	47	0	35	125	0
Confl. Peds. (#/hr)	22		34	34		22	8		29	29		8
Heavy Vehicles (%)	27%	2%	3%	1%	6%	7%	4%	5%	14%	11%	3%	16%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases		4			8		2				6	
Actuated Green, G (s)		94.6			94.6		33.4	33.4			21.2	21.2
Effective Green, g (s)		94.6			94.6		33.4	33.4			21.2	21.2
Actuated g/C Ratio		0.68			0.68		0.24	0.24			0.15	0.15
Clearance Time (s)		6.0			6.0		4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		2168			1343		247	393		174	253	
v/s Ratio Prot							c0.01	0.03				c0.07
v/s Ratio Perm		c0.33			0.28		0.04			0.03		
v/c Ratio		0.49			0.42		0.22	0.12		0.20	0.49	
Uniform Delay, d1		11.0			10.3		42.2	41.8		52.0	54.5	
Progression Factor		0.66			0.54		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			0.9		0.5	0.1		0.6	1.5	
Delay (s)		8.0			6.5		42.6	41.9		52.6	56.0	
Level of Service		A			A		D	D		D	E	
Approach Delay (s)		8.0			6.5			42.3			55.3	
Approach LOS		A			A			D			E	
Intersection Summary												
HCM 2000 Control Delay		13.9									B	
HCM 2000 Volume to Capacity ratio		0.47										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		104.8%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	35	95	135	80	45	35	90	410	30	10	1070	15
Future Volume (vph)	35	95	135	80	45	35	90	410	30	10	1070	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		5.6	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.99			0.99			1.00	
Flpb, ped/bikes	0.99	1.00		0.97	1.00			1.00			1.00	
Frt	1.00	0.91		1.00	0.93			0.99			1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1707	1656		1698	1761			3315			3558	
Flt Permitted	0.70	1.00		0.32	1.00			0.62			0.95	
Satd. Flow (perm)	1266	1656		579	1761			2059			3378	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	95	135	80	45	35	90	410	30	10	1070	15
RTOR Reduction (vph)	0	40	0	0	22	0	0	2	0	0	1	0
Lane Group Flow (vph)	35	190	0	80	58	0	0	528	0	0	1094	0
Confl. Peds. (#/hr)	3		27	27		3	23		50	50		23
Heavy Vehicles (%)	4%	1%	2%	2%	2%	0%	6%	7%	5%	0%	2%	10%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.1	23.1		23.1	23.1		104.9			104.9		
Effective Green, g (s)	23.1	23.1		23.5	23.1		104.9			104.9		
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75			0.75		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0			6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	208	273		97	290		1542			2531		
v/s Ratio Prot		0.11			0.03							
v/s Ratio Perm	0.03			c0.14			0.26			c0.32		
v/c Ratio	0.17	0.70		0.82	0.20		0.34			0.43		
Uniform Delay, d1	50.2	55.1		56.3	50.5		5.9			6.5		
Progression Factor	1.00	1.00		1.00	1.00		1.00			4.19		
Incremental Delay, d2	0.4	7.5		40.9	0.3		0.1			0.4		
Delay (s)	50.6	62.6		97.2	50.8		6.1			27.7		
Level of Service	D	E		F	D		A			C		
Approach Delay (s)		61.0			74.0		6.1			27.7		
Approach LOS		E			E		A			C		
Intersection Summary												
HCM 2000 Control Delay		30.0										C
HCM 2000 Volume to Capacity ratio		0.52										
Actuated Cycle Length (s)		140.0					Sum of lost time (s)	16.0				
Intersection Capacity Utilization		98.8%					ICU Level of Service	F				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	0	600	40	0	730	65	0	700	50	0	470	50
Future Volume (vph)	0	600	40	0	730	65	0	700	50	0	470	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3491			3547			3451			3433	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3491			3547			3451			3433	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	600	40	0	730	65	0	700	50	0	470	50
RTOR Reduction (vph)	0	3	0	0	5	0	0	4	0	0	6	0
Lane Group Flow (vph)	0	637	0	0	790	0	0	746	0	0	514	0
Confl. Peds. (#/hr)		69		72	72		69	74		185	185	74
Heavy Vehicles (%)	0%	3%	3%	0%	1%	0%	0%	3%	0%	0%	4%	0%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1595			1621			1577			1569	
v/s Ratio Prot		0.18			c0.22			c0.22			0.15	
v/s Ratio Perm												
v/c Ratio		0.40			0.49			0.47			0.33	
Uniform Delay, d1		25.2			26.5			26.3			24.3	
Progression Factor		0.65			1.00			1.28			1.41	
Incremental Delay, d2		0.7			1.1			0.9			0.5	
Delay (s)		17.1			27.6			34.6			34.8	
Level of Service		B			C			C			C	
Approach Delay (s)		17.1			27.6			34.6			34.8	
Approach LOS		B			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		28.5						HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio		0.48										
Actuated Cycle Length (s)		140.0						Sum of lost time (s)			12.0	
Intersection Capacity Utilization		65.8%						ICU Level of Service			C	
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Background PM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕↕	↕↕		↕	
Traffic Volume (vph)	165	660	830	55	20	120
Future Volume (vph)	165	660	830	55	20	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frpb, ped/bikes	1.00	1.00	0.99		0.98	
Flpb, ped/bikes	0.98	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.88	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1734	3579	3528		1615	
Flt Permitted	0.30	1.00	1.00		0.99	
Satd. Flow (perm)	556	3579	3528		1615	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	660	830	55	20	120
RTOR Reduction (vph)	0	0	2	0	102	0
Lane Group Flow (vph)	165	660	883	0	38	0
Confl. Peds. (#/hr)	18			18	9	5
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	424	2735	2696		242	
v/s Ratio Prot		0.18	0.25			
v/s Ratio Perm	c0.30				c0.02	
v/c Ratio	0.39	0.24	0.33		0.16	
Uniform Delay, d1	5.5	4.8	5.2		51.8	
Progression Factor	1.00	1.00	0.64		1.00	
Incremental Delay, d2	2.7	0.2	0.3		0.3	
Delay (s)	8.2	5.0	3.6		52.1	
Level of Service	A	A	A		D	
Approach Delay (s)		5.6	3.6		52.1	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕		↕↕		↕	↕	↕
Traffic Volume (vph)	145	135	30	60	275	85	20	945	45	35	565	60
Future Volume (vph)	145	135	30	60	275	85	20	945	45	35	565	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		0.95	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1767	1819		1696	1829			3491			3420	
Flt Permitted	0.17	1.00		0.65	1.00			0.93			0.82	
Satd. Flow (perm)	318	1819		1165	1829			3252			2825	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	135	30	60	275	85	20	945	45	35	565	60
RTOR Reduction (vph)	0	5	0	0	8	0	0	3	0	0	6	0
Lane Group Flow (vph)	145	160	0	60	352	0	0	1007	0	0	654	0
Confl. Peds. (#/hr)	25		36	36		25	42		62	62		42
Heavy Vehicles (%)	1%	1%	3%	0%	0%	0%	0%	3%	0%	3%	4%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			2	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Effective Green, g (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Actuated g/C Ratio	0.38	0.38		0.23	0.23			0.54			0.54	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	293	688		268	421			1742			1513	
v/s Ratio Prot	c0.06	0.09			c0.19							
v/s Ratio Perm	0.13			0.05				c0.31			0.23	
v/c Ratio	0.49	0.23		0.22	0.84			0.58			0.43	
Uniform Delay, d1	32.0	29.6		43.7	51.3			21.9			19.6	
Progression Factor	1.00	1.00		1.00	1.00			0.49			1.00	
Incremental Delay, d2	1.3	0.2		0.4	13.5			1.3			0.9	
Delay (s)	33.4	29.8		44.1	64.8			11.9			20.5	
Level of Service	C	C		D	E			B			C	
Approach Delay (s)		31.5			61.9			11.9			20.5	
Approach LOS		C			E			B			C	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔		↔	↔	
Traffic Volume (vph)	230	105	25	25	170	85	20	680	15	60	510	145
Future Volume (vph)	230	105	25	25	170	85	20	680	15	60	510	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.88			1.00			0.92	
Flpb, ped/bikes	0.96	1.00		0.76	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.95			1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1654	1525		1350	1439			3504			3070	
Flt Permitted	0.30	1.00		0.67	1.00			0.92			0.78	
Satd. Flow (perm)	521	1525		958	1439			3223			2412	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	230	105	25	25	170	85	20	680	15	60	510	145
RTOR Reduction (vph)	0	5	0	0	14	0	0	1	0	0	18	0
Lane Group Flow (vph)	230	125	0	25	241	0	0	714	0	0	697	0
Confl. Peds. (#/hr)	241		132	132		241	133		53	53		133
Heavy Vehicles (%)	4%	19%	0%	0%	14%	8%	5%	3%	0%	3%	4%	8%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	57.4	57.4		28.6	28.6			70.6			70.6	
Effective Green, g (s)	57.4	57.4		28.6	28.6			70.6			70.6	
Actuated g/C Ratio	0.41	0.41		0.20	0.20			0.50			0.50	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	414	625		195	293			1625			1216	
v/s Ratio Prot	c0.10	0.08			c0.17							
v/s Ratio Perm	0.13			0.03			0.22				c0.29	
v/c Ratio	0.56	0.20		0.13	0.82			0.44			0.57	
Uniform Delay, d1	29.5	26.5		45.5	53.3			22.1			24.2	
Progression Factor	1.00	1.00		1.00	1.00			1.98			0.48	
Incremental Delay, d2	1.6	0.2		0.3	16.9			0.8			1.9	
Delay (s)	31.1	26.7		45.8	70.2			44.6			13.4	
Level of Service	C	C		D	E			D			B	
Approach Delay (s)		29.5			68.0			44.6			13.4	
Approach LOS		C			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	70	690	25	20	715	45	120	90	40	60	75	105
Future Volume (vph)	70	690	25	20	715	45	120	90	40	60	75	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0		4.0	6.0			6.0	6.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		0.99			0.98		1.00	0.96			1.00	0.96
Flpb, ped/bikes		0.99			1.00		0.99	1.00			0.89	1.00
Frt		1.00			0.99		1.00	0.95			1.00	0.91
Flt Protected		1.00			1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)		3513			3537		1747	1743			1563	1566
Flt Permitted		0.78			0.92		0.37	1.00			0.67	1.00
Satd. Flow (perm)		2737			3253		676	1743			1108	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	690	25	20	715	45	120	90	40	60	75	105
RTOR Reduction (vph)	0	2	0	0	3	0	0	11	0	0	37	0
Lane Group Flow (vph)	0	783	0	0	777	0	120	119	0	60	143	0
Confl. Peds. (#/hr)	92		57	57		92	30		64	64		30
Heavy Vehicles (%)	9%	1%	0%	0%	0%	7%	1%	1%	0%	2%	5%	9%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases		4			8		2				6	
Actuated Green, G (s)		88.0			88.0		40.0	40.0			21.9	21.9
Effective Green, g (s)		88.0			88.0		40.0	40.0			21.9	21.9
Actuated g/C Ratio		0.63			0.63		0.29	0.29			0.16	0.16
Clearance Time (s)		6.0			6.0		4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1720			2044		301	498		173	244	
v/s Ratio Prot							c0.04	0.07				c0.09
v/s Ratio Perm		c0.29			0.24		0.07				0.05	
v/c Ratio		0.46			0.38		0.40	0.24			0.35	0.59
Uniform Delay, d1		13.5			12.7		38.8	38.3			52.7	54.8
Progression Factor		0.73			0.30		1.00	1.00			1.00	1.00
Incremental Delay, d2		0.9			0.5		0.9	0.3			1.2	3.6
Delay (s)		10.8			4.3		39.7	38.6			53.9	58.4
Level of Service		B			A		D	D			D	E
Approach Delay (s)		10.8			4.3		39.1				57.3	
Approach LOS		B			A		D				E	

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	↔
Traffic Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Future Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.99			0.95			0.99	
Flpb, ped/bikes	0.98	1.00		0.97	1.00			0.99			1.00	
Frt	1.00	0.91		1.00	0.97			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1612	1656		1701	1843			3286			3468	
Flt Permitted	0.59	1.00		0.43	1.00			0.76			0.93	
Satd. Flow (perm)	1007	1656		770	1843			2517			3226	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	20	80	115	115	105	25	145	705	165	10	480	20
RTOR Reduction (vph)	0	40	0	0	7	0	0	9	0	0	1	0
Lane Group Flow (vph)	20	155	0	115	123	0	0	1006	0	0	509	0
Confl. Peds. (#/hr)	15		22	22		15	30		69	69		30
Heavy Vehicles (%)	8%	1%	3%	2%	0%	2%	3%	2%	0%	0%	4%	3%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Effective Green, g (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.74			0.74	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	178	293		136	326			1855			2378	
v/s Ratio Prot		0.09			0.07							
v/s Ratio Perm	0.02			c0.15				c0.40			0.16	
v/c Ratio	0.11	0.53		0.85	0.38			0.54			0.21	
Uniform Delay, d1	48.4	52.3		55.7	50.8			8.1			5.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			2.97	
Incremental Delay, d2	0.3	1.7		35.6	0.7			0.3			0.2	
Delay (s)	48.6	54.0		91.4	51.5			8.4			17.3	
Level of Service	D	D		F	D			A			B	
Approach Delay (s)		53.5			70.2			8.4			17.3	
Approach LOS		D			E			A			B	
Intersection Summary												
HCM 2000 Control Delay		23.2										
HCM 2000 Volume to Capacity ratio		0.62										
Actuated Cycle Length (s)		140.0						16.0				
Intersection Capacity Utilization		98.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Total AM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	↔
Traffic Volume (vph)	0	950	40	0	515	25	0	450	35	0	1060	55
Future Volume (vph)	0	950	40	0	515	25	0	450	35	0	1060	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3511			3468			3276			3460	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3511			3468			3276			3460	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	950	40	0	515	25	0	450	35	0	1060	55
RTOR Reduction (vph)	0	2	0	0	3	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	988	0	0	537	0	0	481	0	0	1112	0
Confl. Peds. (#/hr)	36		50	50		36	43		11	11		43
Heavy Vehicles (%)	0%	2%	0%	0%	3%	6%	0%	9%	6%	0%	3%	7%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1605			1585			1497			1581	
v/s Ratio Prot		c0.28			0.15			0.15			c0.32	
v/c Ratio		0.62			0.34			0.32			0.70	
Uniform Delay, d1		28.7			24.4			24.2			30.4	
Progression Factor		0.65			1.00			1.27			1.16	
Incremental Delay, d2		1.6			0.6			0.5			1.9	
Delay (s)		20.2			25.0			31.2			37.3	
Level of Service		C			C			C			D	
Approach Delay (s)		20.2			25.0			31.2			37.3	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM 2000 Control Delay		28.8										
HCM 2000 Volume to Capacity ratio		0.66										
Actuated Cycle Length (s)		140.0						12.0				
Intersection Capacity Utilization		72.9%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Total AM
Phase 1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕		↕	↕
Traffic Volume (vph)	110	980	465	40	55	80
Future Volume (vph)	110	980	465	40	55	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Flpb, ped/bikes	1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.92	
Flt Protected	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1797	3539	3402		1647	
Flt Permitted	0.47	1.00	1.00		0.98	
Satd. Flow (perm)	882	3539	3402		1647	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	980	465	40	55	80
RTOR Reduction (vph)	0	0	3	0	42	0
Lane Group Flow (vph)	110	980	502	0	93	0
Confl. Peds. (#/hr)	2		2	5	4	
Heavy Vehicles (%)	0%	2%	5%	0%	0%	4%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	674	2704	2600		247	
v/s Ratio Prot		c0.28	0.15			
v/s Ratio Perm	0.12				c0.06	
v/c Ratio	0.16	0.36	0.19		0.38	
Uniform Delay, d1	4.4	5.4	4.6		53.6	
Progression Factor	1.00	1.00	0.93		1.00	
Incremental Delay, d2	0.5	0.4	0.2		1.0	
Delay (s)	5.0	5.8	4.4		54.6	
Level of Service	A	A	A		D	
Approach Delay (s)		5.7	4.4		54.6	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total AM
Phase 1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↕	↕			↕	↕	↕	↕	↕
Traffic Volume (vph)	135	170	75	40	100	15	25	360	10	30	1050	60
Future Volume (vph)	135	170	75	40	100	15	25	360	10	30	1050	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Flpb, ped/bikes	1.00	0.99		1.00	1.00			1.00			0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.98			1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1800	1784		1742	1858			3207			3416	
Flt Permitted	0.54	1.00		0.61	1.00			0.83			0.93	
Satd. Flow (perm)	1021	1784		1112	1858			2668			3186	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	135	170	75	40	100	15	25	360	10	30	1050	60
RTOR Reduction (vph)	0	12	0	0	4	0	0	1	0	0	3	0
Lane Group Flow (vph)	135	233	0	40	111	0	0	394	0	0	1137	0
Confl. Peds. (#/hr)	4		5	5		4	31		29	29		31
Heavy Vehicles (%)	0%	1%	1%	3%	0%	0%	8%	12%	0%	6%	4%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		7	4		8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.7	42.7		24.0	24.0			85.3			85.3	
Effective Green, g (s)	42.7	42.7		24.0	24.0			85.3			85.3	
Actuated g/C Ratio	0.31	0.31		0.17	0.17			0.61			0.61	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	393	544		190	318			1625			1941	
v/s Ratio Prot	0.04	c0.13			0.06							
v/s Ratio Perm	0.07			0.04				0.15			c0.36	
v/c Ratio	0.34	0.43		0.21	0.35			0.24			0.59	
Uniform Delay, d1	36.7	38.9		49.9	51.1			12.5			16.6	
Progression Factor	1.00	1.00		1.00	1.00			1.10			1.00	
Incremental Delay, d2	0.5	0.5		0.6	0.7			0.3			1.3	
Delay (s)	37.2	39.4		50.4	51.8			14.1			17.9	
Level of Service	D	D		D	D			B			B	
Approach Delay (s)		38.7			51.4			14.1			17.9	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Total AM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	90	200	30	20	130	50	25	480	20	110	1030	145
Future Volume (vph)	90	200	30	20	130	50	25	480	20	110	1030	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.91			1.00			0.98	
Flpb, ped/bikes	0.94	1.00		0.96	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.96			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1615	1664		1647	1467			3354			3340	
Flt Permitted	0.38	1.00		0.62	1.00			0.84			0.81	
Satd. Flow (perm)	644	1664		1067	1467			2812			2723	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	200	30	20	130	50	25	480	20	110	1030	145
RTOR Reduction (vph)	0	4	0	0	11	0	0	2	0	0	6	0
Lane Group Flow (vph)	90	226	0	20	169	0	0	523	0	0	1279	0
Confl. Peds. (#/hr)	170		26	26		170	40		22	22		40
Heavy Vehicles (%)	5%	12%	4%	5%	15%	8%	0%	7%	0%	0%	4%	6%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.6	37.6		22.8	22.8			90.4			90.4	
Effective Green, g (s)	37.6	37.6		22.8	22.8			90.4			90.4	
Actuated g/C Ratio	0.27	0.27		0.16	0.16			0.65			0.65	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	247	446		173	238			1815			1758	
v/s Ratio Prot	0.03	c0.14			c0.12							
v/s Ratio Perm	0.07			0.02				0.19			c0.47	
v/c Ratio	0.36	0.51		0.12	0.71			0.29			0.73	
Uniform Delay, d1	40.1	43.3		50.0	55.5			10.8			16.6	
Progression Factor	1.00	1.00		1.00	1.00			1.73			0.79	
Incremental Delay, d2	0.9	0.9		0.3	9.6			0.4			2.4	
Delay (s)	41.0	44.2		50.3	65.1			19.1			15.4	
Level of Service	D	D		D	E			B			B	
Approach Delay (s)		43.3			63.6			19.1			15.4	
Approach LOS		D			E			B			B	

Intersection Summary

HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	107.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Total AM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	30	985	70	105	435	30	55	40	20	50	95	50
Future Volume (vph)	30	985	70	105	435	30	55	40	20	50	95	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			4.0	6.0			6.0
Lane Util. Factor		0.95			0.95			1.00	1.00			1.00
Frpb, ped/bikes		0.99			1.00			1.00	0.98			1.00
Flpb, ped/bikes		1.00			1.00			1.00	1.00			0.95
Frt		0.99			0.99			1.00	0.95			1.00
Flt Protected		1.00			0.99			0.99	0.95			0.95
Satd. Flow (prot)		3446			3352			1728	1633			1539
Flt Permitted		0.92			0.58			0.44	1.00			0.72
Satd. Flow (perm)		3177			1951			808	1633			1163
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	985	70	105	435	30	55	40	20	50	95	50
RTOR Reduction (vph)	0	3	0	0	3	0	0	13	0	0	14	0
Lane Group Flow (vph)	0	1082	0	0	567	0	55	47	0	50	131	0
Confl. Peds. (#/hr)	22		34	34		22	8		29	29		8
Heavy Vehicles (%)	27%	2%	3%	1%	6%	7%	4%	5%	14%	11%	3%	16%
Turn Type		Perm	NA		Perm	NA	pm+pt	NA		Perm	NA	
Protected Phases			4			8	5	2			6	
Permitted Phases		4			8		2			6		
Actuated Green, G (s)		94.6			94.6		33.4	33.4		21.3	21.3	
Effective Green, g (s)		94.6			94.6		33.4	33.4		21.3	21.3	
Actuated g/C Ratio		0.68			0.68		0.24	0.24		0.15	0.15	
Clearance Time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2146			1318		245	389		176	252	
v/s Ratio Prot							c0.01	0.03			c0.08	
v/s Ratio Perm		c0.34			0.29		0.04			0.04		
v/c Ratio		0.50			0.43		0.22	0.12		0.28	0.52	
Uniform Delay, d1		11.2			10.4		42.2	41.8		52.6	54.6	
Progression Factor		0.80			0.54		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			1.0		0.5	0.1		0.9	1.8	
Delay (s)		9.8			6.6		42.6	41.9		53.5	56.4	
Level of Service		A			A		D	D		D	E	
Approach Delay (s)		9.8			6.6		42.3			55.7		
Approach LOS		A			A		D			E		

Intersection Summary

HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	105.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Total AM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	
Traffic Volume (vph)	35	95	135	80	45	35	90	415	30	10	1075	15
Future Volume (vph)	35	95	135	80	45	35	90	415	30	10	1075	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.96		1.00	0.99			0.99			1.00	
Flpb, ped/bikes	0.99	1.00		0.97	1.00			1.00			1.00	
Frt	1.00	0.91		1.00	0.93			0.99			1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1726	1638		1717	1742			3279			3519	
Flt Permitted	0.70	1.00		0.32	1.00			0.62			0.95	
Satd. Flow (perm)	1281	1638		579	1742			2036			3341	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	95	135	80	45	35	90	415	30	10	1075	15
RTOR Reduction (vph)	0	40	0	0	22	0	0	2	0	0	1	0
Lane Group Flow (vph)	35	190	0	80	58	0	0	533	0	0	1099	0
Confl. Peds. (#/hr)	3		27	27		3	23		50	50		23
Heavy Vehicles (%)	4%	1%	2%	2%	2%	0%	6%	7%	5%	0%	2%	10%
Turn Type	Perm	NA		Perm	NA	pm+pt	NA	Perm	NA		NA	
Protected Phases		4			8		5	2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.2	23.2		23.2	23.2			104.8			104.8	
Effective Green, g (s)	23.2	23.2		23.2	23.2			104.8			104.8	
Actuated g/C Ratio	0.17	0.17		0.17	0.17			0.75			0.75	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	212	271		95	288			1524			2500	
v/s Ratio Prot		0.12			0.03							
v/s Ratio Perm	0.03			c0.14				0.26			c0.33	
v/c Ratio	0.17	0.70		0.84	0.20			0.35			0.44	
Uniform Delay, d1	50.1	55.1		56.6	50.4			6.0			6.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			4.09	
Incremental Delay, d2	0.4	7.9		45.7	0.3			0.1			0.4	
Delay (s)	50.5	63.1		102.4	50.8			6.1			27.4	
Level of Service	D	E		F	D			A			C	
Approach Delay (s)		61.4			76.6			6.1			27.4	
Approach LOS		E			E			A			C	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Total PM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	620	40	0	755	65	0	700	50	0	470	50
Future Volume (vph)	0	620	40	0	755	65	0	700	50	0	470	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frbp, ped/bikes		0.99			0.99			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3454			3510			3413			3395	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3454			3510			3413			3395	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	620	40	0	755	65	0	700	50	0	470	50
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	0	6	0
Lane Group Flow (vph)	0	657	0	0	816	0	0	746	0	0	514	0
Confl. Peds. (#/hr)	69		72	72		69	74		185	185		74
Heavy Vehicles (%)	0%	3%	3%	0%	1%	0%	0%	3%	0%	0%	4%	0%
Turn Type	NA				NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1578			1604			1560			1552	
v/s Ratio Prot		0.19			c0.23			c0.22			0.15	
v/s Ratio Perm												
v/c Ratio		0.42			0.51			0.48			0.33	
Uniform Delay, d1		25.5			26.9			26.4			24.3	
Progression Factor		0.66			1.00			1.28			1.28	
Incremental Delay, d2		0.7			1.2			0.9			0.5	
Delay (s)		17.6			28.0			34.7			31.6	
Level of Service		B			C			C			C	
Approach Delay (s)		17.6			28.0			34.7			31.6	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Total PM
Phase 1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕↕	↕↕	↔	↕	↕
Traffic Volume (vph)	165	660	830	70	30	120
Future Volume (vph)	165	660	830	70	30	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Flpb, ped/bikes	1.00	1.00	0.99		0.98	
Flpb, ped/bikes	0.98	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.89	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1754	3539	3477		1643	
Flt Permitted	0.30	1.00	1.00		0.99	
Satd. Flow (perm)	553	3539	3477		1643	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	660	830	70	30	120
RTOR Reduction (vph)	0	0	3	0	102	0
Lane Group Flow (vph)	165	660	897	0	48	0
Confl. Peds. (#/hr)	18			18	9	5
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	422	2704	2657		246	
v/s Ratio Prot		0.19	0.26			
v/s Ratio Perm	c0.30				c0.03	
v/c Ratio	0.39	0.24	0.34		0.20	
Uniform Delay, d1	5.5	4.8	5.2		52.1	
Progression Factor	1.00	1.00	0.63		1.00	
Incremental Delay, d2	2.7	0.2	0.3		0.4	
Delay (s)	8.3	5.0	3.6		52.5	
Level of Service	A	A	A		D	
Approach Delay (s)		5.6	3.6		52.5	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total PM
Phase 1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕		↕↕	↕	↕	↕	↕
Traffic Volume (vph)	145	135	30	60	275	85	20	965	45	35	580	60
Future Volume (vph)	145	135	30	60	275	85	20	965	45	35	580	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Flpb, ped/bikes	1.00	0.99		1.00	0.99			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		0.95	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1787	1799		1715	1809			3453			3384	
Flt Permitted	0.18	1.00		0.65	1.00			0.93			0.82	
Satd. Flow (perm)	330	1799		1178	1809			3217			2779	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	135	30	60	275	85	20	965	45	35	580	60
RTOR Reduction (vph)	0	5	0	0	8	0	0	3	0	0	6	0
Lane Group Flow (vph)	145	160	0	60	352	0	0	1027	0	0	669	0
Confl. Peds. (#/hr)	25		36	36		25	42		62	62		42
Heavy Vehicles (%)	1%	1%	3%	0%	0%	0%	0%	3%	0%	3%	4%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	53.1	53.1		32.6	32.6			74.9			74.9	
Effective Green, g (s)	53.1	53.1		32.6	32.6			74.9			74.9	
Actuated g/C Ratio	0.38	0.38		0.23	0.23			0.54			0.54	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	296	682		274	421			1721			1486	
v/s Ratio Prot	c0.06	0.09			c0.19							
v/s Ratio Perm	0.13			0.05				c0.32			0.24	
v/c Ratio	0.49	0.23		0.22	0.84			0.60			0.45	
Uniform Delay, d1	31.9	29.6		43.4	51.2			22.2			19.9	
Progression Factor	1.00	1.00		1.00	1.00			0.51			1.00	
Incremental Delay, d2	1.3	0.2		0.4	13.5			1.4			1.0	
Delay (s)	33.2	29.8		43.8	64.7			12.7			20.9	
Level of Service	C	C		D	E			B			C	
Approach Delay (s)		31.4			61.7			12.7			20.9	
Approach LOS		C			E			B			C	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Main St N & Nelson St W/Theatre Ln

Future Total PM
 Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔	↔		↔	↔		↔	↔		↔
Traffic Volume (vph)	250	105	25	25	170	85	20	680	15	60	510	160
Future Volume (vph)	250	105	25	25	170	85	20	680	15	60	510	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.94		1.00	0.88			1.00			0.91	
Flpb, ped/bikes	0.96	1.00		0.76	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.95			1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1672	1508		1365	1423			3466			3004	
Flt Permitted	0.30	1.00		0.67	1.00			0.92			0.78	
Satd. Flow (perm)	529	1508		968	1423			3185			2344	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	250	105	25	25	170	85	20	680	15	60	510	160
RTOR Reduction (vph)	0	5	0	0	14	0	0	1	0	0	22	0
Lane Group Flow (vph)	250	125	0	25	241	0	0	714	0	0	708	0
Confl. Peds. (#/hr)	241		132	132		241	133		53	53		133
Heavy Vehicles (%)	4%	19%	0%	0%	14%	8%	5%	3%	0%	3%	4%	8%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	59.8	59.8		28.7	28.7			68.2			68.2	
Effective Green, g (s)	59.8	59.8		28.7	28.7			68.2			68.2	
Actuated g/C Ratio	0.43	0.43		0.20	0.20			0.49			0.49	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	447	644		198	291			1551			1141	
v/s Ratio Prot	c0.11	0.08			c0.17							
v/s Ratio Perm	0.13			0.03				0.22			c0.30	
v/c Ratio	0.56	0.19		0.13	0.83			0.46			0.62	
Uniform Delay, d1	28.3	25.0		45.4	53.3			23.7			26.4	
Progression Factor	1.00	1.00		1.00	1.00			1.95			0.49	
Incremental Delay, d2	1.5	0.1		0.3	17.5			0.9			2.4	
Delay (s)	29.8	25.2		45.7	70.8			47.2			15.4	
Level of Service	C	C		D	E			D			B	
Approach Delay (s)		28.2			68.6			47.2			15.4	
Approach LOS		C			E			D			B	
Intersection Summary												
HCM 2000 Control Delay			35.6	HCM 2000 Level of Service				D				
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			140.0	Sum of lost time (s)				16.0				
Intersection Capacity Utilization			94.0%	ICU Level of Service				F				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
 16: George St S/George St N & Queen St W

Future Total PM
 Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔		↔	↔		↔	↔		↔	↔		↔
Traffic Volume (vph)	70	700	25	20	730	55	120	90	40	70	80	105
Future Volume (vph)	70	700	25	20	730	55	120	90	40	70	80	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			4.0	6.0		6.0	6.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frbp, ped/bikes		0.99			0.98			1.00	0.96		1.00	0.96
Flpb, ped/bikes		0.99			1.00			0.99	1.00		0.89	1.00
Frt		1.00			0.99			1.00	0.95		1.00	0.91
Flt Protected		1.00			1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)		3477			3479			1767	1724		1581	1555
Flt Permitted		0.77			0.92			0.36	1.00		0.67	1.00
Satd. Flow (perm)		2685			3201			669	1724		1121	1555
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	700	25	20	730	55	120	90	40	70	80	105
RTOR Reduction (vph)	0	2	0	0	4	0	0	11	0	0	34	0
Lane Group Flow (vph)	0	793	0	0	801	0	120	119	0	70	151	0
Confl. Peds. (#/hr)	92		57	57		92	30		64	64		30
Heavy Vehicles (%)	9%	1%	0%	0%	0%	7%	1%	1%	0%	2%	5%	9%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		87.8			87.8		40.2	40.2		22.2	22.2	
Effective Green, g (s)		87.8			87.8		40.2	40.2		22.2	22.2	
Actuated g/C Ratio		0.63			0.63		0.29	0.29		0.16	0.16	
Clearance Time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1683			2007		301	495		177	246	
v/s Ratio Prot							c0.04	0.07			c0.10	
v/s Ratio Perm		c0.30			0.25		0.07			0.06		
v/c Ratio		0.47			0.40		0.40	0.24		0.40	0.61	
Uniform Delay, d1		13.8			13.0		38.7	38.2		52.9	54.9	
Progression Factor		0.75			0.28		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9			0.5		0.9	0.3		1.5	4.5	
Delay (s)		11.3			4.2		39.6	38.5		54.3	59.3	
Level of Service		B			A		D	D		D	E	
Approach Delay (s)		11.3			4.2		39.0				58.0	
Approach LOS		B			A		D				E	
Intersection Summary												
HCM 2000 Control Delay			17.5	HCM 2000 Level of Service				B				
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			140.0	Sum of lost time (s)				16.0				
Intersection Capacity Utilization			100.2%	ICU Level of Service				G				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Total PM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Future Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.97		1.00	0.99			0.95			0.99	
Flpb, ped/bikes	0.98	1.00		0.97	1.00			0.99			1.00	
Frt	1.00	0.91		1.00	0.97			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1631	1638		1720	1823			3250			3430	
Flt Permitted	0.59	1.00		0.43	1.00			0.76			0.93	
Satd. Flow (perm)	1016	1638		775	1823			2490			3191	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	20	80	115	115	105	25	145	705	165	10	480	20
RTOR Reduction (vph)	0	40	0	0	7	0	0	9	0	0	1	0
Lane Group Flow (vph)	20	155	0	115	123	0	0	1006	0	0	509	0
Confl. Peds. (#/hr)	15		22	22		15	30		69	69		30
Heavy Vehicles (%)	8%	1%	3%	2%	0%	2%	3%	2%	0%	0%	4%	3%
Turn Type	Perm	NA		Perm	NA	pm+pt	NA		Perm	NA		
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.6	24.6		24.6	24.6		103.4			103.4		
Effective Green, g (s)	24.6	24.6		24.6	24.6		103.4			103.4		
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.74			0.74		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0			6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	178	287		136	320		1839			2356		
v/s Ratio Prot		0.09			0.07							
v/s Ratio Perm	0.02			c0.15			c0.40			0.16		
v/c Ratio	0.11	0.54		0.85	0.39		0.55			0.22		
Uniform Delay, d1	48.5	52.5		55.9	51.0		8.0			5.7		
Progression Factor	1.00	1.00		1.00	1.00		1.00			3.00		
Incremental Delay, d2	0.3	1.9		35.6	0.8		0.3			0.2		
Delay (s)	48.8	54.5		91.5	51.8		8.4			17.3		
Level of Service	D	D		F	D		A			B		
Approach Delay (s)		54.0			70.4		8.4			17.3		
Approach LOS		D			E		A			B		
Intersection Summary												
HCM 2000 Control Delay		23.3					HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio		0.62										
Actuated Cycle Length (s)		140.0					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		98.1%					ICU Level of Service		F			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	950	40	0	515	25	0	450	35	0	1060	55
Future Volume (vph)	0	950	40	0	515	25	0	450	35	0	1060	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frbp, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3511			3468			3276			3460	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3511			3468			3276			3460	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	950	40	0	515	25	0	450	35	0	1060	55
RTOR Reduction (vph)	0	2	0	0	3	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	988	0	0	537	0	0	481	0	0	1112	0
Confl. Peds. (#/hr)		36		50	50		36	43		11	11	43
Heavy Vehicles (%)	0%	2%	0%	0%	3%	6%	0%	9%	6%	0%	3%	7%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1605			1585			1497			1581	
v/s Ratio Prot		c0.28			0.15			0.15			c0.32	
v/s Ratio Perm												
v/c Ratio		0.62			0.34			0.32			0.70	
Uniform Delay, d1		28.7			24.4			24.2			30.4	
Progression Factor		0.65			1.00			1.27			1.16	
Incremental Delay, d2		1.6			0.6			0.5			1.9	
Delay (s)		20.2			25.0			31.2			37.3	
Level of Service		C			C			C			D	
Approach Delay (s)		20.2			25.0			31.2			37.3	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM 2000 Control Delay		28.8						HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio		0.66										
Actuated Cycle Length (s)		140.0						Sum of lost time (s)		12.0		
Intersection Capacity Utilization		72.9%						ICU Level of Service		C		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Total AM
Interim Phase 2 Construction



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕
Traffic Volume (vph)	110	980	465	40	55	80
Future Volume (vph)	110	980	465	40	55	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.92	
Flt Protected	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1797	3539	3402		1647	
Flt Permitted	0.47	1.00	1.00		0.98	
Satd. Flow (perm)	882	3539	3402		1647	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	980	465	40	55	80
RTOR Reduction (vph)	0	0	3	0	42	0
Lane Group Flow (vph)	110	980	502	0	93	0
Confl. Peds. (#/hr)	2		2	5	4	
Heavy Vehicles (%)	0%	2%	5%	0%	0%	4%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	674	2704	2600		247	
v/s Ratio Prot		c0.28	0.15			
v/s Ratio Perm	0.12				c0.06	
v/c Ratio	0.16	0.36	0.19		0.38	
Uniform Delay, d1	4.4	5.4	4.6		53.6	
Progression Factor	1.00	1.00	0.93		1.00	
Incremental Delay, d2	0.5	0.4	0.2		1.0	
Delay (s)	5.0	5.8	4.4		54.6	
Level of Service	A	A	A		D	
Approach Delay (s)		5.7	4.4		54.6	
Approach LOS		A	A		D	

Intersection Summary				
HCM 2000 Control Delay		9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio		0.36		
Actuated Cycle Length (s)		140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization		60.0%	ICU Level of Service	B
Analysis Period (min)		15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total AM
Interim Phase 2 Construction



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	135	170	75	40	100	15	25	360	10	30	1050	60
Future Volume (vph)	135	170	75	40	100	15	25	360	10	30	1050	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Flpb, ped/bikes	1.00	0.99		1.00	1.00			1.00			1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.98			1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1800	1784		1742	1858			3207			3416	
Flt Permitted	0.54	1.00		0.61	1.00			0.83			0.93	
Satd. Flow (perm)	1021	1784		1112	1858			2668			3186	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	135	170	75	40	100	15	25	360	10	30	1050	60
RTOR Reduction (vph)	0	12	0	0	4	0	0	1	0	0	3	0
Lane Group Flow (vph)	135	233	0	40	111	0	0	394	0	0	1137	0
Confl. Peds. (#/hr)	4		5	5		4	31		29	29		31
Heavy Vehicles (%)	0%	1%	1%	3%	0%	0%	8%	12%	0%	6%	4%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		7	4		8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	42.7	42.7		24.0	24.0			85.3			85.3	
Effective Green, g (s)	42.7	42.7		24.0	24.0			85.3			85.3	
Actuated g/C Ratio	0.31	0.31		0.17	0.17			0.61			0.61	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	393	544		190	318			1625			1941	
v/s Ratio Prot	0.04	c0.13			0.06							
v/s Ratio Perm	0.07			0.04				0.15			c0.36	
v/c Ratio	0.34	0.43		0.21	0.35			0.24			0.59	
Uniform Delay, d1	36.7	38.9		49.9	51.1			12.5			16.6	
Progression Factor	1.00	1.00		1.00	1.00			1.10			1.00	
Incremental Delay, d2	0.5	0.5		0.6	0.7			0.3			1.3	
Delay (s)	37.2	39.4		50.4	51.8			14.1			17.9	
Level of Service	D	D		D	D			B			B	
Approach Delay (s)		38.7			51.4			14.1			17.9	
Approach LOS		D			D			B			B	

Intersection Summary				
HCM 2000 Control Delay		23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio		0.55		
Actuated Cycle Length (s)		140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization		96.1%	ICU Level of Service	F
Analysis Period (min)		15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	200	30	20	130	50	25	480	20	110	1030	145
Future Volume (vph)	90	200	30	20	130	50	25	480	20	110	1030	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.99		1.00	0.91			1.00			0.98	
Flpb, ped/bikes	0.94	1.00		0.96	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.96			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1615	1664		1647	1467			3354			3340	
Flt Permitted	0.38	1.00		0.62	1.00			0.84			0.81	
Satd. Flow (perm)	644	1664		1067	1467			2812			2723	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	200	30	20	130	50	25	480	20	110	1030	145
RTOR Reduction (vph)	0	4	0	0	11	0	0	2	0	0	6	0
Lane Group Flow (vph)	90	226	0	20	169	0	0	523	0	0	1279	0
Confl. Peds. (#/hr)	170		26	26		170	40		22	22		40
Heavy Vehicles (%)	5%	12%	4%	5%	15%	8%	0%	7%	0%	0%	4%	6%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.6	37.6		22.8	22.8			90.4			90.4	
Effective Green, g (s)	37.6	37.6		22.8	22.8			90.4			90.4	
Actuated g/C Ratio	0.27	0.27		0.16	0.16			0.65			0.65	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	247	446		173	238			1815			1758	
v/s Ratio Prot	0.03	c0.14			c0.12							
v/s Ratio Perm	0.07			0.02				0.19			c0.47	
v/c Ratio	0.36	0.51		0.12	0.71			0.29			0.73	
Uniform Delay, d1	40.1	43.3		50.0	55.5			10.8			16.6	
Progression Factor	1.00	1.00		1.00	1.00			1.73			0.79	
Incremental Delay, d2	0.9	0.9		0.3	9.6			0.4			2.4	
Delay (s)	41.0	44.2		50.3	65.1			19.1			15.4	
Level of Service	D	D		D	E			B			B	
Approach Delay (s)		43.3			63.6			19.1			15.4	
Approach LOS		D			E			B			B	
Intersection Summary												
HCM 2000 Control Delay		24.2										
HCM 2000 Volume to Capacity ratio		0.71										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		107.5%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	985	70	105	435	30	55	40	20	50	95	50
Future Volume (vph)	30	985	70	105	435	30	55	40	20	50	95	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			4.0	6.0		6.0	6.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frbp, ped/bikes		0.99			1.00			1.00	0.98		1.00	0.99
Flpb, ped/bikes		1.00			1.00			1.00	1.00		0.95	1.00
Frt		0.99			0.99			1.00	0.95		1.00	0.95
Flt Protected		1.00			0.99			0.95	1.00		0.95	1.00
Satd. Flow (prot)		3446			3352			1728	1633		1539	1660
Flt Permitted		0.92			0.58			0.44	1.00		0.72	1.00
Satd. Flow (perm)		3177			1951			808	1633		1163	1660
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	985	70	105	435	30	55	40	20	50	95	50
RTOR Reduction (vph)	0	3	0	0	3	0	0	13	0	0	14	0
Lane Group Flow (vph)	0	1082	0	0	567	0	55	47	0	50	131	0
Confl. Peds. (#/hr)		22		34	34		22	8	29	29		8
Heavy Vehicles (%)	27%	2%	3%	1%	6%	7%	4%	5%	14%	11%	3%	16%
Turn Type		Perm	NA		Perm	NA		pm+pt	NA		Perm	NA
Protected Phases			4			8		5	2			6
Permitted Phases		4			8			2			6	
Actuated Green, G (s)		94.6			94.6			33.4	33.4		21.3	21.3
Effective Green, g (s)		94.6			94.6			33.4	33.4		21.3	21.3
Actuated g/C Ratio		0.68			0.68			0.24	0.24		0.15	0.15
Clearance Time (s)		6.0			6.0			4.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2146			1318			245	389		176	252
v/s Ratio Prot								c0.01	0.03			c0.08
v/s Ratio Perm		c0.34			0.29			0.04			0.04	
v/c Ratio		0.50			0.43			0.22	0.12		0.28	0.52
Uniform Delay, d1		11.2			10.4			42.2	41.8		52.6	54.6
Progression Factor		0.80			0.54			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.8			1.0			0.5	0.1		0.9	1.8
Delay (s)		9.8			6.6			42.6	41.9		53.5	56.4
Level of Service		A			A			D	D		D	E
Approach Delay (s)		9.8			6.6			42.3			55.7	
Approach LOS		A			A			D			E	
Intersection Summary												
HCM 2000 Control Delay		15.3									B	
HCM 2000 Volume to Capacity ratio		0.49										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)						16.0	
Intersection Capacity Utilization		105.5%			ICU Level of Service						G	
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	
Traffic Volume (vph)	35	95	135	80	45	35	90	415	30	10	1075	15
Future Volume (vph)	35	95	135	80	45	35	90	415	30	10	1075	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.96		1.00	0.99			0.99			1.00	
Flpb, ped/bikes	0.99	1.00		0.97	1.00			1.00			1.00	
Frt	1.00	0.91		1.00	0.93			0.99			1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1726	1638		1717	1742			3279			3519	
Flt Permitted	0.70	1.00		0.32	1.00			0.62			0.95	
Satd. Flow (perm)	1281	1638		579	1742			2036			3341	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	95	135	80	45	35	90	415	30	10	1075	15
RTOR Reduction (vph)	0	40	0	0	22	0	0	2	0	0	1	0
Lane Group Flow (vph)	35	190	0	80	58	0	0	533	0	0	1099	0
Confl. Peds. (#/hr)	3		27	27		3	23		50	50		23
Heavy Vehicles (%)	4%	1%	2%	2%	2%	0%	6%	7%	5%	0%	2%	10%
Turn Type	Perm	NA		Perm	NA	pm+pt	NA	Perm	NA		NA	
Protected Phases		4			8		5	2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.2	23.2		23.2	23.2			104.8			104.8	
Effective Green, g (s)	23.2	23.2		23.2	23.2			104.8			104.8	
Actuated g/C Ratio	0.17	0.17		0.17	0.17			0.75			0.75	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	212	271		95	288			1524			2500	
v/s Ratio Prot		0.12			0.03							
v/s Ratio Perm	0.03			c0.14				0.26			c0.33	
v/c Ratio	0.17	0.70		0.84	0.20			0.35			0.44	
Uniform Delay, d1	50.1	55.1		56.6	50.4			6.0			6.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			4.09	
Incremental Delay, d2	0.4	7.9		45.7	0.3			0.1			0.4	
Delay (s)	50.5	63.1		102.4	50.8			6.1			27.4	
Level of Service	D	E		F	D			A			C	
Approach Delay (s)		61.4			76.6			6.1			27.4	
Approach LOS		E			E			A			C	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Total PM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	620	40	0	755	65	0	700	50	0	470	50
Future Volume (vph)	0	620	40	0	755	65	0	700	50	0	470	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frbp, ped/bikes		0.99			0.99			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3454			3510			3413			3395	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3454			3510			3413			3395	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	620	40	0	755	65	0	700	50	0	470	50
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	0	6	0
Lane Group Flow (vph)	0	657	0	0	816	0	0	746	0	0	514	0
Confl. Peds. (#/hr)	69		72	72		69	74		185	185		74
Heavy Vehicles (%)	0%	3%	3%	0%	1%	0%	0%	3%	0%	0%	4%	0%
Turn Type	NA	NA			NA			NA			NA	
Protected Phases		4			8			2				6
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1578			1604			1560			1552	
v/s Ratio Prot		0.19			c0.23			c0.22			0.15	
v/s Ratio Perm												
v/c Ratio		0.42			0.51			0.48			0.33	
Uniform Delay, d1		25.5			26.9			26.4			24.3	
Progression Factor		0.66			1.00			1.28			1.28	
Incremental Delay, d2		0.7			1.2			0.9			0.5	
Delay (s)		17.5			28.0			34.7			31.6	
Level of Service		B			C			C			C	
Approach Delay (s)		17.5			28.0			34.7			31.6	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Total PM
Interim Phase 2 Construction



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕		↕	↕
Traffic Volume (vph)	165	660	830	55	30	120
Future Volume (vph)	165	660	830	55	30	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Flpb, ped/bikes	1.00	1.00	0.99		0.98	
Flpb, ped/bikes	0.98	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.89	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1753	3539	3489		1643	
Flt Permitted	0.30	1.00	1.00		0.99	
Satd. Flow (perm)	562	3539	3489		1643	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	660	830	55	30	120
RTOR Reduction (vph)	0	0	2	0	102	0
Lane Group Flow (vph)	165	660	883	0	48	0
Confl. Peds. (#/hr)	18			18	9	5
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	429	2704	2666		246	
v/s Ratio Prot		0.19	0.25			
v/s Ratio Perm	c0.29				c0.03	
v/c Ratio	0.38	0.24	0.33		0.20	
Uniform Delay, d1	5.5	4.8	5.2		52.1	
Progression Factor	1.00	1.00	0.63		1.00	
Incremental Delay, d2	2.6	0.2	0.3		0.4	
Delay (s)	8.1	5.0	3.6		52.5	
Level of Service	A	A	A		D	
Approach Delay (s)		5.6	3.6		52.5	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total PM
Interim Phase 2 Construction



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕		↕	↕	↕	↕	↕
Traffic Volume (vph)	145	135	30	60	275	85	20	965	45	35	580	60
Future Volume (vph)	145	135	30	60	275	85	20	965	45	35	580	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Flpb, ped/bikes	1.00	0.99		1.00	0.99			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		0.95	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1787	1799		1715	1809			3453			3384	
Flt Permitted	0.18	1.00		0.65	1.00			0.93			0.82	
Satd. Flow (perm)	330	1799		1178	1809			3217			2779	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	135	30	60	275	85	20	965	45	35	580	60
RTOR Reduction (vph)	0	5	0	0	8	0	0	3	0	0	6	0
Lane Group Flow (vph)	145	160	0	60	352	0	0	1027	0	0	669	0
Confl. Peds. (#/hr)	25		36	36		25	42		62	62		42
Heavy Vehicles (%)	1%	1%	3%	0%	0%	0%	0%	3%	0%	3%	4%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		7	4		8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	53.1	53.1		32.6	32.6			74.9			74.9	
Effective Green, g (s)	53.1	53.1		32.6	32.6			74.9			74.9	
Actuated g/C Ratio	0.38	0.38		0.23	0.23			0.54			0.54	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	296	682		274	421			1721			1486	
v/s Ratio Prot	c0.06	0.09			c0.19							
v/s Ratio Perm	0.13			0.05				c0.32			0.24	
v/c Ratio	0.49	0.23		0.22	0.84			0.60			0.45	
Uniform Delay, d1	31.9	29.6		43.4	51.2			22.2			19.9	
Progression Factor	1.00	1.00		1.00	1.00			0.51			1.00	
Incremental Delay, d2	1.3	0.2		0.4	13.5			1.4			1.0	
Delay (s)	33.2	29.8		43.8	64.7			12.7			20.9	
Level of Service	C	C		D	E			B			C	
Approach Delay (s)		31.4			61.7			12.7			20.9	
Approach LOS		C			E			B			C	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Total PM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	250	105	25	25	170	85	20	680	15	60	510	160
Future Volume (vph)	250	105	25	25	170	85	20	680	15	60	510	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.94		1.00	0.88			1.00			0.91	
Flpb, ped/bikes	0.96	1.00		0.76	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.95			1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1672	1508		1365	1423			3466			3004	
Flt Permitted	0.30	1.00		0.67	1.00			0.92			0.78	
Satd. Flow (perm)	529	1508		968	1423			3185			2344	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	250	105	25	25	170	85	20	680	15	60	510	160
RTOR Reduction (vph)	0	5	0	0	14	0	0	1	0	0	22	0
Lane Group Flow (vph)	250	125	0	25	241	0	0	714	0	0	708	0
Confl. Peds. (#/hr)	241		132	132		241	133		53	53		133
Heavy Vehicles (%)	4%	19%	0%	0%	14%	8%	5%	3%	0%	3%	4%	8%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	59.8	59.8		28.7	28.7			68.2			68.2	
Effective Green, g (s)	59.8	59.8		28.7	28.7			68.2			68.2	
Actuated g/C Ratio	0.43	0.43		0.20	0.20			0.49			0.49	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	447	644		198	291			1551			1141	
v/s Ratio Prot	c0.11	0.08			c0.17							
v/s Ratio Perm	0.13			0.03				0.22			c0.30	
v/c Ratio	0.56	0.19		0.13	0.83			0.46			0.62	
Uniform Delay, d1	28.3	25.0		45.4	53.3			23.7			26.4	
Progression Factor	1.00	1.00		1.00	1.00			1.95			0.49	
Incremental Delay, d2	1.5	0.1		0.3	17.5			0.9			2.4	
Delay (s)	29.8	25.2		45.7	70.8			47.2			15.4	
Level of Service	C	C		D	E			D			B	
Approach Delay (s)		28.2			68.6			47.2			15.4	
Approach LOS		C			E			D			B	
Intersection Summary												
HCM 2000 Control Delay		35.6			HCM 2000 Level of Service			D				
HCM 2000 Volume to Capacity ratio		0.66										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		94.0%			ICU Level of Service			F				
Analysis Period (min)		15										
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Total PM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔		↔	↔		↔	↔
Traffic Volume (vph)	70	700	25	20	715	70	120	90	40	70	80	105
Future Volume (vph)	70	700	25	20	715	70	120	90	40	70	80	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			4.0	6.0		6.0	6.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frbp, ped/bikes		0.99			0.98			1.00	0.96		1.00	0.96
Flpb, ped/bikes		0.99			1.00			0.99	1.00		0.89	1.00
Frt		1.00			0.99			1.00	0.95		1.00	0.91
Flt Protected		1.00			1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)		3477			3446			1767	1724		1581	1555
Flt Permitted		0.77			0.92			0.36	1.00		0.67	1.00
Satd. Flow (perm)		2685			3171			669	1724		1121	1555
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	700	25	20	715	70	120	90	40	70	80	105
RTOR Reduction (vph)	0	2	0	0	6	0	0	11	0	0	34	0
Lane Group Flow (vph)	0	793	0	0	799	0	120	119	0	70	151	0
Confl. Peds. (#/hr)		92		57	57		92	30		64	64	30
Heavy Vehicles (%)		9%	1%	0%	0%	0%	7%	1%	1%	0%	2%	5%
Turn Type		Perm	NA		Perm	NA		pm+pt	NA		Perm	NA
Protected Phases			4			8		5	2			6
Permitted Phases		4			8			2			6	
Actuated Green, G (s)		87.8			87.8			40.2	40.2		22.2	22.2
Effective Green, g (s)		87.8			87.8			40.2	40.2		22.2	22.2
Actuated g/C Ratio		0.63			0.63			0.29	0.29		0.16	0.16
Clearance Time (s)		6.0			6.0			4.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1683			1988			301	495		177	246
v/s Ratio Prot								c0.04	0.07			c0.10
v/s Ratio Perm		c0.30			0.25			0.07			0.06	
v/c Ratio		0.47			0.40			0.40	0.24		0.40	0.61
Uniform Delay, d1		13.8			13.0			38.7	38.2		52.9	54.9
Progression Factor		0.75			0.29			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.9			0.5			0.9	0.3		1.5	4.5
Delay (s)		11.3			4.3			39.6	38.5		54.3	59.3
Level of Service		B			A			D	D		D	E
Approach Delay (s)		11.3			4.3			39.0			58.0	
Approach LOS		B			A			D			E	
Intersection Summary												
HCM 2000 Control Delay		17.6			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.49										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		100.4%			ICU Level of Service			G				
Analysis Period (min)		15										
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Total PM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	
Traffic Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Future Volume (vph)	20	80	115	115	105	25	145	705	165	10	480	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.97		1.00	0.99			0.95			0.99	
Flpb, ped/bikes	0.98	1.00		0.97	1.00			0.99			1.00	
Frt	1.00	0.91		1.00	0.97			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1631	1638		1720	1823			3250			3430	
Flt Permitted	0.59	1.00		0.43	1.00			0.76			0.93	
Satd. Flow (perm)	1016	1638		775	1823			2490			3191	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	20	80	115	115	105	25	145	705	165	10	480	20
RTOR Reduction (vph)	0	40	0	0	7	0	0	9	0	0	1	0
Lane Group Flow (vph)	20	155	0	115	123	0	0	1006	0	0	509	0
Confl. Peds. (#/hr)	15		22	22		15	30		69	69		30
Heavy Vehicles (%)	8%	1%	3%	2%	0%	2%	3%	2%	0%	0%	4%	3%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8			5			2	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.6	24.6		24.6	24.6			103.4			103.4	
Effective Green, g (s)	24.6	24.6		24.6	24.6			103.4			103.4	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.74			0.74	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	178	287		136	320			1839			2356	
v/s Ratio Prot		0.09			0.07							
v/s Ratio Perm	0.02			c0.15				c0.40			0.16	
v/c Ratio	0.11	0.54		0.85	0.39			0.55			0.22	
Uniform Delay, d1	48.5	52.5		55.9	51.0			8.0			5.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			3.00	
Incremental Delay, d2	0.3	1.9		35.6	0.8			0.3			0.2	
Delay (s)	48.8	54.5		91.5	51.8			8.4			17.3	
Level of Service	D	D		F	D			A			B	
Approach Delay (s)		54.0			70.4			8.4			17.3	
Approach LOS		D			E			A			B	
Intersection Summary												
HCM 2000 Control Delay		23.3										
HCM 2000 Volume to Capacity ratio		0.62										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		98.1%			ICU Level of Service			F				
Analysis Period (min)		15										
c Critical Lane Group												


HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Total AM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	990	40	0	525	25	0	450	35	0	1065	55
Future Volume (vph)	0	990	40	0	525	25	0	450	35	0	1065	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width		3.5	3.7		3.5	3.5		3.7	3.5		3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frbp, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3551			3507			3312			3498	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3551			3507			3312			3498	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	990	40	0	525	25	0	450	35	0	1065	55
RTOR Reduction (vph)	0	2	0	0	2	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	1028	0	0	548	0	0	481	0	0	1117	0
Confl. Peds. (#/hr)	36		50	50		36	43		11	11		43
Heavy Vehicles (%)	0%	2%	0%	0%	3%	6%	0%	9%	6%	0%	3%	7%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1623			1603			1514			1599	
v/s Ratio Prot		c0.29			0.16			0.15			c0.32	
v/s Ratio Perm												
v/c Ratio		0.63			0.34			0.32			0.70	
Uniform Delay, d1		29.0			24.4			24.1			30.3	
Progression Factor		0.66			1.00			1.27			1.19	
Incremental Delay, d2		1.7			0.6			0.5			1.9	
Delay (s)		20.9			25.0			31.2			38.0	
Level of Service		C			C			C			D	
Approach Delay (s)		20.9			25.0			31.2			38.0	
Approach LOS		C			C			C			D	
Intersection Summary												
HCM 2000 Control Delay		29.2										
HCM 2000 Volume to Capacity ratio		0.67										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		73.0%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N


Future Total AM
Phase 2 - Before Denison Extension



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕		↕	
Traffic Volume (vph)	110	980	475	40	75	80
Future Volume (vph)	110	980	475	40	75	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frbp, ped/bikes	1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.93	
Flt Protected	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1777	3579	3441		1647	
Flt Permitted	0.46	1.00	1.00		0.98	
Satd. Flow (perm)	864	3579	3441		1647	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	980	475	40	75	80
RTOR Reduction (vph)	0	0	3	0	31	0
Lane Group Flow (vph)	110	980	512	0	124	0
Confl. Peds. (#/hr)	2			2	5	4
Heavy Vehicles (%)	0%	2%	5%	0%	0%	4%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	106.7	106.7	106.7		21.3	
Effective Green, g (s)	106.7	106.7	106.7		21.3	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	658	2727	2622		250	
v/s Ratio Prot		c0.27	0.15			
v/s Ratio Perm	0.13				c0.08	
v/c Ratio	0.17	0.36	0.20		0.50	
Uniform Delay, d1	4.5	5.5	4.7		54.4	
Progression Factor	1.00	1.00	0.99		1.00	
Incremental Delay, d2	0.5	0.4	0.2		1.6	
Delay (s)	5.1	5.8	4.8		56.0	
Level of Service	A	A	A		E	
Approach Delay (s)		5.7	4.8		56.0	
Approach LOS		A	A		E	
Intersection Summary						
HCM 2000 Control Delay		9.9			HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio		0.38				
Actuated Cycle Length (s)		140.0		Sum of lost time (s)	12.0	
Intersection Capacity Utilization		60.3%		ICU Level of Service	B	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total AM
Phase 2 - Before Denison Extension



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↕	↕	↕		↕	↕	↕	↕	↕
Traffic Volume (vph)	145	170	75	40	100	15	25	360	10	30	1050	65
Future Volume (vph)	145	170	75	40	100	15	25	360	10	30	1050	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.5	3.7
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.99		1.00	1.00			1.00			0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.98			1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1780	1803		1722	1879			3242			3451	
Flt Permitted	0.54	1.00		0.61	1.00			0.83			0.93	
Satd. Flow (perm)	1009	1803		1100	1879			2696			3219	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	170	75	40	100	15	25	360	10	30	1050	65
RTOR Reduction (vph)	0	12	0	0	4	0	0	1	0	0	3	0
Lane Group Flow (vph)	145	233	0	40	111	0	0	394	0	0	1142	0
Confl. Peds. (#/hr)	4		5	5		4	31		29	29		31
Heavy Vehicles (%)	0%	1%	1%	3%	0%	0%	8%	12%	0%	6%	4%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.5	43.5		24.0	24.0			84.5			84.5	
Effective Green, g (s)	43.5	43.5		24.0	24.0			84.5			84.5	
Actuated g/C Ratio	0.31	0.31		0.17	0.17			0.60			0.60	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	398	560		188	322			1627			1942	
v/s Ratio Prot	0.04	c0.13			0.06							
v/s Ratio Perm	0.07			0.04				0.15			c0.35	
v/c Ratio	0.36	0.42		0.21	0.34			0.24			0.59	
Uniform Delay, d1	36.3	38.2		49.9	51.1			12.9			17.1	
Progression Factor	1.00	1.00		1.00	1.00			1.07			1.00	
Incremental Delay, d2	0.6	0.5		0.6	0.6			0.3			1.3	
Delay (s)	36.9	38.7		50.4	51.7			14.1			18.4	
Level of Service	D	D		D	D			B			B	
Approach Delay (s)		38.0			51.4			14.1			18.4	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM 2000 Control Delay		23.7						HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio		0.55										
Actuated Cycle Length (s)		140.0		Sum of lost time (s)				16.0				
Intersection Capacity Utilization		96.2%		ICU Level of Service				F				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
 15: Main St N & Nelson St W/Theatre Ln

Future Total AM
 Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	90	200	35	20	130	50	25	480	20	110	1030	145
Future Volume (vph)	90	200	35	20	130	50	25	480	20	110	1030	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0		6.0		
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95		0.95		
Frbp, ped/bikes	1.00	0.99		1.00	0.91			1.00		0.98		
Flpb, ped/bikes	0.94	1.00		0.96	1.00			1.00		1.00		
Frt	1.00	0.98		1.00	0.96			0.99		0.98		
Flt Protected	0.95	1.00		0.95	1.00			1.00		1.00		
Satd. Flow (prot)	1598	1678		1629	1483			3392		3377		
Flt Permitted	0.38	1.00		0.61	1.00			0.84		0.81		
Satd. Flow (perm)	633	1678		1050	1483			2843		2754		
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	200	35	20	130	50	25	480	20	110	1030	145
RTOR Reduction (vph)	0	5	0	0	11	0	0	2	0	0	6	0
Lane Group Flow (vph)	90	230	0	20	169	0	0	523	0	0	1279	0
Confl. Peds. (#/hr)	170		26	26		170	40		22	22		40
Heavy Vehicles (%)	5%	12%	4%	5%	15%	8%	0%	7%	0%	0%	4%	6%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		8	8		2	2		6	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.4	37.4		22.6	22.6		90.6	90.6		90.6	90.6	
Effective Green, g (s)	37.4	37.4		22.6	22.6		90.6	90.6		90.6	90.6	
Actuated g/C Ratio	0.27	0.27		0.16	0.16		0.65	0.65		0.65	0.65	
Clearance Time (s)	4.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	243	448		169	239		1839	1782		1782	1782	
v/s Ratio Prot	0.03	c0.14			c0.11							
v/s Ratio Perm	0.07			0.02			0.18			c0.46		
v/c Ratio	0.37	0.51		0.12	0.71		0.28	0.72		0.72	0.72	
Uniform Delay, d1	40.3	43.6		50.2	55.6		10.7	16.3		16.3	16.3	
Progression Factor	1.00	1.00		1.00	1.00		1.82	0.73		0.73	0.73	
Incremental Delay, d2	1.0	1.0		0.3	9.2		0.4	2.2		2.2	2.2	
Delay (s)	41.3	44.6		50.5	64.8		19.8	14.1		14.1	14.1	
Level of Service	D	D		D	E		B	B		B	B	
Approach Delay (s)		43.7			63.3		19.8	14.1		14.1	14.1	
Approach LOS		D			E		B	B		B	B	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	107.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: George St S/George St N & Queen St W

Future Total AM
 Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	30	1005	70	105	445	30	55	40	20	70	95	50
Future Volume (vph)	30	1005	70	105	445	30	55	40	20	70	95	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes		0.99			1.00		1.00	0.98		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		0.95	1.00	
Frt		0.99			0.99		1.00	0.95		1.00	0.95	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3486			3390		1709	1651		1522	1679	
Flt Permitted		0.92			0.57		0.44	1.00		0.72	1.00	
Satd. Flow (perm)		3213			1963		799	1651		1150	1679	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	1005	70	105	445	30	55	40	20	70	95	50
RTOR Reduction (vph)	0	3	0	0	3	0	0	13	0	0	14	0
Lane Group Flow (vph)	0	1102	0	0	577	0	55	47	0	70	131	0
Confl. Peds. (#/hr)	22		34	34		22	8		29	29		8
Heavy Vehicles (%)	27%	2%	3%	1%	6%	7%	4%	5%	14%	11%	3%	16%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2		6	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		94.5			94.5		33.5	33.5		21.3	21.3	
Effective Green, g (s)		94.5			94.5		33.5	33.5		21.3	21.3	
Actuated g/C Ratio		0.68			0.68		0.24	0.24		0.15	0.15	
Clearance Time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2168			1325		244	395		174	255	
v/s Ratio Prot							c0.01	0.03			c0.08	
v/s Ratio Perm		c0.34			0.29		0.04			0.06		
v/c Ratio		0.51			0.44		0.23	0.12		0.40	0.51	
Uniform Delay, d1		11.3			10.5		42.1	41.7		53.6	54.6	
Progression Factor		0.89			0.55		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			1.0		0.5	0.1		1.5	1.7	
Delay (s)		10.8			6.7		42.6	41.8		55.1	56.3	
Level of Service		B			A		D	D		E	E	
Approach Delay (s)		10.8			6.7		42.2	41.8		55.9	56.3	
Approach LOS		B			A		D	D		E	E	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 29: Main St S & Wellington St E

Future Total AM
 Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↕	
Traffic Volume (vph)	35	95	135	80	45	35	90	415	30	10	1080	15
Future Volume (vph)	35	95	135	80	45	35	90	415	30	10	1080	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.99			0.99			1.00	
Flpb, ped/bikes	0.99	1.00		0.97	1.00			1.00			1.00	
Frt	1.00	0.91		1.00	0.93			0.99			1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1707	1656		1698	1761			3316			3558	
Flt Permitted	0.70	1.00		0.32	1.00			0.61			0.95	
Satd. Flow (perm)	1266	1656		570	1761			2056			3378	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	95	135	80	45	35	90	415	30	10	1080	15
RTOR Reduction (vph)	0	40	0	0	22	0	0	2	0	0	1	0
Lane Group Flow (vph)	35	190	0	80	58	0	0	533	0	0	1104	0
Confl. Peds. (#/hr)	3		27	27		3	23		50	50		23
Heavy Vehicles (%)	4%	1%	2%	2%	2%	0%	6%	7%	5%	0%	2%	10%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.1	23.1		23.1	23.1		104.9			104.9		
Effective Green, g (s)	23.1	23.1		23.1	23.1		104.9			104.9		
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.75			0.75		
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0			6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0			3.0		
Lane Grp Cap (vph)	208	273		94	290		1540			2531		
v/s Ratio Prot		0.11			0.03							
v/s Ratio Perm	0.03			c0.14			0.26			c0.33		
v/c Ratio	0.17	0.70		0.85	0.20		0.35			0.44		
Uniform Delay, d1	50.2	55.1		56.8	50.5		5.9			6.5		
Progression Factor	1.00	1.00		1.00	1.00		1.00			4.15		
Incremental Delay, d2	0.4	7.5		48.3	0.3		0.1			0.4		
Delay (s)	50.6	62.6		105.1	50.8		6.1			27.5		
Level of Service	D	E		F	D		A			C		
Approach Delay (s)		61.0			78.0		6.1			27.5		
Approach LOS		E			E		A			C		

Intersection Summary				
HCM 2000 Control Delay		30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio		0.53		
Actuated Cycle Length (s)		140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization		99.2%	ICU Level of Service	F
Analysis Period (min)		15		
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
 5: Main St S/Main St N & Queen St W/Queen St E

Future Total PM
 Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	0	635	40	0	780	65	0	705	50	0	475	50
Future Volume (vph)	0	635	40	0	780	65	0	705	50	0	475	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3494			3551			3451			3434	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3494			3551			3451			3434	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	635	40	0	780	65	0	705	50	0	475	50
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	0	5	0
Lane Group Flow (vph)	0	672	0	0	841	0	0	751	0	0	520	0
Confl. Peds. (#/hr)	69		72	72		69	74		185	185		74
Heavy Vehicles (%)	0%	3%	3%	0%	1%	0%	0%	3%	0%	0%	4%	0%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1597			1623			1577			1569	
v/s Ratio Prot		0.19			c0.24			c0.22			0.15	
v/s Ratio Perm												
v/c Ratio		0.42			0.52			0.48			0.33	
Uniform Delay, d1		25.5			27.0			26.4			24.3	
Progression Factor		0.66			1.00			1.28			1.31	
Incremental Delay, d2		0.7			1.2			0.9			0.5	
Delay (s)		17.7			28.2			34.7			32.3	
Level of Service		B			C			C			C	
Approach Delay (s)		17.7			28.2			34.7			32.3	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕↕	↕↕		↕	
Traffic Volume (vph)	165	660	855	70	40	120
Future Volume (vph)	165	660	855	70	40	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frpb, ped/bikes	1.00	1.00	0.99		0.98	
Flpb, ped/bikes	0.98	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.90	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1736	3579	3517		1633	
Flt Permitted	0.29	1.00	1.00		0.99	
Satd. Flow (perm)	531	3579	3517		1633	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	660	855	70	40	120
RTOR Reduction (vph)	0	0	3	0	87	0
Lane Group Flow (vph)	165	660	922	0	73	0
Confl. Peds. (#/hr)	18			18	9	5
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	405	2735	2687		244	
v/s Ratio Prot		0.18	0.26			
v/s Ratio Perm	c0.31				c0.04	
v/c Ratio	0.41	0.24	0.34		0.30	
Uniform Delay, d1	5.6	4.8	5.3		53.0	
Progression Factor	1.00	1.00	0.64		1.00	
Incremental Delay, d2	3.0	0.2	0.3		0.7	
Delay (s)	8.7	5.0	3.7		53.7	
Level of Service	A	A	A		D	
Approach Delay (s)		5.7	3.7		53.7	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕↕	↕↕	↔	↕↕	↕↕		↕↕	↕↕	↕↕	↕↕	↕↕
Traffic Volume (vph)	145	135	30	60	275	85	20	955	45	35	585	60
Future Volume (vph)	145	135	30	60	275	85	20	955	45	35	585	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		0.95	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1767	1819		1696	1829			3491			3422	
Flt Permitted	0.17	1.00		0.65	1.00			0.93			0.82	
Satd. Flow (perm)	318	1819		1165	1829			3251			2824	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	135	30	60	275	85	20	955	45	35	585	60
RTOR Reduction (vph)	0	5	0	0	8	0	0	3	0	0	6	0
Lane Group Flow (vph)	145	160	0	60	352	0	0	1017	0	0	674	0
Confl. Peds. (#/hr)	25		36	36		25	42		62	62		42
Heavy Vehicles (%)	1%	1%	3%	0%	0%	0%	0%	3%	0%	3%	4%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			2	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Effective Green, g (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Actuated g/C Ratio	0.38	0.38		0.23	0.23			0.54			0.54	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	293	688		268	421			1741			1512	
v/s Ratio Prot	c0.06	0.09			c0.19							
v/s Ratio Perm	0.13			0.05				c0.31			0.24	
v/c Ratio	0.49	0.23		0.22	0.84			0.58			0.45	
Uniform Delay, d1	32.0	29.6		43.7	51.3			22.0			19.8	
Progression Factor	1.00	1.00		1.00	1.00			0.49			1.00	
Incremental Delay, d2	1.3	0.2		0.4	13.5			1.3			1.0	
Delay (s)	33.4	29.8		44.1	64.8			12.1			20.8	
Level of Service	C	C		D	E			B			C	
Approach Delay (s)		31.5			61.9			12.1			20.8	
Approach LOS		C			E			B			C	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	240	105	30	25	170	85	25	680	15	60	510	165
Future Volume (vph)	240	105	30	25	170	85	25	680	15	60	510	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.88			1.00			0.91	
Flpb, ped/bikes	0.96	1.00		0.76	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.95			1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1654	1511		1353	1439			3501			3027	
Flt Permitted	0.30	1.00		0.67	1.00			0.90			0.78	
Satd. Flow (perm)	521	1511		955	1439			3169			2370	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	240	105	30	25	170	85	25	680	15	60	510	165
RTOR Reduction (vph)	0	6	0	0	14	0	0	1	0	0	22	0
Lane Group Flow (vph)	240	129	0	25	241	0	0	719	0	0	713	0
Confl. Peds. (#/hr)	241		132	132		241	133		53	53		133
Heavy Vehicles (%)	4%	19%	0%	0%	14%	8%	5%	3%	0%	3%	4%	8%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	58.6	58.6		28.6	28.6			69.4			69.4	
Effective Green, g (s)	58.6	58.6		28.6	28.6			69.4			69.4	
Actuated g/C Ratio	0.42	0.42		0.20	0.20			0.50			0.50	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	428	632		195	293			1570			1174	
v/s Ratio Prot	c0.10	0.09			c0.17							
v/s Ratio Perm	0.13			0.03			0.23				c0.30	
v/c Ratio	0.56	0.20		0.13	0.82			0.46			0.61	
Uniform Delay, d1	28.9	25.9		45.5	53.3			23.0			25.5	
Progression Factor	1.00	1.00		1.00	1.00			1.98			0.48	
Incremental Delay, d2	1.7	0.2		0.3	16.9			0.9			2.2	
Delay (s)	30.6	26.0		45.8	70.2			46.3			14.6	
Level of Service	C	C		D	E			D			B	
Approach Delay (s)		29.0			68.0			46.3			14.6	
Approach LOS		C			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	35.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	70	710	25	20	755	55	120	90	40	75	75	105
Future Volume (vph)	70	710	25	20	755	55	120	90	40	75	75	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0		4.0	6.0			6.0	6.0
Lane Util. Factor		0.95			0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes		0.99			0.98		1.00	0.96			1.00	0.96
Flpb, ped/bikes		0.99			1.00		0.99	1.00			0.89	1.00
Frt		1.00			0.99		1.00	0.95			1.00	0.91
Flt Protected		1.00			1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)		3518			3522		1747	1743			1563	1566
Flt Permitted		0.76			0.92		0.37	1.00			0.67	1.00
Satd. Flow (perm)		2695			3242		676	1743			1108	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	710	25	20	755	55	120	90	40	75	75	105
RTOR Reduction (vph)	0	2	0	0	4	0	0	11	0	0	37	0
Lane Group Flow (vph)	0	803	0	0	826	0	120	119	0	75	143	0
Confl. Peds. (#/hr)	92		57	57		92	30		64	64		30
Heavy Vehicles (%)	9%	1%	0%	0%	0%	7%	1%	1%	0%	2%	5%	9%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases		4			8		2				6	
Actuated Green, G (s)		88.0			88.0		40.0	40.0			21.9	21.9
Effective Green, g (s)		88.0			88.0		40.0	40.0			21.9	21.9
Actuated g/C Ratio		0.63			0.63		0.29	0.29			0.16	0.16
Clearance Time (s)		6.0			6.0		4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1694			2037		301	498			173	244
v/s Ratio Prot							c0.04	0.07				c0.09
v/s Ratio Perm		c0.30			0.25		0.07				0.07	
v/c Ratio		0.47			0.41		0.40	0.24			0.43	0.59
Uniform Delay, d1		13.8			13.0		38.8	38.3			53.4	54.8
Progression Factor		0.77			0.28		1.00	1.00			1.00	1.00
Incremental Delay, d2		0.9			0.5		0.9	0.3			1.7	3.6
Delay (s)		11.6			4.1		39.7	38.6			55.2	58.4
Level of Service		B			A		D	D			E	E
Approach Delay (s)		11.6			4.1		39.1				57.4	
Approach LOS		B			A		D				E	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	101.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	↔
Traffic Volume (vph)	20	80	115	115	105	25	145	710	165	10	485	20
Future Volume (vph)	20	80	115	115	105	25	145	710	165	10	485	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.99			0.95			0.99	
Flpb, ped/bikes	0.98	1.00		0.97	1.00			0.99			1.00	
Frt	1.00	0.91		1.00	0.97			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1612	1656		1701	1843			3288			3468	
Flt Permitted	0.59	1.00		0.43	1.00			0.76			0.93	
Satd. Flow (perm)	1007	1656		770	1843			2515			3227	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	20	80	115	115	105	25	145	710	165	10	485	20
RTOR Reduction (vph)	0	40	0	0	7	0	0	9	0	0	1	0
Lane Group Flow (vph)	20	155	0	115	123	0	0	1011	0	0	514	0
Confl. Peds. (#/hr)	15		22	22		15	30		69	69		30
Heavy Vehicles (%)	8%	1%	3%	2%	0%	2%	3%	2%	0%	0%	4%	3%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Effective Green, g (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.74			0.74	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	178	293		136	326			1853			2378	
v/s Ratio Prot		0.09			0.07							
v/s Ratio Perm	0.02			c0.15				c0.40			0.16	
v/c Ratio	0.11	0.53		0.85	0.38			0.55			0.22	
Uniform Delay, d1	48.4	52.3		55.7	50.8			8.1			5.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			3.00	
Incremental Delay, d2	0.3	1.7		35.6	0.7			0.3			0.2	
Delay (s)	48.6	54.0		91.4	51.5			8.4			17.4	
Level of Service	D	D		F	D			A			B	
Approach Delay (s)		53.5			70.2			8.4			17.4	
Approach LOS		D			E			A			B	
Intersection Summary												
HCM 2000 Control Delay		23.2									C	
HCM 2000 Volume to Capacity ratio		0.62										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		98.2%			ICU Level of Service			F				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	↔
Traffic Volume (vph)	0	990	40	0	525	25	0	450	35	0	1065	55
Future Volume (vph)	0	990	40	0	525	25	0	450	35	0	1065	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3551			3507			3312			3498	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3551			3507			3312			3498	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	990	40	0	525	25	0	450	35	0	1065	55
RTOR Reduction (vph)	0	2	0	0	2	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	1028	0	0	548	0	0	481	0	0	1117	0
Confl. Peds. (#/hr)	36		50	50		36	43		11	11		43
Heavy Vehicles (%)	0%	2%	0%	0%	3%	6%	0%	9%	6%	0%	3%	7%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1623			1603			1514			1599	
v/s Ratio Prot		c0.29			0.16			0.15			c0.32	
v/s Ratio Perm												
v/c Ratio		0.63			0.34			0.32			0.70	
Uniform Delay, d1		29.0			24.4			24.1			30.3	
Progression Factor		0.66			1.00			1.27			1.04	
Incremental Delay, d2		1.7			0.6			0.5			1.9	
Delay (s)		20.9			25.0			31.2			33.4	
Level of Service		C			C			C			C	
Approach Delay (s)		20.9			25.0			31.2			33.4	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		27.6						HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio		0.67										
Actuated Cycle Length (s)		140.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		73.0%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕		↕	↕
Traffic Volume (vph)	110	980	475	40	75	80
Future Volume (vph)	110	980	475	40	75	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frbp, ped/bikes	1.00	1.00	1.00		0.99	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.93	
Flt Protected	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1777	3579	3441		1647	
Flt Permitted	0.46	1.00	1.00		0.98	
Satd. Flow (perm)	864	3579	3441		1647	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	980	475	40	75	80
RTOR Reduction (vph)	0	0	3	0	31	0
Lane Group Flow (vph)	110	980	512	0	124	0
Confl. Peds. (#/hr)	2			2	5	4
Heavy Vehicles (%)	0%	2%	5%	0%	0%	4%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	106.7	106.7	106.7		21.3	
Effective Green, g (s)	106.7	106.7	106.7		21.3	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	658	2727	2622		250	
v/s Ratio Prot		c0.27	0.15			
v/s Ratio Perm	0.13				c0.08	
v/c Ratio	0.17	0.36	0.20		0.50	
Uniform Delay, d1	4.5	5.5	4.7		54.4	
Progression Factor	1.00	1.00	0.99		1.00	
Incremental Delay, d2	0.5	0.4	0.2		1.6	
Delay (s)	5.1	5.8	4.8		56.0	
Level of Service	A	A	A		E	
Approach Delay (s)		5.7	4.8		56.0	
Approach LOS		A	A		E	
Intersection Summary						
HCM 2000 Control Delay		9.9			HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio		0.38				
Actuated Cycle Length (s)		140.0		Sum of lost time (s)	12.0	
Intersection Capacity Utilization		60.3%		ICU Level of Service	B	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕		↕	↕	↕	↕	↕
Traffic Volume (vph)	145	170	75	40	100	15	25	360	10	30	1050	65
Future Volume (vph)	145	170	75	40	100	15	25	360	10	30	1050	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.5	3.7
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.99		1.00	1.00			1.00			0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.98			1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1780	1803		1722	1879			3242			3451	
Flt Permitted	0.54	1.00		0.61	1.00			0.83			0.93	
Satd. Flow (perm)	1009	1803		1100	1879			2696			3219	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	170	75	40	100	15	25	360	10	30	1050	65
RTOR Reduction (vph)	0	12	0	0	4	0	0	1	0	0	3	0
Lane Group Flow (vph)	145	233	0	40	111	0	0	394	0	0	1142	0
Confl. Peds. (#/hr)	4		5	5		4	31		29	29		31
Heavy Vehicles (%)	0%	1%	1%	3%	0%	0%	8%	12%	0%	6%	4%	3%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.5	43.5		24.0	24.0			84.5			84.5	
Effective Green, g (s)	43.5	43.5		24.0	24.0			84.5			84.5	
Actuated g/C Ratio	0.31	0.31		0.17	0.17			0.60			0.60	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	398	560		188	322			1627			1942	
v/s Ratio Prot	0.04	c0.13			0.06							
v/s Ratio Perm	0.07			0.04				0.15			c0.35	
v/c Ratio	0.36	0.42		0.21	0.34			0.24			0.59	
Uniform Delay, d1	36.3	38.2		49.9	51.1			12.9			17.1	
Progression Factor	1.00	1.00		1.00	1.00			1.24			1.00	
Incremental Delay, d2	0.6	0.5		0.6	0.6			0.3			1.3	
Delay (s)	36.9	38.7		50.4	51.7			16.3			18.4	
Level of Service	D	D		D	D			B			B	
Approach Delay (s)		38.0			51.4			16.3			18.4	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM 2000 Control Delay		24.1						HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio		0.55										
Actuated Cycle Length (s)		140.0		Sum of lost time (s)							16.0	
Intersection Capacity Utilization		96.2%		ICU Level of Service							F	
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	90	200	35	20	130	50	25	480	20	110	1030	145
Future Volume (vph)	90	200	35	20	130	50	25	480	20	110	1030	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.99		1.00	0.91			1.00			0.98	
Flpb, ped/bikes	0.94	1.00		0.96	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.96			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1598	1678		1629	1483			3392			3377	
Flt Permitted	0.38	1.00		0.61	1.00			0.84			0.81	
Satd. Flow (perm)	633	1678		1050	1483			2843			2754	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	200	35	20	130	50	25	480	20	110	1030	145
RTOR Reduction (vph)	0	5	0	0	11	0	0	2	0	0	6	0
Lane Group Flow (vph)	90	230	0	20	169	0	0	523	0	0	1279	0
Confl. Peds. (#/hr)	170		26	26		170	40		22	22		40
Heavy Vehicles (%)	5%	12%	4%	5%	15%	8%	0%	7%	0%	0%	4%	6%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.4	37.4		22.6	22.6			90.6			90.6	
Effective Green, g (s)	37.4	37.4		22.6	22.6			90.6			90.6	
Actuated g/C Ratio	0.27	0.27		0.16	0.16			0.65			0.65	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	243	448		169	239			1839			1782	
v/s Ratio Prot	0.03	c0.14			c0.11							
v/s Ratio Perm	0.07			0.02				0.18			c0.46	
v/c Ratio	0.37	0.51		0.12	0.71			0.28			0.72	
Uniform Delay, d1	40.3	43.6		50.2	55.6			10.7			16.3	
Progression Factor	1.00	1.00		1.00	1.00			1.82			0.50	
Incremental Delay, d2	1.0	1.0		0.3	9.2			0.4			2.2	
Delay (s)	41.3	44.6		50.5	64.8			19.8			10.4	
Level of Service	D	D		D	E			B			B	
Approach Delay (s)		43.7			63.3			19.8			10.4	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	107.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	30	1005	70	105	445	30	55	40	20	70	95	50
Future Volume (vph)	30	1005	70	105	445	30	55	40	20	70	95	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			4.0	6.0		6.0	6.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frbp, ped/bikes		0.99			1.00			1.00	0.98		1.00	0.99
Flpb, ped/bikes		1.00			1.00			1.00	1.00		0.95	1.00
Frt		0.99			0.99			1.00	0.95		1.00	0.95
Flt Protected		1.00			0.99			0.95	1.00		0.95	1.00
Satd. Flow (prot)		3486			3390			1709	1651		1522	1679
Flt Permitted		0.92			0.57			0.44	1.00		0.72	1.00
Satd. Flow (perm)		3213			1963			799	1651		1150	1679
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	1005	70	105	445	30	55	40	20	70	95	50
RTOR Reduction (vph)	0	3	0	0	3	0	0	13	0	0	14	0
Lane Group Flow (vph)	0	1102	0	0	577	0	55	47	0	70	131	0
Confl. Peds. (#/hr)	22		34	34		22	8		29	29		8
Heavy Vehicles (%)	27%	2%	3%	1%	6%	7%	4%	5%	14%	11%	3%	16%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		94.5			94.5		33.5	33.5		21.3	21.3	
Effective Green, g (s)		94.5			94.5		33.5	33.5		21.3	21.3	
Actuated g/C Ratio		0.68			0.68		0.24	0.24		0.15	0.15	
Clearance Time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2168			1325		244	395		174	255	
v/s Ratio Prot							c0.01	0.03			c0.08	
v/s Ratio Perm		c0.34			0.29		0.04			0.06		
v/c Ratio		0.51			0.44		0.23	0.12		0.40	0.51	
Uniform Delay, d1		11.3			10.5		42.1	41.7		53.6	54.6	
Progression Factor		0.89			0.55		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			1.0		0.5	0.1		1.5	1.7	
Delay (s)		10.8			6.7		42.6	41.8		55.1	56.3	
Level of Service		B			A		D	D		E	E	
Approach Delay (s)		10.8			6.7		42.2			55.9		
Approach LOS		B			A		D			E		

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
29: Main St S & Wellington St E

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	
Traffic Volume (vph)	35	95	135	80	45	35	90	415	30	10	1080	15
Future Volume (vph)	35	95	135	80	45	35	90	415	30	10	1080	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.96		1.00	0.99			0.99			1.00	
Flpb, ped/bikes	0.99	1.00		0.97	1.00			1.00			1.00	
Frt	1.00	0.91		1.00	0.93			0.99			1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1707	1656		1698	1761			3316			3558	
Flt Permitted	0.70	1.00		0.32	1.00			0.61			0.95	
Satd. Flow (perm)	1266	1656		570	1761			2056			3378	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	95	135	80	45	35	90	415	30	10	1080	15
RTOR Reduction (vph)	0	40	0	0	22	0	0	2	0	0	1	0
Lane Group Flow (vph)	35	190	0	80	58	0	0	533	0	0	1104	0
Confl. Peds. (#/hr)	3		27	27		3	23		50	50		23
Heavy Vehicles (%)	4%	1%	2%	2%	2%	0%	6%	7%	5%	0%	2%	10%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.1	23.1		23.1	23.1			104.9			104.9	
Effective Green, g (s)	23.1	23.1		23.1	23.1			104.9			104.9	
Actuated g/C Ratio	0.17	0.17		0.17	0.17			0.75			0.75	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	208	273		94	290			1540			2531	
v/s Ratio Prot		0.11			0.03							
v/s Ratio Perm	0.03			c0.14				0.26			c0.33	
v/c Ratio	0.17	0.70		0.85	0.20			0.35			0.44	
Uniform Delay, d1	50.2	55.1		56.8	50.5			5.9			6.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00			4.13	
Incremental Delay, d2	0.4	7.5		48.3	0.3			0.1			0.4	
Delay (s)	50.6	62.6		105.1	50.8			6.1			27.4	
Level of Service	D	E		F	D			A			C	
Approach Delay (s)		61.0			78.0			6.1			27.4	
Approach LOS		E			E			A			C	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Main St S/Main St N & Queen St W/Queen St E

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	640	40	0	780	65	0	705	50	0	475	50
Future Volume (vph)	0	640	40	0	780	65	0	705	50	0	475	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frbp, ped/bikes		0.99			0.99			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.99	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		3494			3551			3451			3434	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		3494			3551			3451			3434	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	640	40	0	780	65	0	705	50	0	475	50
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	0	5	0
Lane Group Flow (vph)	0	677	0	0	841	0	0	751	0	0	520	0
Confl. Peds. (#/hr)	69		72	72		69	74		185	185		74
Heavy Vehicles (%)	0%	3%	3%	0%	1%	0%	0%	3%	0%	0%	4%	0%
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases												
Actuated Green, G (s)		64.0			64.0			64.0			64.0	
Effective Green, g (s)		64.0			64.0			64.0			64.0	
Actuated g/C Ratio		0.46			0.46			0.46			0.46	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		1597			1623			1577			1569	
v/s Ratio Prot		0.19			c0.24			c0.22			0.15	
v/s Ratio Perm												
v/c Ratio		0.42			0.52			0.48			0.33	
Uniform Delay, d1		25.6			27.0			26.4			24.3	
Progression Factor		0.68			1.00			1.28			1.25	
Incremental Delay, d2		0.8			1.2			0.9			0.5	
Delay (s)		18.0			28.2			34.7			30.9	
Level of Service		B			C			C			C	
Approach Delay (s)		18.0			28.2			34.7			30.9	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Queen St W & Mill St N

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	165	660	855	70	40	120
Future Volume (vph)	165	660	855	70	40	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.5	3.5
Total Lost time (s)	6.0	6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	0.95		1.00	
Frbp, ped/bikes	1.00	1.00	0.99		0.98	
Flpb, ped/bikes	0.98	1.00	1.00		1.00	
Frt	1.00	1.00	0.99		0.90	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1736	3579	3517		1633	
Flt Permitted	0.29	1.00	1.00		0.99	
Satd. Flow (perm)	531	3579	3517		1633	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	660	855	70	40	120
RTOR Reduction (vph)	0	0	3	0	87	0
Lane Group Flow (vph)	165	660	922	0	73	0
Confl. Peds. (#/hr)	18			18	9	5
Heavy Vehicles (%)	1%	2%	2%	0%	0%	0%
Turn Type	Perm	NA	NA		Perm	
Protected Phases		4	8			
Permitted Phases	4				6	
Actuated Green, G (s)	107.0	107.0	107.0		21.0	
Effective Green, g (s)	107.0	107.0	107.0		21.0	
Actuated g/C Ratio	0.76	0.76	0.76		0.15	
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)	405	2735	2687		244	
v/s Ratio Prot		0.18	0.26			
v/s Ratio Perm	c0.31				c0.04	
v/c Ratio	0.41	0.24	0.34		0.30	
Uniform Delay, d1	5.6	4.8	5.3		53.0	
Progression Factor	1.00	1.00	0.63		1.00	
Incremental Delay, d2	3.0	0.2	0.3		0.7	
Delay (s)	8.7	5.0	3.7		53.7	
Level of Service	A	A	A		D	
Approach Delay (s)		5.7	3.7		53.7	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			8.7		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.39			
Actuated Cycle Length (s)			140.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			71.8%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
11: Main St N & Church St W

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	135	30	60	275	85	20	970	45	35	590	60
Future Volume (vph)	145	135	30	60	275	85	20	970	45	35	590	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.99		1.00	0.99			0.99			0.99	
Flpb, ped/bikes	1.00	1.00		0.95	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1767	1819		1696	1829			3492			3423	
Flt Permitted	0.17	1.00		0.65	1.00			0.93			0.82	
Satd. Flow (perm)	318	1819		1165	1829			3252			2811	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	145	135	30	60	275	85	20	970	45	35	590	60
RTOR Reduction (vph)	0	5	0	0	8	0	0	3	0	0	6	0
Lane Group Flow (vph)	145	160	0	60	352	0	0	1032	0	0	679	0
Confl. Peds. (#/hr)	25		36	36		25	42		62	62		42
Heavy Vehicles (%)	1%	1%	3%	0%	0%	0%	0%	3%	0%	3%	4%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8								
Actuated Green, G (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Effective Green, g (s)	53.0	53.0		32.3	32.3			75.0			75.0	
Actuated g/C Ratio	0.38	0.38		0.23	0.23			0.54			0.54	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	293	688		268	421			1742			1505	
v/s Ratio Prot	c0.06	0.09			c0.19							
v/s Ratio Perm	0.13			0.05				c0.32			0.24	
v/c Ratio	0.49	0.23		0.22	0.84			0.59			0.45	
Uniform Delay, d1	32.0	29.6		43.7	51.3			22.1			19.9	
Progression Factor	1.00	1.00		1.00	1.00			0.50			1.00	
Incremental Delay, d2	1.3	0.2		0.4	13.5			1.4			1.0	
Delay (s)	33.4	29.8		44.1	64.8			12.5			20.9	
Level of Service	C	C		D	E			B			C	
Approach Delay (s)		31.5			61.9			12.5			20.9	
Approach LOS		C			E			B			C	
Intersection Summary												
HCM 2000 Control Delay				25.7				HCM 2000 Level of Service			C	
HCM 2000 Volume to Capacity ratio				0.64								
Actuated Cycle Length (s)				140.0				Sum of lost time (s)			16.0	
Intersection Capacity Utilization				99.9%				ICU Level of Service			F	
Analysis Period (min)				15								
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
15: Main St N & Nelson St W/Theatre Ln

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	↔
Traffic Volume (vph)	255	105	30	25	170	85	25	680	15	60	510	170
Future Volume (vph)	255	105	30	25	170	85	25	680	15	60	510	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.93		1.00	0.88			1.00			0.90	
Flpb, ped/bikes	0.96	1.00		0.76	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.95			1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1655	1511		1353	1439			3501			3017	
Flt Permitted	0.29	1.00		0.67	1.00			0.90			0.77	
Satd. Flow (perm)	512	1511		955	1439			3167			2346	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	255	105	30	25	170	85	25	680	15	60	510	170
RTOR Reduction (vph)	0	6	0	0	14	0	0	1	0	0	24	0
Lane Group Flow (vph)	255	129	0	25	241	0	0	719	0	0	716	0
Confl. Peds. (#/hr)	241		132	132		241	133		53	53		133
Heavy Vehicles (%)	4%	19%	0%	0%	14%	8%	5%	3%	0%	3%	4%	8%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	60.4	60.4		28.2	28.2			67.6			67.6	
Effective Green, g (s)	60.4	60.4		28.2	28.2			67.6			67.6	
Actuated g/C Ratio	0.43	0.43		0.20	0.20			0.48			0.48	
Clearance Time (s)	4.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	451	651		192	289			1529			1132	
v/s Ratio Prot	c0.11	0.09			c0.17							
v/s Ratio Perm	0.13			0.03				0.23			c0.31	
v/c Ratio	0.57	0.20		0.13	0.84			0.47			0.63	
Uniform Delay, d1	28.0	24.7		45.8	53.7			24.2			27.0	
Progression Factor	1.00	1.00		1.00	1.00			1.95			0.50	
Incremental Delay, d2	1.6	0.1		0.3	18.4			0.9			2.6	
Delay (s)	29.7	24.9		46.2	72.1			48.1			16.0	
Level of Service	C	C		D	E			D			B	
Approach Delay (s)		28.0			69.8			48.1			16.0	
Approach LOS		C			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	36.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: George St S/George St N & Queen St W

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	↔
Traffic Volume (vph)	70	710	25	20	755	55	120	90	40	90	80	105
Future Volume (vph)	70	710	25	20	755	55	120	90	40	90	80	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0			6.0			4.0	6.0		6.0	6.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frbp, ped/bikes		0.99			0.98			1.00	0.96		1.00	0.96
Flpb, ped/bikes		0.99			1.00			0.99	1.00		0.89	1.00
Frt		1.00			0.99			1.00	0.95		1.00	0.91
Flt Protected		1.00			1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)		3518			3522			1748	1743		1563	1573
Flt Permitted		0.76			0.92			0.36	1.00		0.67	1.00
Satd. Flow (perm)		2693			3242			662	1743		1108	1573
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	710	25	20	755	55	120	90	40	90	80	105
RTOR Reduction (vph)	0	2	0	0	4	0	0	11	0	0	34	0
Lane Group Flow (vph)	0	803	0	0	826	0	120	119	0	90	151	0
Confl. Peds. (#/hr)	92		57	57		92	30		64	64		30
Heavy Vehicles (%)	9%	1%	0%	0%	0%	7%	1%	1%	0%	2%	5%	9%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		87.7			87.7		40.3	40.3		22.2	22.2	
Effective Green, g (s)		87.7			87.7		40.3	40.3		22.2	22.2	
Actuated g/C Ratio		0.63			0.63		0.29	0.29		0.16	0.16	
Clearance Time (s)		6.0			6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1686			2030		299	501		175	249	
v/s Ratio Prot							c0.04	0.07			c0.10	
v/s Ratio Perm		c0.30			0.25		0.07			0.08		
v/c Ratio		0.48			0.41		0.40	0.24		0.51	0.60	
Uniform Delay, d1		13.9			13.1		38.6	38.1		54.0	54.8	
Progression Factor		0.78			0.28		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0			0.5		0.9	0.2		2.5	4.1	
Delay (s)		11.8			4.2		39.5	38.4		56.5	58.9	
Level of Service		B			A		D	D		E	E	
Approach Delay (s)		11.8			4.2		38.9			58.1		
Approach LOS		B			A		D			E		

Intersection Summary			
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	101.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 29: Main St S & Wellington St E

Future Total PM
 Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	↔
Traffic Volume (vph)	20	80	115	115	105	25	145	710	165	10	485	20
Future Volume (vph)	20	80	115	115	105	25	145	710	165	10	485	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frbp, ped/bikes	1.00	0.97		1.00	0.99			0.95			0.99	
Flpb, ped/bikes	0.98	1.00		0.97	1.00			0.99			1.00	
Frt	1.00	0.91		1.00	0.97			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1612	1656		1701	1843			3288			3468	
Flt Permitted	0.59	1.00		0.43	1.00			0.76			0.93	
Satd. Flow (perm)	1007	1656		770	1843			2515			3227	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	20	80	115	115	105	25	145	710	165	10	485	20
RTOR Reduction (vph)	0	40	0	0	7	0	0	9	0	0	1	0
Lane Group Flow (vph)	20	155	0	115	123	0	0	1011	0	0	514	0
Confl. Peds. (#/hr)	15		22	22		15	30		69	69		30
Heavy Vehicles (%)	8%	1%	3%	2%	0%	2%	3%	2%	0%	0%	4%	3%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Effective Green, g (s)	24.8	24.8		24.8	24.8			103.2			103.2	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.74			0.74	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	178	293		136	326			1853			2378	
v/s Ratio Prot		0.09			0.07							
v/s Ratio Perm	0.02			c0.15				c0.40			0.16	
v/c Ratio	0.11	0.53		0.85	0.38			0.55			0.22	
Uniform Delay, d1	48.4	52.3		55.7	50.8			8.1			5.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			3.03	
Incremental Delay, d2	0.3	1.7		35.6	0.7			0.3			0.2	
Delay (s)	48.6	54.0		91.4	51.5			8.4			17.6	
Level of Service	D	D		F	D			A			B	
Approach Delay (s)		53.5			70.2			8.4			17.6	
Approach LOS		D			E			A			B	

Intersection Summary			
HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

**APPENDIX H:
Synchro Analysis Sheets – Unsignalized Intersections**

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Existing AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	70	60	5	0	10	20	5	95	65	30	165	105
Future Volume (Veh/h)	70	60	5	0	10	20	5	95	65	30	165	105
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	70	60	5	0	10	20	5	95	65	30	165	105
Pedestrians	5			142			137			7		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			12			11			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												20
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	452	594	360	729	614	276	275	302				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	376	529	277	673	550	276	186	302				
tC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2	2.2				
p0 queue free %	85	83	99	100	97	97	100	97				
cM capacity (veh/h)	452	357	631	208	325	662	1300	1120				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	135	30	165	300								
Volume Left	70	0	5	30								
Volume Right	5	20	65	105								
cSH	408	492	1300	1120								
Volume to Capacity	0.33	0.06	0.00	0.03								
Queue Length 95th (m)	10.0	1.4	0.1	0.6								
Control Delay (s)	18.1	12.8	0.3	1.1								
Lane LOS	C	B	A	A								
Approach Delay (s)	18.1	12.8	0.3	1.1								
Approach LOS	C	B										
Intersection Summary												
Average Delay				5.1								
Intersection Capacity Utilization				50.6%			ICU Level of Service			A		
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Existing AM
Baseline

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	95	30	100	85	120	205
Future Volume (vph)	95	30	100	85	120	205
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	30	100	85	120	205
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	125	185	325			
Volume Left (vph)	95	0	120			
Volume Right (vph)	30	85	0			
Hadj (s)	0.03	-0.19	0.11			
Departure Headway (s)	5.1	4.4	4.6			
Degree Utilization, x	0.18	0.23	0.41			
Capacity (veh/h)	646	778	762			
Control Delay (s)	9.2	8.7	10.7			
Approach Delay (s)	9.2	8.7	10.7			
Approach LOS	A	A	B			
Intersection Summary						
Delay			9.8			
Level of Service	A					
Intersection Capacity Utilization			46.7%		ICU Level of Service	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Existing AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Future Volume (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	85	135	170								
Volume Left (vph)	45	20	0	25								
Volume Right (vph)	5	10	25	60								
Hadj (s)	0.05	0.07	-0.06	-0.14								
Departure Headway (s)	4.8	4.9	4.7	4.6								
Degree Utilization, x	0.24	0.12	0.18	0.22								
Capacity (veh/h)	700	669	712	730								
Control Delay (s)	9.3	8.6	8.7	8.9								
Approach Delay (s)	9.3	8.6	8.7	8.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.9								
Level of Service				A								
Intersection Capacity Utilization				42.6%	ICU Level of Service							A
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Existing AM
Baseline

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↔			↔	↔		
Traffic Volume (veh/h)	140	0	10	75	0	10	
Future Volume (Veh/h)	140	0	10	75	0	10	
Sign Control	Free			Free	Stop		
Grade	0%			0%	0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	140	0	10	75	0	10	
Pedestrians						30	
Lane Width (m)						3.6	
Walking Speed (m/s)						1.2	
Percent Blockage						3	
Right turn flare (veh)							
Median type	None					None	
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume			170	265	170		
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			170	265	170		
tC, single (s)			4.1	6.4	6.2		
tC, 2 stage (s)							
tF (s)			2.2	3.5	3.3		
p0 queue free %			99	100	99		
cM capacity (veh/h)			1384	705	857		
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	140	85	10				
Volume Left	0	10	0				
Volume Right	0	0	10				
cSH	1700	1384	857				
Volume to Capacity	0.08	0.01	0.01				
Queue Length 95th (m)	0.0	0.2	0.2				
Control Delay (s)	0.0	0.9	9.2				
Lane LOS			A			A	
Approach Delay (s)	0.0	0.9	9.2				
Approach LOS			A				
Intersection Summary							
Average Delay			0.7				
Intersection Capacity Utilization			22.4%	ICU Level of Service			A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Existing AM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	5	5	0	5	5	5
Future Volume (Veh/h)	5	5	0	5	5	5
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	5	0	5	5	5
Pedestrians	12					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	17					30 14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	17					30 14
tC, single (s)	4.1					6.4 6.2
tC, 2 stage (s)						
tF (s)	2.2					3.5 3.3
p0 queue free %	100					99 100
cM capacity (veh/h)	1597					977 1060
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	10	5	10			
Volume Left	5	0	5			
Volume Right	0	5	5			
cSH	1597	1700	1017			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (m)	0.1	0.0	0.2			
Control Delay (s)	3.6	0.0	8.6			
Lane LOS	A		A			
Approach Delay (s)	3.6	0.0	8.6			
Approach LOS			A			
Intersection Summary						
Average Delay	4.9					
Intersection Capacity Utilization	16.6%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Existing AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	5	150	0	30	85	0	0	0	35	5	5	0
Future Volume (Veh/h)	5	150	0	30	85	0	0	0	35	5	5	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	0	30	85	0	0	0	35	5	5	0
Pedestrians				2			3			11		
Lane Width (m)				3.6			3.6			3.6		
Walking Speed (m/s)				1.2			1.2			1.2		
Percent Blockage				0			0			1		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	96			153			310	319	155	353	319	96
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	96			153			310	319	155	353	319	96
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			100	100	96	99	99	100
cM capacity (veh/h)	1496			1436			623	580	892	527	580	957
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	155	115	35	10								
Volume Left	5	30	0	5								
Volume Right	0	0	35	0								
cSH	1496	1436	892	552								
Volume to Capacity	0.00	0.02	0.04	0.02								
Queue Length 95th (m)	0.1	0.4	0.9	0.4								
Control Delay (s)	0.3	2.1	9.2	11.6								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.3	2.1	9.2	11.6								
Approach LOS			A	B								
Intersection Summary												
Average Delay	2.3											
Intersection Capacity Utilization	30.7%		ICU Level of Service	A								
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Existing AM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (veh/h)	115	5	30	90	5	20
Future Volume (Veh/h)	115	5	30	90	5	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	5	30	90	5	20
Pedestrians					28	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			148		296	146
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			148		296	146
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		99	98
cM capacity (veh/h)			1412		669	886
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	120	120	25			
Volume Left	0	30	5			
Volume Right	5	0	20			
cSH	1700	1412	832			
Volume to Capacity	0.07	0.02	0.03			
Queue Length 95th (m)	0.0	0.5	0.7			
Control Delay (s)	0.0	2.0	9.5			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.0	9.5			
Approach LOS			A			
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization		23.1%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Existing AM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (veh/h)	115	35	15	80	5	5
Future Volume (Veh/h)	115	35	15	80	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	35	15	80	5	5
Pedestrians					32	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			182		274	164
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			182		274	164
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1368		693	862
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	150	95	10			
Volume Left	0	15	5			
Volume Right	35	0	5			
cSH	1700	1368	768			
Volume to Capacity	0.09	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.3			
Control Delay (s)	0.0	1.3	9.7			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.3	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization		27.0%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Existing PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				↔
Traffic Volume (veh/h)	95	20	5	5	10	40	0	220	30	15	190	160
Future Volume (Veh/h)	95	20	5	5	10	40	0	220	30	15	190	160
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	20	5	5	10	40	0	220	30	15	190	160
Pedestrians	7				58				73			
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	1			5			6			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												20
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93	0.93						
vC, conflicting volume	589	615	350	681	680	295	357	308				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	525	553	269	623	622	295	276	308				
tC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1	4.2				
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2	2.3				
p0 queue free %	75	95	99	98	97	94	100	99				
cM capacity (veh/h)	378	371	676	303	326	700	1206	1166				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	120	55	250	365								
Volume Left	95	5	0	15								
Volume Right	5	40	30	160								
cSH	384	527	1206	1166								
Volume to Capacity	0.31	0.10	0.00	0.01								
Queue Length 95th (m)	9.2	2.4	0.0	0.3								
Control Delay (s)	18.6	12.6	0.0	0.5								
Lane LOS	C	B		A								
Approach Delay (s)	18.6	12.6	0.0	0.5								
Approach LOS	C	B										
Intersection Summary												
Average Delay	3.9											
Intersection Capacity Utilization	53.2%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Existing PM
Baseline

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	200	130	265	90	55	165
Future Volume (vph)	200	130	265	90	55	165
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	200	130	265	90	55	165
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	355	220			
Volume Left (vph)	200	0	55			
Volume Right (vph)	130	90	0			
Hadj (s)	-0.10	-0.15	0.06			
Departure Headway (s)	5.3	5.0	5.4			
Degree Utilization, x	0.48	0.50	0.33			
Capacity (veh/h)	640	675	623			
Control Delay (s)	13.1	12.9	11.1			
Approach Delay (s)	13.1	12.9	11.1			
Approach LOS	B	B	B			
Intersection Summary						
Delay	12.5					
Level of Service	B					
Intersection Capacity Utilization	60.6%		ICU Level of Service		B	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Existing PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Future Volume (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	220	220	200								
Volume Left (vph)	60	15	35	20								
Volume Right (vph)	15	30	25	70								
Hadj (s)	0.05	-0.04	-0.04	-0.18								
Departure Headway (s)	5.4	5.3	5.3	5.2								
Degree Utilization, x	0.27	0.32	0.32	0.29								
Capacity (veh/h)	602	625	620	634								
Control Delay (s)	10.5	10.8	10.8	10.3								
Approach Delay (s)	10.5	10.8	10.8	10.3								
Approach LOS	B	B	B	B								

Intersection Summary

Delay		10.6		
Level of Service		B		
Intersection Capacity Utilization	51.5%		ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Existing PM
Baseline

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕	↕	
Traffic Volume (veh/h)	105	0	15	245	5	5
Future Volume (Veh/h)	105	0	15	245	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	105	0	15	245	5	5
Pedestrians					15	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			120		395	120
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			120		395	120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1462		600	925

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	105	260	10
Volume Left	0	15	5
Volume Right	0	0	5
cSH	1700	1462	728
Volume to Capacity	0.06	0.01	0.01
Queue Length 95th (m)	0.0	0.2	0.3
Control Delay (s)	0.0	0.5	10.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	10.0
Approach LOS			B

Intersection Summary

Average Delay		0.6		
Intersection Capacity Utilization	30.4%		ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Existing PM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↔	↔		↔	↔	
Traffic Volume (veh/h)	5	0	5	5	10	5	
Future Volume (Veh/h)	5	0	5	5	10	5	
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	5	0	5	5	10	5	
Pedestrians	8						
Lane Width (m)	3.6						
Walking Speed (m/s)	1.2						
Percent Blockage	1						
Right turn flare (veh)							
Median type	None		None				
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	18					26	16
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	18					26	16
tC, single (s)	4.1					6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2					3.5	3.3
p0 queue free %	100					99	100
cM capacity (veh/h)	1601					985	1063
Direction, Lane #	EB 1	WB 1	SB 1				
Volume Total	5	10	15				
Volume Left	5	0	10				
Volume Right	0	5	5				
cSH	1601	1700	1010				
Volume to Capacity	0.00	0.01	0.01				
Queue Length 95th (m)	0.1	0.0	0.3				
Control Delay (s)	7.3	0.0	8.6				
Lane LOS	A	A					
Approach Delay (s)	7.3	0.0	8.6				
Approach LOS	A						
Intersection Summary							
Average Delay	5.5						
Intersection Capacity Utilization	15.7%		ICU Level of Service	A			
Analysis Period (min)	15						

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Existing PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	0	150	0	25	250	5	30	5	25	5	5	0
Future Volume (Veh/h)	0	150	0	25	250	5	30	5	25	5	5	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	150	0	25	250	5	30	5	25	5	5	0
Pedestrians	2			3			4			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	259	153			458			462	155	486	460	256
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259	153			458			462	155	486	460	256
tC, single (s)	4.1	4.1			7.1			6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2	2.2			3.5			4.0	3.3	3.7	4.0	3.3
p0 queue free %	100	98			94			99	97	99	99	100
cM capacity (veh/h)	1313	1436			502			488	892	430	490	784
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	280	60	10								
Volume Left	0	25	30	5								
Volume Right	0	5	25	0								
cSH	1313	1436	612	458								
Volume to Capacity	0.00	0.02	0.10	0.02								
Queue Length 95th (m)	0.0	0.4	2.3	0.5								
Control Delay (s)	0.0	0.8	11.5	13.0								
Lane LOS	A		B									
Approach Delay (s)	0.0	0.8	11.5	13.0								
Approach LOS	B		B									
Intersection Summary												
Average Delay	2.1											
Intersection Capacity Utilization	38.2%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Existing PM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	110	0	0	170	20	10
Future Volume (Veh/h)	110	0	0	170	20	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	110	0	0	170	20	10
Pedestrians					24	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			134		304	134
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			134		304	134
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		97	99
cM capacity (veh/h)			1434		678	902
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	110	170	30			
Volume Left	0	0	20			
Volume Right	0	0	10			
cSH	1700	1434	739			
Volume to Capacity	0.06	0.00	0.04			
Queue Length 95th (m)	0.0	0.0	0.9			
Control Delay (s)	0.0	0.0	10.1			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization		19.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Existing PM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	105	5	0	190	70	5
Future Volume (Veh/h)	105	5	0	190	70	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	105	5	0	190	70	5
Pedestrians					25	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			135		322	132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			135		322	132
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	99
cM capacity (veh/h)			1431		661	903
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	110	190	75			
Volume Left	0	0	70			
Volume Right	5	0	5			
cSH	1700	1431	673			
Volume to Capacity	0.06	0.00	0.11			
Queue Length 95th (m)	0.0	0.0	2.6			
Control Delay (s)	0.0	0.0	11.0			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization		21.0%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	70	60	5	0	10	20	5	95	65	30	165	105
Future Volume (Veh/h)	70	60	5	0	10	20	5	95	65	30	165	105
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	70	60	5	0	10	20	5	95	65	30	165	105
Pedestrians	5			142			137			7		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			12			11			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	452	594	360	729	614	276	275	302				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	376	529	277	673	550	276	186	302				
tC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2	2.2				
p0 queue free %	85	83	99	100	97	97	100	97				
cM capacity (veh/h)	452	357	631	208	325	662	1300	1120				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	135	30	165	300								
Volume Left	70	0	5	30								
Volume Right	5	20	65	105								
cSH	408	492	1300	1120								
Volume to Capacity	0.33	0.06	0.00	0.03								
Queue Length 95th (m)	11.4	1.6	0.1	0.7								
Control Delay (s)	18.1	12.8	0.3	1.1								
Lane LOS	C	B	A	A								
Approach Delay (s)	18.1	12.8	0.3	1.1								
Approach LOS	C	B										
Intersection Summary												
Average Delay	5.1											
Intersection Capacity Utilization	50.6%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Background AM
Phase 1 Construction

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	95	30	100	85	120	205
Future Volume (vph)	95	30	100	85	120	205
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	30	100	85	120	205
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	125	185	325			
Volume Left (vph)	95	0	120			
Volume Right (vph)	30	85	0			
Hadj (s)	0.03	-0.19	0.11			
Departure Headway (s)	5.1	4.4	4.6			
Degree Utilization, x	0.18	0.23	0.41			
Capacity (veh/h)	646	778	762			
Control Delay (s)	9.2	8.7	10.7			
Approach Delay (s)	9.2	8.7	10.7			
Approach LOS	A	A	B			
Intersection Summary						
Delay	9.8					
Level of Service	A					
Intersection Capacity Utilization	46.7%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Future Volume (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	85	135	170								
Volume Left (vph)	45	20	0	25								
Volume Right (vph)	5	10	25	60								
Hadj (s)	0.05	0.07	-0.06	-0.14								
Departure Headway (s)	4.8	4.9	4.7	4.6								
Degree Utilization, x	0.24	0.12	0.18	0.22								
Capacity (veh/h)	700	669	712	730								
Control Delay (s)	9.3	8.6	8.7	8.9								
Approach Delay (s)	9.3	8.6	8.7	8.9								
Approach LOS	A	A	A	A								

Intersection Summary				
Delay		8.9		
Level of Service		A		
Intersection Capacity Utilization	42.6%		ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Background AM
Phase 1 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕	↕	
Traffic Volume (veh/h)	140	0	5	75	0	0
Future Volume (Veh/h)	140	0	5	75	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	140	0	5	75	0	0
Pedestrians					30	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			170		255	170
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		255	170
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1384		717	857

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	140	80	0
Volume Left	0	5	0
Volume Right	0	0	0
cSH	1700	1384	1700
Volume to Capacity	0.08	0.00	0.00
Queue Length 95th (m)	0.0	0.1	0.0
Control Delay (s)	0.0	0.5	0.0
Lane LOS		A	A
Approach Delay (s)	0.0	0.5	0.0
Approach LOS		A	

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization	14.5%		ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Traffic Volume (veh/h)	0	10	0	0	0	5
Future Volume (Veh/h)	0	10	0	0	0	5
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	10	0	0	0	5
Pedestrians	12					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	12					22
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	12					22
tC, single (s)	4.1					6.4
tC, 2 stage (s)						
tF (s)	2.2					3.5
p0 queue free %	100					100
cM capacity (veh/h)	1604					990
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	10	0	5			
Volume Left	0	0	0			
Volume Right	0	0	5			
cSH	1604	1700	1064			
Volume to Capacity	0.00	0.00	0.00			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	8.4			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	8.4			
Approach LOS	A					
Intersection Summary						
Average Delay	2.8					
Intersection Capacity Utilization	16.6%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Background AM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	5	150	0	30	85	0	0	0	35	5	5	0
Future Volume (Veh/h)	5	150	0	30	85	0	0	0	35	5	5	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	0	30	85	0	0	0	35	5	5	0
Pedestrians	2			3			11			11		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			1			1		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	96	153			310			319	155	353	319	96
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	96	153			310			319	155	353	319	96
tC, single (s)	4.1	4.1			7.1			6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2	2.2			3.5			4.0	3.3	3.7	4.0	3.3
p0 queue free %	100	98			100			100	96	99	99	100
cM capacity (veh/h)	1496	1436			623			580	892	527	580	957
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	155	115	35	10								
Volume Left	5	30	0	5								
Volume Right	0	0	35	0								
cSH	1496	1436	892	552								
Volume to Capacity	0.00	0.02	0.04	0.02								
Queue Length 95th (m)	0.1	0.5	1.0	0.4								
Control Delay (s)	0.3	2.1	9.2	11.6								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.3	2.1	9.2	11.6								
Approach LOS	A		B									
Intersection Summary												
Average Delay	2.3											
Intersection Capacity Utilization	30.7%		ICU Level of Service		A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Background AM
Phase 1 Construction

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (veh/h)	135	0	0	120	0	0
Future Volume (Veh/h)	135	0	0	120	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	135	0	0	120	0	0
Pedestrians					28	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			163		283	163
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			163		283	163
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1395		695	866
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	135	120	0			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	1395	1700			
Volume to Capacity	0.08	0.00	0.00			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS			A			
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			14.2%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Background AM
Phase 1 Construction

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (veh/h)	110	30	45	75	5	25
Future Volume (Veh/h)	110	30	45	75	5	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	110	30	45	75	5	25
Pedestrians					32	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			172		322	157
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			172		322	157
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		99	97
cM capacity (veh/h)			1379		636	870
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	140	120	30			
Volume Left	0	45	5			
Volume Right	30	0	25			
cSH	1700	1379	820			
Volume to Capacity	0.08	0.03	0.04			
Queue Length 95th (m)	0.0	0.8	0.9			
Control Delay (s)	0.0	3.1	9.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	3.1	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization			31.3%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	95	20	5	5	10	40	0	220	30	15	190	160
Future Volume (Veh/h)	95	20	5	5	10	40	0	220	30	15	190	160
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	20	5	5	10	40	0	220	30	15	190	160
Pedestrians	7			58			73			2		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	1			5			6			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91		0.91					
vC, conflicting volume	589	615	350	681	680	295	357	308				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	503	531	241	604	603	295	249	308				
tC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1	4.2				
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2	2.3				
p0 queue free %	75	95	99	98	97	94	100	99				
cM capacity (veh/h)	383	373	685	305	328	700	1207	1166				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	120	55	250	365								
Volume Left	95	5	0	15								
Volume Right	5	40	30	160								
cSH	388	529	1207	1166								
Volume to Capacity	0.31	0.10	0.00	0.01								
Queue Length 95th (m)	10.3	2.8	0.0	0.3								
Control Delay (s)	18.4	12.6	0.0	0.5								
Lane LOS	C	B		A								
Approach Delay (s)	18.4	12.6	0.0	0.5								
Approach LOS	C	B										
Intersection Summary												
Average Delay	3.9											
Intersection Capacity Utilization	53.2%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Background PM
Phase 1 Construction

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	200	130	265	90	55	165
Future Volume (vph)	200	130	265	90	55	165
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	200	130	265	90	55	165
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	355	220			
Volume Left (vph)	200	0	55			
Volume Right (vph)	130	90	0			
Hadj (s)	-0.10	-0.15	0.06			
Departure Headway (s)	5.3	5.0	5.4			
Degree Utilization, x	0.48	0.50	0.33			
Capacity (veh/h)	640	675	623			
Control Delay (s)	13.1	12.9	11.1			
Approach Delay (s)	13.1	12.9	11.1			
Approach LOS	B	B	B			
Intersection Summary						
Delay	12.5					
Level of Service	B					
Intersection Capacity Utilization	60.6%		ICU Level of Service	B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Future Volume (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	220	220	200								
Volume Left (vph)	60	15	35	20								
Volume Right (vph)	15	30	25	70								
Hadj (s)	0.05	-0.04	-0.04	-0.18								
Departure Headway (s)	5.4	5.3	5.3	5.2								
Degree Utilization, x	0.27	0.32	0.32	0.29								
Capacity (veh/h)	602	625	620	634								
Control Delay (s)	10.5	10.8	10.8	10.3								
Approach Delay (s)	10.5	10.8	10.8	10.3								
Approach LOS	B	B	B	B								

Intersection Summary				
Delay		10.6		
Level of Service		B		
Intersection Capacity Utilization	51.5%		ICU Level of Service	A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Background PM
Phase 1 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕	↕	
Traffic Volume (veh/h)	105	0	15	245	5	0
Future Volume (Veh/h)	105	0	15	245	5	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	105	0	15	245	5	0
Pedestrians					15	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			120		395	120
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			120		395	120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	100
cM capacity (veh/h)			1462		600	925
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	105	260	5			
Volume Left	0	15	5			
Volume Right	0	0	0			
cSH	1700	1462	600			
Volume to Capacity	0.06	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.2			
Control Delay (s)	0.0	0.5	11.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.5	11.1			
Approach LOS		B				

Intersection Summary				
Average Delay		0.5		
Intersection Capacity Utilization	30.4%		ICU Level of Service	A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Traffic Volume (veh/h)	0	5	0	0	0	5
Future Volume (Veh/h)	0	5	0	0	0	5
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	5	0	0	0	5
Pedestrians	8					
Lane Width (m)	3.6					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	8					8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	8					8
tC, single (s)	4.1					6.2
tC, 2 stage (s)						
tF (s)	2.2					3.3
p0 queue free %	100					100
cM capacity (veh/h)	1615					1073
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	5	0	5			
Volume Left	0	0	0			
Volume Right	0	0	5			
cSH	1615	1700	1073			
Volume to Capacity	0.00	0.00	0.00			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	8.4			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	8.4			
Approach LOS	A					
Intersection Summary						
Average Delay	4.2					
Intersection Capacity Utilization	15.7%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Background PM
Phase 1 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	0	150	0	25	250	5	30	5	25	5	5	0
Future Volume (Veh/h)	0	150	0	25	250	5	30	5	25	5	5	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	150	0	25	250	5	30	5	25	5	5	0
Pedestrians	2			3			4			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	259	153			458			462	155	486	460	256
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259	153			458			462	155	486	460	256
tC, single (s)	4.1	4.1			7.1			6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2	2.2			3.5			4.0	3.3	3.7	4.0	3.3
p0 queue free %	100	98			94			99	97	99	99	100
cM capacity (veh/h)	1313	1436			502			488	892	430	490	784
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	280	60	10								
Volume Left	0	25	30	5								
Volume Right	0	5	25	0								
cSH	1313	1436	612	458								
Volume to Capacity	0.00	0.02	0.10	0.02								
Queue Length 95th (m)	0.0	0.4	2.6	0.5								
Control Delay (s)	0.0	0.8	11.5	13.0								
Lane LOS	A		B									
Approach Delay (s)	0.0	0.8	11.5	13.0								
Approach LOS	B		B									
Intersection Summary												
Average Delay	2.1											
Intersection Capacity Utilization	38.2%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Background PM
Phase 1 Construction

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	120	0	0	170	0	0
Future Volume (Veh/h)	120	0	0	170	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	120	0	0	170	0	0
Pedestrians					24	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			144		314	144
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			144		314	144
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1422		669	891
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	120	170	0			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	1422	1700			
Volume to Capacity	0.07	0.00	0.00			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS			A			
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			13.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Background PM
Phase 1 Construction

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	105	5	0	170	80	15
Future Volume (Veh/h)	105	5	0	170	80	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	105	5	0	170	80	15
Pedestrians					25	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			135		302	132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			135		302	132
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		88	98
cM capacity (veh/h)			1431		679	903
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	110	170	95			
Volume Left	0	0	80			
Volume Right	5	0	15			
cSH	1700	1431	707			
Volume to Capacity	0.06	0.00	0.13			
Queue Length 95th (m)	0.0	0.0	3.7			
Control Delay (s)	0.0	0.0	10.9			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.9			
Approach LOS			B			
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization			22.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	70	60	5	0	10	20	5	95	65	30	165	105
Future Volume (Veh/h)	70	60	5	0	10	20	5	95	65	30	165	105
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	70	60	5	0	10	20	5	95	65	30	165	105
Pedestrians	5			142			137			7		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			12			11			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	452	594	360	729	614	276	275	302				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	376	529	277	673	550	276	186	302				
tC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2	2.2				
p0 queue free %	85	83	99	100	97	97	100	97				
cM capacity (veh/h)	452	357	631	208	325	662	1300	1120				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	135	30	165	300								
Volume Left	70	0	5	30								
Volume Right	5	20	65	105								
cSH	408	492	1300	1120								
Volume to Capacity	0.33	0.06	0.00	0.03								
Queue Length 95th (m)	11.4	1.6	0.1	0.7								
Control Delay (s)	18.1	12.8	0.3	1.1								
Lane LOS	C	B	A	A								
Approach Delay (s)	18.1	12.8	0.3	1.1								
Approach LOS	C	B										
Intersection Summary												
Average Delay				5.1								
Intersection Capacity Utilization				50.6%			ICU Level of Service			A		
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Background AM
Baseline

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	95	30	100	85	120	205
Future Volume (vph)	95	30	100	85	120	205
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	30	100	85	120	205
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	125	185	325			
Volume Left (vph)	95	0	120			
Volume Right (vph)	30	85	0			
Hadj (s)	0.03	-0.19	0.11			
Departure Headway (s)	5.1	4.4	4.6			
Degree Utilization, x	0.18	0.23	0.41			
Capacity (veh/h)	646	778	762			
Control Delay (s)	9.2	8.7	10.7			
Approach Delay (s)	9.2	8.7	10.7			
Approach LOS	A	A	B			
Intersection Summary						
Delay			9.8			
Level of Service	A					
Intersection Capacity Utilization			46.7%		ICU Level of Service	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Future Volume (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	130	5	20	55	10	0	110	25	25	85	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	85	135	170								
Volume Left (vph)	45	20	0	25								
Volume Right (vph)	5	10	25	60								
Hadj (s)	0.05	0.07	-0.06	-0.14								
Departure Headway (s)	4.8	4.9	4.7	4.6								
Degree Utilization, x	0.24	0.12	0.18	0.22								
Capacity (veh/h)	700	669	712	730								
Control Delay (s)	9.3	8.6	8.7	8.9								
Approach Delay (s)	9.3	8.6	8.7	8.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.9								
Level of Service				A								
Intersection Capacity Utilization				42.6%	ICU Level of Service							A
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Background AM
Baseline

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↔			↕	↕		
Traffic Volume (veh/h)	140	0	10	75	0	10	
Future Volume (Veh/h)	140	0	10	75	0	10	
Sign Control	Free			Free	Stop		
Grade	0%			0%	0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	140	0	10	75	0	10	
Pedestrians						30	
Lane Width (m)						3.6	
Walking Speed (m/s)						1.2	
Percent Blockage						3	
Right turn flare (veh)							
Median type	None					None	
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume			170			170	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			170			170	
tC, single (s)			4.1			6.2	
tC, 2 stage (s)							
tF (s)			2.2			3.3	
p0 queue free %			99			99	
cM capacity (veh/h)			1384			857	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	140	85	10				
Volume Left	0	10	0				
Volume Right	0	0	10				
cSH	1700	1384	857				
Volume to Capacity	0.08	0.01	0.01				
Queue Length 95th (m)	0.0	0.2	0.3				
Control Delay (s)	0.0	0.9	9.2				
Lane LOS			A				
Approach Delay (s)	0.0	0.9	9.2				
Approach LOS			A				
Intersection Summary							
Average Delay			0.7				
Intersection Capacity Utilization			22.4%	ICU Level of Service			A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Background AM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↔	↔		↔	↔	
Traffic Volume (veh/h)	5	5	0	5	5	5	
Future Volume (Veh/h)	5	5	0	5	5	5	
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	5	5	0	5	5	5	
Pedestrians	12						
Lane Width (m)	3.6						
Walking Speed (m/s)	1.2						
Percent Blockage	1						
Right turn flare (veh)							
Median type	None		None				
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	17					30	14
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	17					30	14
tC, single (s)	4.1					6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2					3.5	3.3
p0 queue free %	100					99	100
cM capacity (veh/h)	1597					977	1060
Direction, Lane #	EB 1	WB 1	SB 1				
Volume Total	10	5	10				
Volume Left	5	0	5				
Volume Right	0	5	5				
cSH	1597	1700	1017				
Volume to Capacity	0.00	0.00	0.01				
Queue Length 95th (m)	0.1	0.0	0.2				
Control Delay (s)	3.6	0.0	8.6				
Lane LOS	A		A				
Approach Delay (s)	3.6	0.0	8.6				
Approach LOS			A				
Intersection Summary							
Average Delay	4.9						
Intersection Capacity Utilization	16.6%		ICU Level of Service	A			
Analysis Period (min)	15						

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Background AM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	5	150	0	30	85	0	0	0	35	5	5	0
Future Volume (Veh/h)	5	150	0	30	85	0	0	0	35	5	5	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	0	30	85	0	0	0	35	5	5	0
Pedestrians	2						3			11		
Lane Width (m)	3.6						3.6			3.6		
Walking Speed (m/s)	1.2						1.2			1.2		
Percent Blockage	0						0			1		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	96	153			310			319	155	353	319	96
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	96	153			310			319	155	353	319	96
tC, single (s)	4.1	4.1			7.1			6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2	2.2			3.5			4.0	3.3	3.7	4.0	3.3
p0 queue free %	100	98			100			100	96	99	99	100
cM capacity (veh/h)	1496	1436			623			580	892	527	580	957
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	155	115	35	10								
Volume Left	5	30	0	5								
Volume Right	0	0	35	0								
cSH	1496	1436	892	552								
Volume to Capacity	0.00	0.02	0.04	0.02								
Queue Length 95th (m)	0.1	0.5	1.0	0.4								
Control Delay (s)	0.3	2.1	9.2	11.6								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.3	2.1	9.2	11.6								
Approach LOS			A	B								
Intersection Summary												
Average Delay	2.3											
Intersection Capacity Utilization	30.7%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Background AM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	115	5	30	90	5	20
Future Volume (Veh/h)	115	5	30	90	5	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	5	30	90	5	20
Pedestrians					28	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			148	296	146	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			148	296	146	
IC, single (s)			4.1	6.4	6.2	
IC, 2 stage (s)						
IF (s)			2.2	3.5	3.3	
p0 queue free %			98	99	98	
cM capacity (veh/h)			1412	669	886	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	120	120	25			
Volume Left	0	30	5			
Volume Right	5	0	20			
cSH	1700	1412	832			
Volume to Capacity	0.07	0.02	0.03			
Queue Length 95th (m)	0.0	0.5	0.7			
Control Delay (s)	0.0	2.0	9.5			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.0	9.5			
Approach LOS			A			
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			23.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Background AM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	115	35	15	80	5	5
Future Volume (Veh/h)	115	35	15	80	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	35	15	80	5	5
Pedestrians					32	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			182	274	164	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			182	274	164	
IC, single (s)			4.1	6.4	6.2	
IC, 2 stage (s)						
IF (s)			2.2	3.5	3.3	
p0 queue free %			99	99	99	
cM capacity (veh/h)			1368	693	862	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	150	95	10			
Volume Left	0	15	5			
Volume Right	35	0	5			
cSH	1700	1368	768			
Volume to Capacity	0.09	0.01	0.01			
Queue Length 95th (m)	0.0	0.3	0.3			
Control Delay (s)	0.0	1.3	9.7			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.3	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			27.0%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	95	20	5	5	10	40	0	220	30	15	190	160
Future Volume (Veh/h)	95	20	5	5	10	40	0	220	30	15	190	160
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	20	5	5	10	40	0	220	30	15	190	160
Pedestrians	7			58			73			2		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	1			5			6			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91		0.91					
vC, conflicting volume	589	615	350	681	680	295	357	308				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	503	531	241	604	603	295	249	308				
tC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1	4.2				
tC, 2 stage (s)												
tF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2	2.3				
p0 queue free %	75	95	99	98	97	94	100	99				
cM capacity (veh/h)	383	373	685	305	328	700	1207	1166				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	120	55	250	365								
Volume Left	95	5	0	15								
Volume Right	5	40	30	160								
cSH	388	529	1207	1166								
Volume to Capacity	0.31	0.10	0.00	0.01								
Queue Length 95th (m)	10.3	2.8	0.0	0.3								
Control Delay (s)	18.4	12.6	0.0	0.5								
Lane LOS	C	B		A								
Approach Delay (s)	18.4	12.6	0.0	0.5								
Approach LOS	C	B										
Intersection Summary												
Average Delay	3.9											
Intersection Capacity Utilization	53.2%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Background PM
Baseline

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	200	130	265	90	55	165
Future Volume (vph)	200	130	265	90	55	165
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	200	130	265	90	55	165
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	355	220			
Volume Left (vph)	200	0	55			
Volume Right (vph)	130	90	0			
Hadj (s)	-0.10	-0.15	0.06			
Departure Headway (s)	5.3	5.0	5.4			
Degree Utilization, x	0.48	0.50	0.33			
Capacity (veh/h)	640	675	623			
Control Delay (s)	13.1	12.9	11.1			
Approach Delay (s)	13.1	12.9	11.1			
Approach LOS	B	B	B			
Intersection Summary						
Delay	12.5					
Level of Service	B					
Intersection Capacity Utilization	60.6%		ICU Level of Service	B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Future Volume (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	60	105	15	15	175	30	35	160	25	20	110	70
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	220	220	200								
Volume Left (vph)	60	15	35	20								
Volume Right (vph)	15	30	25	70								
Hadj (s)	0.05	-0.04	-0.04	-0.18								
Departure Headway (s)	5.4	5.3	5.3	5.2								
Degree Utilization, x	0.27	0.32	0.32	0.29								
Capacity (veh/h)	602	625	620	634								
Control Delay (s)	10.5	10.8	10.8	10.3								
Approach Delay (s)	10.5	10.8	10.8	10.3								
Approach LOS	B	B	B	B								

Intersection Summary

Delay		10.6		
Level of Service		B		
Intersection Capacity Utilization	51.5%		ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Background PM
Baseline

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕	↕	
Traffic Volume (veh/h)	105	0	15	245	5	5
Future Volume (Veh/h)	105	0	15	245	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	105	0	15	245	5	5
Pedestrians					15	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			120		395	120
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			120		395	120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1462		600	925

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	105	260	10
Volume Left	0	15	5
Volume Right	0	0	5
cSH	1700	1462	728
Volume to Capacity	0.06	0.01	0.01
Queue Length 95th (m)	0.0	0.2	0.3
Control Delay (s)	0.0	0.5	10.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	10.0
Approach LOS			B

Intersection Summary

Average Delay		0.6		
Intersection Capacity Utilization	30.4%		ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Background PM
Baseline

Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↔	↔		↔		
Traffic Volume (veh/h)	5	0	5	5	10	5	
Future Volume (Veh/h)	5	0	5	5	10	5	
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	5	0	5	5	10	5	
Pedestrians	8						
Lane Width (m)	3.6						
Walking Speed (m/s)	1.2						
Percent Blockage	1						
Right turn flare (veh)							
Median type	None		None				
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	18					26	16
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	18					26	16
tC, single (s)	4.1					6.4	6.2
tC, 2 stage (s)							
tF (s)	2.2					3.5	3.3
p0 queue free %	100					99	100
cM capacity (veh/h)	1601					985	1063
Direction, Lane #	EB 1	WB 1	SB 1				
Volume Total	5	10	15				
Volume Left	5	0	10				
Volume Right	0	5	5				
cSH	1601	1700	1010				
Volume to Capacity	0.00	0.01	0.01				
Queue Length 95th (m)	0.1	0.0	0.4				
Control Delay (s)	7.3	0.0	8.6				
Lane LOS	A	A					
Approach Delay (s)	7.3	0.0	8.6				
Approach LOS	A						
Intersection Summary							
Average Delay	5.5						
Intersection Capacity Utilization	15.7%		ICU Level of Service	A			
Analysis Period (min)	15						

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Background PM
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔		↔	↔	
Traffic Volume (veh/h)	0	150	0	25	250	5	30	5	25	5	5	0
Future Volume (Veh/h)	0	150	0	25	250	5	30	5	25	5	5	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	150	0	25	250	5	30	5	25	5	5	0
Pedestrians	2			3			4			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	259	153			458			462	155	486	460	256
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259	153			458			462	155	486	460	256
tC, single (s)	4.1	4.1			7.1			6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2	2.2			3.5			4.0	3.3	3.7	4.0	3.3
p0 queue free %	100	98			94			99	97	99	99	100
cM capacity (veh/h)	1313	1436			502			488	892	430	490	784
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	280	60	10								
Volume Left	0	25	30	5								
Volume Right	0	5	25	0								
cSH	1313	1436	612	458								
Volume to Capacity	0.00	0.02	0.10	0.02								
Queue Length 95th (m)	0.0	0.4	2.6	0.5								
Control Delay (s)	0.0	0.8	11.5	13.0								
Lane LOS	A		B									
Approach Delay (s)	0.0	0.8	11.5	13.0								
Approach LOS	B		B									
Intersection Summary												
Average Delay	2.1											
Intersection Capacity Utilization	38.2%			ICU Level of Service	A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Background PM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	110	0	0	170	20	10
Future Volume (Veh/h)	110	0	0	170	20	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	110	0	0	170	20	10
Pedestrians					24	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			134		304	134
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			134		304	134
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		97	99
cM capacity (veh/h)			1434		678	902
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	110	170	30			
Volume Left	0	0	20			
Volume Right	0	0	10			
cSH	1700	1434	739			
Volume to Capacity	0.06	0.00	0.04			
Queue Length 95th (m)	0.0	0.0	1.0			
Control Delay (s)	0.0	0.0	10.1			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			19.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Background PM
Baseline

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖	↗	
Traffic Volume (veh/h)	105	5	0	190	70	5
Future Volume (Veh/h)	105	5	0	190	70	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	105	5	0	190	70	5
Pedestrians					25	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			135		322	132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			135		322	132
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	99
cM capacity (veh/h)			1431		661	903
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	110	190	75			
Volume Left	0	0	70			
Volume Right	5	0	5			
cSH	1700	1431	673			
Volume to Capacity	0.06	0.00	0.11			
Queue Length 95th (m)	0.0	0.0	3.0			
Control Delay (s)	0.0	0.0	11.0			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization			21.0%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	95	80	20	0	15	20	5	95	65	30	165	125
Future Volume (Veh/h)	95	80	20	0	15	20	5	95	65	30	165	125
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	80	20	0	15	20	5	95	65	30	165	125
Pedestrians	5			142			137			7		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			12			11			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	464	604	370	764	634	276	295			302		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	389	540	288	711	572	276	208			302		
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1			4.1		
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	78	77	97	100	95	97	100			97		
cM capacity (veh/h)	437	352	622	181	316	662	1277			1120		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	195	35	165	320								
Volume Left	95	0	5	30								
Volume Right	20	20	65	125								
cSH	409	450	1277	1120								
Volume to Capacity	0.48	0.08	0.00	0.03								
Queue Length 95th (m)	17.5	1.8	0.1	0.6								
Control Delay (s)	21.6	13.7	0.3	1.0								
Lane LOS	C	B	A	A								
Approach Delay (s)	21.6	13.7	0.3	1.0								
Approach LOS	C	B										
Intersection Summary												
Average Delay				7.1								
Intersection Capacity Utilization	55.7%			ICU Level of Service	B							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total AM
Phase 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	95	30	110	100	120	225
Future Volume (vph)	95	30	110	100	120	225
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	30	110	100	120	225
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	125	210	345			
Volume Left (vph)	95	0	120			
Volume Right (vph)	30	100	0			
Hadj (s)	0.03	-0.20	0.11			
Departure Headway (s)	5.2	4.4	4.6			
Degree Utilization, x	0.18	0.26	0.44			
Capacity (veh/h)	629	775	757			
Control Delay (s)	9.3	9.0	11.2			
Approach Delay (s)	9.3	9.0	11.2			
Approach LOS	A	A	B			
Intersection Summary						
Delay			10.2			
Level of Service	B					
Intersection Capacity Utilization	48.7%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Total AM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↔			↔		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	45	130	20	20	55	10	5	120	25	30	95	60
Future Volume (vph)	45	130	20	20	55	10	5	120	25	30	95	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	130	20	20	55	10	5	120	25	30	95	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	195	85	150	185								
Volume Left (vph)	45	20	5	30								
Volume Right (vph)	20	10	25	60								
Hadj (s)	0.00	0.07	-0.04	-0.12								
Departure Headway (s)	4.8	5.1	4.8	4.7								
Degree Utilization, x	0.26	0.12	0.20	0.24								
Capacity (veh/h)	693	648	698	715								
Control Delay (s)	9.5	8.7	9.0	9.2								
Approach Delay (s)	9.5	8.7	9.0	9.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay	9.2											
Level of Service	A											
Intersection Capacity Utilization	44.0%			ICU Level of Service	A							
Analysis Period (min)	15											


HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Total AM
Phase 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	↔
Traffic Volume (veh/h)	150	0	10	85	0	10
Future Volume (Veh/h)	150	0	10	85	0	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	150	0	10	85	0	10
Pedestrians						30
Lane Width (m)						3.6
Walking Speed (m/s)						1.2
Percent Blockage						3
Right turn flare (veh)						
Median type	None					None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			180			180
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			180			180
IC, single (s)			4.1			6.2
IC, 2 stage (s)						
IF (s)			2.2			3.3
p0 queue free %			99			99
cM capacity (veh/h)			1373			846
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	150	95	10			
Volume Left	0	10	0			
Volume Right	0	0	10			
cSH	1700	1373	846			
Volume to Capacity	0.09	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.3			
Control Delay (s)	0.0	0.9	9.3			
Lane LOS			A			A
Approach Delay (s)	0.0	0.9	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			22.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St


Future Total AM
Phase 1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	5	5	0	5	5	5
Future Volume (Veh/h)	5	5	0	5	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	5	0	5	5	5
Pedestrians					12	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	17				30	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	17				30	14
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1597				977	1060
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	10	5	10			
Volume Left	5	0	5			
Volume Right	0	5	5			
cSH	1597	1700	1017			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (m)	0.1	0.0	0.2			
Control Delay (s)	3.6	0.0	8.6			
Lane LOS	A	A	A			
Approach Delay (s)	3.6	0.0	8.6			
Approach LOS			A			
Intersection Summary						
Average Delay			4.9			
Intersection Capacity Utilization		16.6%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total AM
Phase 1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	5	150	0	30	85	5	0	0	35	20	10	0
Future Volume (Veh/h)	5	150	0	30	85	5	0	0	35	20	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	0	30	85	5	0	0	35	20	10	0
Pedestrians					2			3			11	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					0			0			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	101			153				316	324	155	356	322
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	101			153				316	324	155	356	322
IC, single (s)	4.1			4.1				7.1	6.5	6.2	7.3	6.5
IC, 2 stage (s)												
IF (s)	2.2			2.2				3.5	4.0	3.3	3.7	4.0
p0 queue free %	100			98				100	100	96	96	98
cM capacity (veh/h)	1490			1436				614	576	892	525	578
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	155	120	35	30								
Volume Left	5	30	0	20								
Volume Right	0	5	35	0								
cSH	1490	1436	892	541								
Volume to Capacity	0.00	0.02	0.04	0.06								
Queue Length 95th (m)	0.1	0.4	0.9	1.2								
Control Delay (s)	0.3	2.0	9.2	12.0								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.3	2.0	9.2	12.0								
Approach LOS			A	B								
Intersection Summary												
Average Delay				2.8								
Intersection Capacity Utilization		34.7%			ICU Level of Service					A		
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total AM
Phase 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	115	15	65	90	15	80
Future Volume (Veh/h)	115	15	65	90	15	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	15	65	90	15	80
Pedestrians					28	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			158		370	150
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			158		370	150
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			95		97	91
cM capacity (veh/h)			1400		590	880
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	130	155	95			
Volume Left	0	65	15			
Volume Right	15	0	80			
cSH	1700	1400	817			
Volume to Capacity	0.08	0.05	0.12			
Queue Length 95th (m)	0.0	1.0	2.8			
Control Delay (s)	0.0	3.4	10.0			
Lane LOS		A	A			
Approach Delay (s)	0.0	3.4	10.0			
Approach LOS			A			
Intersection Summary						
Average Delay			3.9			
Intersection Capacity Utilization		35.0%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total AM
Phase 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	125	35	15	90	5	5
Future Volume (Veh/h)	125	35	15	90	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	125	35	15	90	5	5
Pedestrians					32	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			192		294	174
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			192		294	174
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1356		674	851
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	160	105	10			
Volume Left	0	15	5			
Volume Right	35	0	5			
cSH	1700	1356	752			
Volume to Capacity	0.09	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.3			
Control Delay (s)	0.0	1.2	9.8			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.2	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		27.5%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
40: Park St & Site Access 2

Future Total AM
Phase 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↕			↕
Traffic Volume (veh/h)	20	0	5	5	0	10
Future Volume (Veh/h)	20	0	5	5	0	10
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	20	0	5	5	0	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None		None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	18	8			10	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	18	8			10	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	1000	1075			1610	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	20	10	10			
Volume Left	20	0	0			
Volume Right	0	5	0			
cSH	1000	1700	1610			
Volume to Capacity	0.02	0.01	0.00			
Queue Length 95th (m)	0.4	0.0	0.0			
Control Delay (s)	8.7	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	8.7	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization		13.3%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total PM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	95	20	5	5	10	40	0	220	30	15	190	170
Future Volume (Veh/h)	95	20	5	5	10	40	0	220	30	15	190	170
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	20	5	5	10	40	0	220	30	15	190	170
Pedestrians		7			58			73			2	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			5			6			0	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)											17	
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91		0.91					
vC, conflicting volume	594	620	355	686	690	295	367			308		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	504	532	241	605	609	295	254			308		
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1			4.2		
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2			2.3		
p0 queue free %	75	95	99	98	97	94	100			99		
cM capacity (veh/h)	380	371	682	303	323	700	1196			1166		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	120	55	250	375								
Volume Left	95	5	0	15								
Volume Right	5	40	30	170								
cSH	386	526	1196	1166								
Volume to Capacity	0.31	0.10	0.00	0.01								
Queue Length 95th (m)	9.1	2.4	0.0	0.3								
Control Delay (s)	18.5	12.6	0.0	0.5								
Lane LOS	C	B		A								
Approach Delay (s)	18.5	12.6	0.0	0.5								
Approach LOS	C	B										
Intersection Summary												
Average Delay				3.9								
Intersection Capacity Utilization		53.9%			ICU Level of Service	A						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total PM
Phase 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		R			R
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	200	130	265	90	55	175
Future Volume (vph)	200	130	265	90	55	175
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	200	130	265	90	55	175
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	355	230			
Volume Left (vph)	200	0	55			
Volume Right (vph)	130	90	0			
Hadj (s)	-0.10	-0.15	0.06			
Departure Headway (s)	5.3	5.1	5.4			
Degree Utilization, x	0.49	0.50	0.35			
Capacity (veh/h)	637	672	623			
Control Delay (s)	13.2	13.0	11.3			
Approach Delay (s)	13.2	13.0	11.3			
Approach LOS	B	B	B			
Intersection Summary						
Delay			12.6			
Level of Service			B			
Intersection Capacity Utilization			61.1%	ICU Level of Service	B	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Total PM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		R			R			R			R	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	60	140	25	15	200	30	50	160	25	20	110	70
Future Volume (vph)	60	140	25	15	200	30	50	160	25	20	110	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	60	140	25	15	200	30	50	160	25	20	110	70
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	225	245	235	200								
Volume Left (vph)	60	15	50	20								
Volume Right (vph)	25	30	25	70								
Hadj (s)	0.02	-0.03	-0.02	-0.18								
Departure Headway (s)	5.6	5.5	5.6	5.5								
Degree Utilization, x	0.35	0.37	0.36	0.30								
Capacity (veh/h)	590	601	588	591								
Control Delay (s)	11.5	11.8	11.7	10.9								
Approach Delay (s)	11.5	11.8	11.7	10.9								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay				11.5								
Level of Service				B								
Intersection Capacity Utilization				58.6%	ICU Level of Service	B						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Total PM
Phase 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	115	0	45	255	5	20
Future Volume (Veh/h)	115	0	45	255	5	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	0	45	255	5	20
Pedestrians					15	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			130		475	130
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			130		475	130
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			97		99	98
cM capacity (veh/h)			1450		528	914
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	115	300	25			
Volume Left	0	45	5			
Volume Right	0	0	20			
cSH	1700	1450	797			
Volume to Capacity	0.07	0.03	0.03			
Queue Length 95th (m)	0.0	0.7	0.7			
Control Delay (s)	0.0	1.4	9.7			
Lane LOS	A	A	A			
Approach Delay (s)	0.0	1.4	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization		32.6%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Total PM
Phase 1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	5	0	5	20	40	5
Future Volume (Veh/h)	5	0	5	20	40	5
Sign Control		Free	Free		Stop	Stop
Grade		0%	0%		0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	0	5	20	40	5
Pedestrians					8	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	33				33	23
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	33				33	23
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	100				96	100
cM capacity (veh/h)	1581				976	1053
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	5	25	45			
Volume Left	5	0	40			
Volume Right	0	20	5			
cSH	1581	1700	984			
Volume to Capacity	0.00	0.01	0.05			
Queue Length 95th (m)	0.1	0.0	1.0			
Control Delay (s)	7.3	0.0	8.8			
Lane LOS	A	A	A			
Approach Delay (s)	7.3	0.0	8.8			
Approach LOS			A			
Intersection Summary						
Average Delay			5.8			
Intersection Capacity Utilization		15.7%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total PM
Phase 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	0	150	0	25	250	45	30	25	25	50	15	0
Future Volume (Veh/h)	0	150	0	25	250	45	30	25	25	50	15	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	150	0	25	250	45	30	25	25	50	15	0
Pedestrians					2			3			4	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	299			153			483	502	155	516	480	276
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	299			153			483	502	155	516	480	276
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			94	95	97	87	97	100
cM capacity (veh/h)	1269			1436			476	463	892	396	477	765
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	320	80	65								
Volume Left	0	25	30	50								
Volume Right	0	45	25	0								
cSH	1269	1436	552	412								
Volume to Capacity	0.00	0.02	0.15	0.16								
Queue Length 95th (m)	0.0	0.4	3.5	3.9								
Control Delay (s)	0.0	0.7	12.6	15.4								
Lane LOS		A	B	C								
Approach Delay (s)	0.0	0.7	12.6	15.4								
Approach LOS			B	C								
Intersection Summary												
Average Delay				3.6								
Intersection Capacity Utilization			42.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total PM
Phase 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	110	25	10	170	60	10
Future Volume (Veh/h)	110	25	10	170	60	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	110	25	10	170	60	10
Pedestrians					24	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type		None			None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume				159	336	146
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				159	336	146
IC, single (s)				4.1	6.4	6.2
IC, 2 stage (s)						
IF (s)				2.2	3.5	3.3
p0 queue free %				99	91	99
cM capacity (veh/h)				1404	645	888
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	135	180	70			
Volume Left	0	10	60			
Volume Right	25	0	10			
cSH	1700	1404	671			
Volume to Capacity	0.08	0.01	0.10			
Queue Length 95th (m)	0.0	0.2	2.4			
Control Delay (s)	0.0	0.5	11.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.5	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay				2.2		
Intersection Capacity Utilization		27.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total PM
Phase 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	130	5	0	230	70	5
Future Volume (Veh/h)	130	5	0	230	70	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	130	5	0	230	70	5
Pedestrians					25	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			160		388	158
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			160		388	158
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			100		88	99
cM capacity (veh/h)			1402		607	875
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	135	230	75			
Volume Left	0	0	70			
Volume Right	5	0	5			
cSH	1700	1402	620			
Volume to Capacity	0.08	0.00	0.12			
Queue Length 95th (m)	0.0	0.0	2.9			
Control Delay (s)	0.0	0.0	11.6			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.6			
Approach LOS			B			
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization		23.0%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
40: Park St & Site Access 2

Future Total PM
Phase 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔		↔	↔
Traffic Volume (veh/h)	25	0	25	45	0	40
Future Volume (Veh/h)	25	0	25	45	0	40
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	25	0	25	45	0	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	88	48			70	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	88	48			70	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	97	100			100	
cM capacity (veh/h)	913	1022			1531	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	25	70	40			
Volume Left	25	0	0			
Volume Right	0	45	0			
cSH	913	1700	1531			
Volume to Capacity	0.03	0.04	0.00			
Queue Length 95th (m)	0.6	0.0	0.0			
Control Delay (s)	9.1	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.1	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization		14.1%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	95	80	35	0	15	20	20	95	65	30	165	125
Future Volume (Veh/h)	95	80	35	0	15	20	20	95	65	30	165	125
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	80	35	0	15	20	20	95	65	30	165	125
Pedestrians	5			142			137			7		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			12			11			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	494	634	370	809	664	276	295			302		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	422	572	288	759	604	276	208			302		
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1			4.1		
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	77	76	94	100	95	97	98			97		
cM capacity (veh/h)	412	333	622	161	299	662	1277			1120		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	210	35	180	320								
Volume Left	95	0	20	30								
Volume Right	35	20	65	125								
cSH	398	435	1277	1120								
Volume to Capacity	0.53	0.08	0.02	0.03								
Queue Length 95th (m)	20.8	1.8	0.3	0.6								
Control Delay (s)	23.7	14.0	1.0	1.0								
Lane LOS	C	B	A	A								
Approach Delay (s)	23.7	14.0	1.0	1.0								
Approach LOS	C	B										
Intersection Summary												
Average Delay				8.0								
Intersection Capacity Utilization				49.1%			ICU Level of Service			A		
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total AM
Interim Phase 2 Construction

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	95	30	110	100	120	225
Future Volume (vph)	95	30	110	100	120	225
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	30	110	100	120	225
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	125	210	345			
Volume Left (vph)	95	0	120			
Volume Right (vph)	30	100	0			
Hadj (s)	0.03	-0.20	0.11			
Departure Headway (s)	5.2	4.4	4.6			
Degree Utilization, x	0.18	0.26	0.44			
Capacity (veh/h)	629	775	757			
Control Delay (s)	9.3	9.0	11.2			
Approach Delay (s)	9.3	9.0	11.2			
Approach LOS	A	A	B			
Intersection Summary						
Delay			10.2			
Level of Service	B					
Intersection Capacity Utilization			48.7%		ICU Level of Service	
Analysis Period (min)			15		A	

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↔			↔		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	45	130	5	20	55	10	0	125	25	30	110	60
Future Volume (vph)	45	130	5	20	55	10	0	125	25	30	110	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	130	5	20	55	10	0	125	25	30	110	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	85	150	200								
Volume Left (vph)	45	20	0	30								
Volume Right (vph)	5	10	25	60								
Hadj (s)	0.05	0.07	-0.05	-0.10								
Departure Headway (s)	4.9	5.1	4.8	4.7								
Degree Utilization, x	0.25	0.12	0.20	0.26								
Capacity (veh/h)	679	644	702	720								
Control Delay (s)	9.5	8.8	9.0	9.3								
Approach Delay (s)	9.5	8.8	9.0	9.3								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				9.2								
Level of Service				A								
Intersection Capacity Utilization				44.5%	ICU Level of Service							A
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Total AM
Interim Phase 2 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↔		↔		↔		
Traffic Volume (veh/h)	150	0	15	85	0	10	
Future Volume (Veh/h)	150	0	15	85	0	10	
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	150	0	15	85	0	10	
Pedestrians						30	
Lane Width (m)						3.6	
Walking Speed (m/s)						1.2	
Percent Blockage						3	
Right turn flare (veh)							
Median type	None		None				
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume			180			180	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			180			180	
IC, single (s)			4.1			6.2	
IC, 2 stage (s)							
IF (s)			2.2			3.3	
p0 queue free %			99			99	
cM capacity (veh/h)			1373			846	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	150	100	10				
Volume Left	0	15	0				
Volume Right	0	0	10				
cSH	1700	1373	846				
Volume to Capacity	0.09	0.01	0.01				
Queue Length 95th (m)	0.0	0.2	0.3				
Control Delay (s)	0.0	1.2	9.3				
Lane LOS	A		A				
Approach Delay (s)	0.0	1.2	9.3				
Approach LOS	A		A				
Intersection Summary							
Average Delay			0.8				
Intersection Capacity Utilization			27.2%	ICU Level of Service			A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	5	5	0	5	10	5
Future Volume (Veh/h)	5	5	0	5	10	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	5	0	5	10	5
Pedestrians					12	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	17				30	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	17				30	14
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1597				977	1060
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	10	5	15			
Volume Left	5	0	10			
Volume Right	0	5	5			
cSH	1597	1700	1003			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (m)	0.1	0.0	0.3			
Control Delay (s)	3.6	0.0	8.6			
Lane LOS	A	A	A			
Approach Delay (s)	3.6	0.0	8.6			
Approach LOS			A			
Intersection Summary						
Average Delay			5.5			
Intersection Capacity Utilization		16.6%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total AM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	5	150	0	30	85	0	0	0	35	5	10	0
Future Volume (Veh/h)	5	150	0	30	85	0	0	0	35	5	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	0	30	85	0	0	0	35	5	10	0
Pedestrians					2			3			11	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					0			0			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	96			153			313	319	155	353	319	96
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	96			153			313	319	155	353	319	96
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			100	100	96	99	98	100
cM capacity (veh/h)	1496			1436			616	580	892	527	580	957
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	155	115	35	15								
Volume Left	5	30	0	5								
Volume Right	0	0	35	0								
cSH	1496	1436	892	561								
Volume to Capacity	0.00	0.02	0.04	0.03								
Queue Length 95th (m)	0.1	0.4	0.9	0.6								
Control Delay (s)	0.3	2.1	9.2	11.6								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.3	2.1	9.2	11.6								
Approach LOS			A	B								
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization		31.0%		ICU Level of Service	A							
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total AM
Interim Phase 2 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Volume (veh/h)	115	15	70	90	20	95
Future Volume (Veh/h)	115	15	70	90	20	95
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	15	70	90	20	95
Pedestrians						28
Lane Width (m)						3.6
Walking Speed (m/s)						1.2
Percent Blockage						2
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			158		380	150
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			158		380	150
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			95		97	89
cM capacity (veh/h)			1400		580	880
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	130	160	115			
Volume Left	0	70	20			
Volume Right	15	0	95			
cSH	1700	1400	808			
Volume to Capacity	0.08	0.05	0.14			
Queue Length 95th (m)	0.0	1.1	3.5			
Control Delay (s)	0.0	3.6	10.2			
Lane LOS	A		B			
Approach Delay (s)	0.0	3.6	10.2			
Approach LOS	B					
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization			36.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total AM
Interim Phase 2 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Volume (veh/h)	125	35	15	95	5	5
Future Volume (Veh/h)	125	35	15	95	5	5
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	125	35	15	95	5	5
Pedestrians						32
Lane Width (m)						3.6
Walking Speed (m/s)						1.2
Percent Blockage						3
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			192		300	174
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			192		300	174
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1356		670	851
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	160	110	10			
Volume Left	0	15	5			
Volume Right	35	0	5			
cSH	1700	1356	750			
Volume to Capacity	0.09	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.3			
Control Delay (s)	0.0	1.1	9.9			
Lane LOS	A		A			
Approach Delay (s)	0.0	1.1	9.9			
Approach LOS	A					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			27.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total PM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	95	20	5	5	50	40	0	220	30	15	190	170
Future Volume (Veh/h)	95	20	5	5	50	40	0	220	30	15	190	170
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	20	5	5	50	40	0	220	30	15	190	170
Pedestrians	7			58			73			2		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	1			5			6			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												17
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91		0.91					
vC, conflicting volume	614	620	355	686	690	295	367	308				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	526	532	241	605	609	295	254	308				
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1	4.2				
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2	2.3				
p0 queue free %	71	95	99	98	85	94	100	99				
cM capacity (veh/h)	332	371	682	303	323	700	1196	1166				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	120	95	250	375								
Volume Left	95	5	0	15								
Volume Right	5	40	30	170								
cSH	346	416	1196	1166								
Volume to Capacity	0.35	0.23	0.00	0.01								
Queue Length 95th (m)	10.6	6.1	0.0	0.3								
Control Delay (s)	20.9	16.2	0.0	0.5								
Lane LOS	C	C		A								
Approach Delay (s)	20.9	16.2	0.0	0.5								
Approach LOS	C	C										
Intersection Summary												
Average Delay	5.0											
Intersection Capacity Utilization	53.9%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total PM
Interim Phase 2 Construction

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	200	130	265	90	55	175
Future Volume (vph)	200	130	265	90	55	175
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	200	130	265	90	55	175
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	355	230			
Volume Left (vph)	200	0	55			
Volume Right (vph)	130	90	0			
Hadj (s)	-0.10	-0.15	0.06			
Departure Headway (s)	5.3	5.1	5.4			
Degree Utilization, x	0.49	0.50	0.35			
Capacity (veh/h)	637	672	623			
Control Delay (s)	13.2	13.0	11.3			
Approach Delay (s)	13.2	13.0	11.3			
Approach LOS	B	B	B			
Intersection Summary						
Delay	12.6					
Level of Service	B					
Intersection Capacity Utilization	61.1%		ICU Level of Service		B	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Total PM
Interim Phase 2 Construction

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↔			↔		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	60	140	25	15	175	30	35	160	25	20	110	70
Future Volume (vph)	60	140	25	15	175	30	35	160	25	20	110	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	60	140	25	15	175	30	35	160	25	20	110	70
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	225	220	220	200								
Volume Left (vph)	60	15	35	20								
Volume Right (vph)	25	30	25	70								
Hadj (s)	0.02	-0.04	-0.04	-0.18								
Departure Headway (s)	5.5	5.4	5.4	5.3								
Degree Utilization, x	0.34	0.33	0.33	0.30								
Capacity (veh/h)	605	609	600	612								
Control Delay (s)	11.3	11.1	11.1	10.6								
Approach Delay (s)	11.3	11.1	11.1	10.6								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay	11.0											
Level of Service	B											
Intersection Capacity Utilization	53.4%			ICU Level of Service	A							
Analysis Period (min)	15											


HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Total PM
Interim Phase 2 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	115	0	70	255	5	25
Future Volume (Veh/h)	115	0	70	255	5	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	0	70	255	5	25
Pedestrians						15
Lane Width (m)						3.6
Walking Speed (m/s)						1.2
Percent Blockage						1
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			130			130
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			130			130
IC, single (s)			4.1			6.2
IC, 2 stage (s)						
IF (s)			2.2			3.3
p0 queue free %			95			97
cM capacity (veh/h)			1450			914
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	115	325	30			
Volume Left	0	70	5			
Volume Right	0	0	25			
cSH	1700	1450	796			
Volume to Capacity	0.07	0.05	0.04			
Queue Length 95th (m)	0.0	1.1	0.8			
Control Delay (s)	0.0	2.0	9.7			
Lane LOS	A		A			
Approach Delay (s)	0.0	2.0	9.7			
Approach LOS	A		A			
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization	34.0%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St


Future Total PM
Interim Phase 2 Construction



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	5	0	5	25	65	5
Future Volume (Veh/h)	5	0	5	25	65	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	0	5	25	65	5
Pedestrians					8	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	38				36	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	38				36	26
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	100				93	100
cM capacity (veh/h)	1575				973	1049
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	5	30	70			
Volume Left	5	0	65			
Volume Right	0	25	5			
cSH	1575	1700	978			
Volume to Capacity	0.00	0.02	0.07			
Queue Length 95th (m)	0.1	0.0	1.6			
Control Delay (s)	7.3	0.0	9.0			
Lane LOS	A		A			
Approach Delay (s)	7.3	0.0	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay			6.3			
Intersection Capacity Utilization		16.2%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total PM
Interim Phase 2 Construction



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	150	0	25	250	5	30	25	25	50	15	0
Future Volume (Veh/h)	0	150	0	25	250	5	30	25	25	50	15	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	150	0	25	250	5	30	25	25	50	15	0
Pedestrians					2			3			4	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	259			153			463	462	155	496	460	256
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259			153			463	462	155	496	460	256
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			94	95	97	88	97	100
cM capacity (veh/h)	1313			1436			491	488	892	410	490	784
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	280	80	65								
Volume Left	0	25	30	50								
Volume Right	0	5	25	0								
cSH	1313	1436	570	426								
Volume to Capacity	0.00	0.02	0.14	0.15								
Queue Length 95th (m)	0.0	0.4	3.4	3.7								
Control Delay (s)	0.0	0.8	12.3	15.0								
Lane LOS		A	B	B								
Approach Delay (s)	0.0	0.8	12.3	15.0								
Approach LOS			B	B								
Intersection Summary												
Average Delay				3.8								
Intersection Capacity Utilization		40.0%			ICU Level of Service	A						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total PM
Interim Phase 2 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Volume (veh/h)	110	30	50	170	85	10
Future Volume (Veh/h)	110	30	50	170	85	10
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	110	30	50	170	85	10
Pedestrians						24
Lane Width (m)						3.6
Walking Speed (m/s)						1.2
Percent Blockage						2
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			164		419	149
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			164		419	149
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			96		85	99
cM capacity (veh/h)			1398		562	885
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	140	220	95			
Volume Left	0	50	85			
Volume Right	30	0	10			
cSH	1700	1398	584			
Volume to Capacity	0.08	0.04	0.16			
Queue Length 95th (m)	0.0	0.8	4.0			
Control Delay (s)	0.0	2.0	12.4			
Lane LOS	A		B			
Approach Delay (s)	0.0	2.0	12.4			
Approach LOS	B					
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			38.0%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total PM
Interim Phase 2 Construction

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Volume (veh/h)	135	5	0	255	70	5
Future Volume (Veh/h)	135	5	0	255	70	5
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	135	5	0	255	70	5
Pedestrians						25
Lane Width (m)						3.6
Walking Speed (m/s)						1.2
Percent Blockage						2
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			165		418	162
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			165		418	162
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			100		88	99
cM capacity (veh/h)			1396		583	869
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	140	255	75			
Volume Left	0	0	70			
Volume Right	5	0	5			
cSH	1700	1396	596			
Volume to Capacity	0.08	0.00	0.13			
Queue Length 95th (m)	0.0	0.0	3.0			
Control Delay (s)	0.0	0.0	11.9			
Lane LOS	B		B			
Approach Delay (s)	0.0	0.0	11.9			
Approach LOS	B					
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			24.3%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	105	80	20	0	15	20	15	95	65	30	165	130
Future Volume (Veh/h)	105	80	20	0	15	20	15	95	65	30	165	130
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	105	80	20	0	15	20	15	95	65	30	165	130
Pedestrians	5			142			137			7		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			12			11			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	487	627	372	786	660	276	300			302		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	412	562	288	734	597	276	211			302		
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1			4.1		
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	75	76	97	100	95	97	99			97		
cM capacity (veh/h)	419	338	620	172	302	662	1272			1120		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	205	35	175	325								
Volume Left	105	0	15	30								
Volume Right	20	20	65	130								
cSH	395	438	1272	1120								
Volume to Capacity	0.52	0.08	0.01	0.03								
Queue Length 95th (m)	20.2	1.8	0.3	0.6								
Control Delay (s)	23.6	13.9	0.8	1.0								
Lane LOS	C	B	A	A								
Approach Delay (s)	23.6	13.9	0.8	1.0								
Approach LOS	C	B										
Intersection Summary												
Average Delay	7.8											
Intersection Capacity Utilization	49.9%			ICU Level of Service			A					
Analysis Period (min)	15											


HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total AM
Phase 2 - Before Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	100	30	110	110	120	225
Future Volume (vph)	100	30	110	110	120	225
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	100	30	110	110	120	225
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	130	220	345			
Volume Left (vph)	100	0	120			
Volume Right (vph)	30	110	0			
Hadj (s)	0.04	-0.21	0.11			
Departure Headway (s)	5.2	4.4	4.6			
Degree Utilization, x	0.19	0.27	0.44			
Capacity (veh/h)	625	774	752			
Control Delay (s)	9.4	9.1	11.2			
Approach Delay (s)	9.4	9.1	11.2			
Approach LOS	A	A	B			
Intersection Summary						
Delay	10.2					
Level of Service	B					
Intersection Capacity Utilization	49.4%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W


Future Total AM
Phase 2 - Before Denison Extension



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕			↕			↕			↕		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	45	155	40	20	55	10	5	120	25	30	95	60
Future Volume (vph)	45	155	40	20	55	10	5	120	25	30	95	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	155	40	20	55	10	5	120	25	30	95	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	240	85	150	185								
Volume Left (vph)	45	20	5	30								
Volume Right (vph)	40	10	25	60								
Hadj (s)	-0.05	0.07	-0.04	-0.12								
Departure Headway (s)	4.8	5.1	4.9	4.8								
Degree Utilization, x	0.32	0.12	0.21	0.25								
Capacity (veh/h)	699	635	674	693								
Control Delay (s)	10.1	8.9	9.2	9.4								
Approach Delay (s)	10.1	8.9	9.2	9.4								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay				9.5								
Level of Service				A								
Intersection Capacity Utilization				46.4%	ICU Level of Service	A						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St


Future Total AM
Phase 2 - Before Denison Extension



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕			↕	↕	↕
Traffic Volume (veh/h)	150	0	15	85	0	20
Future Volume (Veh/h)	150	0	15	85	0	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	150	0	15	85	0	20
Pedestrians					30	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			180			180
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			180			180
IC, single (s)			4.1			6.2
IC, 2 stage (s)						
IF (s)			2.2			3.3
p0 queue free %			99			98
cM capacity (veh/h)			1373			846
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	150	100	20			
Volume Left	0	15	0			
Volume Right	0	0	20			
cSH	1700	1373	846			
Volume to Capacity	0.09	0.01	0.02			
Queue Length 95th (m)	0.0	0.2	0.5			
Control Delay (s)	0.0	1.2	9.4			
Lane LOS			A			A
Approach Delay (s)	0.0	1.2	9.4			
Approach LOS			A			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			27.2%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St


Future Total AM
Phase 2 - Before Denison Extension



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	5	5	0	15	10	5
Future Volume (Veh/h)	5	5	0	15	10	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	5	0	15	10	5
Pedestrians					12	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	27				34	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	27				34	20
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1584				971	1054
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	10	15	15			
Volume Left	5	0	10			
Volume Right	0	15	5			
cSH	1584	1700	997			
Volume to Capacity	0.00	0.01	0.02			
Queue Length 95th (m)	0.1	0.0	0.3			
Control Delay (s)	3.7	0.0	8.7			
Lane LOS	A	A	A			
Approach Delay (s)	3.7	0.0	8.7			
Approach LOS			A			
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization		16.6%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total AM
Phase 2 - Before Denison Extension



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕		↕	↕	
Traffic Volume (veh/h)	5	150	0	30	85	5	0	10	35	65	15	0
Future Volume (Veh/h)	5	150	0	30	85	5	0	10	35	65	15	0
Sign Control		Free			Free			Stop		Stop		Stop
Grade		0%			0%			0%		0%		0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	0	30	85	5	0	10	35	65	15	0
Pedestrians					2			3				11
Lane Width (m)					3.6			3.6				3.6
Walking Speed (m/s)					1.2			1.2				1.2
Percent Blockage					0			0				1
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	101			153			318	324	155	360	322	98
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	101			153			318	324	155	360	322	98
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			100	98	96	87	97	100
cM capacity (veh/h)	1490			1436			608	576	892	514	578	954
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	155	120	45	80								
Volume Left	5	30	0	65								
Volume Right	0	5	35	0								
cSH	1490	1436	795	525								
Volume to Capacity	0.00	0.02	0.06	0.15								
Queue Length 95th (m)	0.1	0.4	1.3	3.7								
Control Delay (s)	0.3	2.0	9.8	13.1								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.3	2.0	9.8	13.1								
Approach LOS			A	B								
Intersection Summary												
Average Delay				4.4								
Intersection Capacity Utilization		37.4%			ICU Level of Service	A						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total AM
Phase 2 - Before Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	125	15	65	95	15	80
Future Volume (Veh/h)	125	15	65	95	15	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	125	15	65	95	15	80
Pedestrians					28	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			168		386	160
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			168		386	160
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			95		97	91
cM capacity (veh/h)			1389		579	869
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	140	160	95			
Volume Left	0	65	15			
Volume Right	15	0	80			
cSH	1700	1389	805			
Volume to Capacity	0.08	0.05	0.12			
Queue Length 95th (m)	0.0	1.0	2.8			
Control Delay (s)	0.0	3.4	10.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.4	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization		35.5%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total AM
Phase 2 - Before Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	135	35	15	95	5	5
Future Volume (Veh/h)	135	35	15	95	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	135	35	15	95	5	5
Pedestrians					32	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			202		310	184
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			202		310	184
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1345		661	840
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	170	110	10			
Volume Left	0	15	5			
Volume Right	35	0	5			
cSH	1700	1345	740			
Volume to Capacity	0.10	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.3			
Control Delay (s)	0.0	1.1	9.9			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.1	9.9			
Approach LOS			A			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		27.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
40: Park St & Site Access 2

Future Total AM
Phase 2 - Before Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	T
Traffic Volume (veh/h)	70	10	5	15	5	10
Future Volume (Veh/h)	70	10	5	15	5	10
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	70	10	5	15	5	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None		None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	32	12			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	32	12			20	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	93	99			100	
cM capacity (veh/h)	978	1068			1596	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	80	20	15			
Volume Left	70	0	5			
Volume Right	10	15	0			
cSH	988	1700	1596			
Volume to Capacity	0.08	0.01	0.00			
Queue Length 95th (m)	1.8	0.0	0.1			
Control Delay (s)	9.0	0.0	2.4			
Lane LOS	A		A			
Approach Delay (s)	9.0	0.0	2.4			
Approach LOS	A					
Intersection Summary						
Average Delay		6.6				
Intersection Capacity Utilization		16.1%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		T		L	T			T		L	T	
Traffic Volume (veh/h)	95	20	5	5	10	40	0	220	30	15	190	170
Future Volume (Veh/h)	95	20	5	5	10	40	0	220	30	15	190	170
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	20	5	5	10	40	0	220	30	15	190	170
Pedestrians		7			58			73			2	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			5			6			0	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)											17	
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91		0.91					
vC, conflicting volume	594	620	355	686	690	295	367			308		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	501	530	238	603	607	295	251			308		
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1			4.2		
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2			2.3		
p0 queue free %	75	95	99	98	97	94	100			99		
cM capacity (veh/h)	381	371	683	304	323	700	1196			1166		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	120	55	250	375								
Volume Left	95	5	0	15								
Volume Right	5	40	30	170								
cSH	386	526	1196	1166								
Volume to Capacity	0.31	0.10	0.00	0.01								
Queue Length 95th (m)	9.1	2.4	0.0	0.3								
Control Delay (s)	18.5	12.6	0.0	0.5								
Lane LOS	C	B		A								
Approach Delay (s)	18.5	12.6	0.0	0.5								
Approach LOS	C	B										
Intersection Summary												
Average Delay				3.9								
Intersection Capacity Utilization			53.9%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total PM
Phase 2 - Before Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	200	130	265	90	55	175
Future Volume (vph)	200	130	265	90	55	175
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	200	130	265	90	55	175
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	355	230			
Volume Left (vph)	200	0	55			
Volume Right (vph)	130	90	0			
Hadj (s)	-0.10	-0.15	0.06			
Departure Headway (s)	5.3	5.1	5.4			
Degree Utilization, x	0.49	0.50	0.35			
Capacity (veh/h)	637	672	623			
Control Delay (s)	13.2	13.0	11.3			
Approach Delay (s)	13.2	13.0	11.3			
Approach LOS	B	B	B			
Intersection Summary						
Delay			12.6			
Level of Service			B			
Intersection Capacity Utilization			61.1%	ICU Level of Service	B	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		Stop
Traffic Volume (vph)	60	160	35	15	215	30	50	160	25	20	110	70
Future Volume (vph)	60	160	35	15	215	30	50	160	25	20	110	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	60	160	35	15	215	30	50	160	25	20	110	70
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	255	260	235	200								
Volume Left (vph)	60	15	50	20								
Volume Right (vph)	35	30	25	70								
Hadj (s)	-0.01	-0.03	-0.02	-0.18								
Departure Headway (s)	5.6	5.6	5.7	5.6								
Degree Utilization, x	0.40	0.40	0.37	0.31								
Capacity (veh/h)	587	591	566	569								
Control Delay (s)	12.3	12.4	12.1	11.2								
Approach Delay (s)	12.3	12.4	12.1	11.2								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay				12.0								
Level of Service				B								
Intersection Capacity Utilization				60.8%	ICU Level of Service	B						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Volume (veh/h)	115	0	45	255	5	20
Future Volume (Veh/h)	115	0	45	255	5	20
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	0	45	255	5	20
Pedestrians					15	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			130		475 130	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			130		475 130	
IC, single (s)			4.1		6.4 6.2	
IC, 2 stage (s)						
IF (s)			2.2		3.5 3.3	
p0 queue free %			97		99 98	
cM capacity (veh/h)			1450		528 914	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	115	300	25			
Volume Left	0	45	5			
Volume Right	0	0	20			
cSH	1700	1450	797			
Volume to Capacity	0.07	0.03	0.03			
Queue Length 95th (m)	0.0	0.7	0.7			
Control Delay (s)	0.0	1.4	9.7			
Lane LOS	A		A			
Approach Delay (s)	0.0	1.4	9.7			
Approach LOS	A		A			
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			32.6%		ICU Level of Service A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔		↔		↔	
Traffic Volume (veh/h)	5	0	5	20	40	5
Future Volume (Veh/h)	5	0	5	20	40	5
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	0	5	20	40	5
Pedestrians					8	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	33				33 23	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	33				33 23	
IC, single (s)	4.1				6.4 6.2	
IC, 2 stage (s)						
IF (s)	2.2				3.5 3.3	
p0 queue free %	100				96 100	
cM capacity (veh/h)	1581				976 1053	
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	5	25	45			
Volume Left	5	0	40			
Volume Right	0	20	5			
cSH	1581	1700	984			
Volume to Capacity	0.00	0.01	0.05			
Queue Length 95th (m)	0.1	0.0	1.0			
Control Delay (s)	7.3	0.0	8.8			
Lane LOS	A		A			
Approach Delay (s)	7.3	0.0	8.8			
Approach LOS	A		A			
Intersection Summary						
Average Delay			5.8			
Intersection Capacity Utilization			15.7%		ICU Level of Service A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	0	150	0	25	250	60	30	55	25	80	15	0
Future Volume (Veh/h)	0	150	0	25	250	60	30	55	25	80	15	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	150	0	25	250	60	30	55	25	80	15	0
Pedestrians				2			3			4		
Lane Width (m)				3.6			3.6			3.6		
Walking Speed (m/s)				1.2			1.2			1.2		
Percent Blockage				0			0			0		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	314			153			490	517	155	538	487	284
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	314			153			490	517	155	538	487	284
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			94	88	97	78	97	100
cM capacity (veh/h)	1253			1436			470	454	892	362	473	757
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	335	110	95								
Volume Left	0	25	30	80								
Volume Right	0	60	25	0								
cSH	1253	1436	517	376								
Volume to Capacity	0.00	0.02	0.21	0.25								
Queue Length 95th (m)	0.0	0.4	5.6	6.9								
Control Delay (s)	0.0	0.7	13.8	17.8								
Lane LOS	A		B	C								
Approach Delay (s)	0.0	0.7	13.8	17.8								
Approach LOS	B		C									
Intersection Summary												
Average Delay			5.0									
Intersection Capacity Utilization			48.6%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	↔
Traffic Volume (veh/h)	110	25	10	170	60	10
Future Volume (Veh/h)	110	25	10	170	60	10
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	110	25	10	170	60	10
Pedestrians			24		24	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			2		2	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			159	336	146	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			159	336	146	
IC, single (s)			4.1	6.4	6.2	
IC, 2 stage (s)						
IF (s)			2.2	3.5	3.3	
p0 queue free %			99	91	99	
cM capacity (veh/h)			1404	645	888	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	135	180	70			
Volume Left	0	10	60			
Volume Right	25	0	10			
cSH	1700	1404	671			
Volume to Capacity	0.08	0.01	0.10			
Queue Length 95th (m)	0.0	0.2	2.4			
Control Delay (s)	0.0	0.5	11.0			
Lane LOS	A		B			
Approach Delay (s)	0.0	0.5	11.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization			27.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total PM
Phase 2 - Before Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	130	5	0	230	70	5
Future Volume (Veh/h)	130	5	0	230	70	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	130	5	0	230	70	5
Pedestrians					25	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			160		388	158
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			160		388	158
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			100		88	99
cM capacity (veh/h)			1402		607	875
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	135	230	75			
Volume Left	0	0	70			
Volume Right	5	0	5			
cSH	1700	1402	620			
Volume to Capacity	0.08	0.00	0.12			
Queue Length 95th (m)	0.0	0.0	2.9			
Control Delay (s)	0.0	0.0	11.6			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.6			
Approach LOS			B			
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization		23.0%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
40: Park St & Site Access 2

Future Total PM
Phase 2 - Before Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Volume (veh/h)	55	0	25	90	0	40
Future Volume (Veh/h)	55	0	25	90	0	40
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	55	0	25	90	0	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	110	70			115	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	110	70			115	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	94	100			100	
cM capacity (veh/h)	887	993			1474	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	55	115	40			
Volume Left	55	0	0			
Volume Right	0	90	0			
cSH	887	1700	1474			
Volume to Capacity	0.06	0.07	0.00			
Queue Length 95th (m)	1.4	0.0	0.0			
Control Delay (s)	9.3	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.3	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization		16.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	95	80	20	0	15	20	5	105	65	30	170	125
Future Volume (Veh/h)	95	80	20	0	15	20	5	105	65	30	170	125
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	80	20	0	15	20	5	105	65	30	170	125
Pedestrians	5			142			137			7		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			12			11			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)												19
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	480	620	374	779	650	286	300			312		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	404	554	291	726	587	286	211			312		
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1			4.1		
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	78	77	97	100	95	97	100			97		
cM capacity (veh/h)	426	344	618	176	309	653	1272			1111		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	195	35	175	325								
Volume Left	95	0	5	30								
Volume Right	20	20	65	125								
cSH	400	442	1272	1111								
Volume to Capacity	0.49	0.08	0.00	0.03								
Queue Length 95th (m)	18.1	1.8	0.1	0.6								
Control Delay (s)	22.3	13.8	0.3	1.0								
Lane LOS	C	B	A	A								
Approach Delay (s)	22.3	13.8	0.3	1.0								
Approach LOS	C	B										
Intersection Summary												
Average Delay				7.1								
Intersection Capacity Utilization	56.3%			ICU Level of Service	B							
Analysis Period (min)	15											


HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total AM
Phase 2 - After Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	100	30	110	110	120	225
Future Volume (vph)	100	30	110	110	120	225
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	100	30	110	110	120	225
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	130	220	345			
Volume Left (vph)	100	0	120			
Volume Right (vph)	30	110	0			
Hadj (s)	0.04	-0.21	0.11			
Departure Headway (s)	5.2	4.4	4.6			
Degree Utilization, x	0.19	0.27	0.44			
Capacity (veh/h)	625	774	752			
Control Delay (s)	9.4	9.1	11.2			
Approach Delay (s)	9.4	9.1	11.2			
Approach LOS	A	A	B			
Intersection Summary						
Delay			10.2			
Level of Service	B					
Intersection Capacity Utilization			49.4%	ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W


Future Total AM
Phase 2 - After Denison Extension



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕			↕			↕			↕		
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	45	130	5	20	55	10	0	125	25	55	130	60
Future Volume (vph)	45	130	5	20	55	10	0	125	25	55	130	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	130	5	20	55	10	0	125	25	55	130	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	180	85	150	245								
Volume Left (vph)	45	20	0	55								
Volume Right (vph)	5	10	25	60								
Hadj (s)	0.05	0.07	-0.05	-0.06								
Departure Headway (s)	5.0	5.2	4.9	4.7								
Degree Utilization, x	0.25	0.12	0.20	0.32								
Capacity (veh/h)	657	623	687	714								
Control Delay (s)	9.7	8.9	9.1	10.0								
Approach Delay (s)	9.7	8.9	9.1	10.0								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				9.6								
Level of Service				A								
Intersection Capacity Utilization				46.6%	ICU Level of Service	A						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St


Future Total AM
Phase 2 - After Denison Extension



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↕			↕	↕	↕
Traffic Volume (veh/h)	150	0	10	85	0	10
Future Volume (Veh/h)	150	0	10	85	0	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	150	0	10	85	0	10
Pedestrians					30	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			180		285	180
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			180		285	180
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			99		100	99
cM capacity (veh/h)			1373		687	846
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	150	95	10			
Volume Left	0	10	0			
Volume Right	0	0	10			
cSH	1700	1373	846			
Volume to Capacity	0.09	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.3			
Control Delay (s)	0.0	0.9	9.3			
Lane LOS			A	A		
Approach Delay (s)	0.0	0.9	9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			22.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St


Future Total AM
Phase 2 - After Denison Extension



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↗	↘		↖	↙
Traffic Volume (veh/h)	5	5	0	5	5	5
Future Volume (Veh/h)	5	5	0	5	5	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	5	0	5	5	5
Pedestrians					12	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	17				30	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	17				30	14
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1597				977	1060
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	10	5	10			
Volume Left	5	0	5			
Volume Right	0	5	5			
cSH	1597	1700	1017			
Volume to Capacity	0.00	0.00	0.01			
Queue Length 95th (m)	0.1	0.0	0.2			
Control Delay (s)	3.6	0.0	8.6			
Lane LOS	A	A	A			
Approach Delay (s)	3.6	0.0	8.6			
Approach LOS			A			
Intersection Summary						
Average Delay		4.9				
Intersection Capacity Utilization		16.6%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total AM
Phase 2 - After Denison Extension



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘	↖	↙		↗	↘	↙	↖	↙	↘
Traffic Volume (veh/h)	5	150	0	30	85	0	0	10	35	5	15	0
Future Volume (Veh/h)	5	150	0	30	85	0	0	10	35	5	15	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	0	30	85	0	0	10	35	5	15	0
Pedestrians					2			3			11	
Lane Width (m)					3.6			3.6			3.6	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					0			0			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	96			153			316	319	155	358	319	96
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	96			153			316	319	155	358	319	96
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			100	98	96	99	97	100
cM capacity (veh/h)	1496			1436			610	580	892	516	580	957
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	155	115	45	20								
Volume Left	5	30	0	5								
Volume Right	0	0	35	0								
cSH	1496	1436	797	562								
Volume to Capacity	0.00	0.02	0.06	0.04								
Queue Length 95th (m)	0.1	0.4	1.3	0.8								
Control Delay (s)	0.3	2.1	9.8	11.6								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.3	2.1	9.8	11.6								
Approach LOS			A	B								
Intersection Summary												
Average Delay		2.9										
Intersection Capacity Utilization		31.2%	ICU Level of Service	A								
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total AM
Phase 2 - After Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	115	15	65	90	15	80
Future Volume (Veh/h)	115	15	65	90	15	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	15	65	90	15	80
Pedestrians					28	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			158		370	150
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			158		370	150
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			95		97	91
cM capacity (veh/h)			1400		590	880
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	130	155	95			
Volume Left	0	65	15			
Volume Right	15	0	80			
cSH	1700	1400	817			
Volume to Capacity	0.08	0.05	0.12			
Queue Length 95th (m)	0.0	1.0	2.8			
Control Delay (s)	0.0	3.4	10.0			
Lane LOS		A	A			
Approach Delay (s)	0.0	3.4	10.0			
Approach LOS			A			
Intersection Summary						
Average Delay			3.9			
Intersection Capacity Utilization		35.0%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total AM
Phase 2 - After Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	125	35	15	90	5	5
Future Volume (Veh/h)	125	35	15	90	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	125	35	15	90	5	5
Pedestrians					32	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			192		294	174
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			192		294	174
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			99		99	99
cM capacity (veh/h)			1356		674	851
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	160	105	10			
Volume Left	0	15	5			
Volume Right	35	0	5			
cSH	1700	1356	752			
Volume to Capacity	0.09	0.01	0.01			
Queue Length 95th (m)	0.0	0.2	0.3			
Control Delay (s)	0.0	1.2	9.8			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.2	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		27.5%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
39: Park St & Denison Ave Ext.

Future Total AM
Phase 2 - After Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		R			T
Traffic Volume (veh/h)	10	0	5	10	0	10
Future Volume (Veh/h)	10	0	5	10	0	10
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	0	5	10	0	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20	10			15	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20	10			15	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	997	1071			1603	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	10	15	10			
Volume Left	10	0	0			
Volume Right	0	10	0			
cSH	997	1700	1603			
Volume to Capacity	0.01	0.01	0.00			
Queue Length 95th (m)	0.2	0.0	0.0			
Control Delay (s)	8.6	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	8.6	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization		13.3%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
40: Mill St N & Denison Ave Ext.

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			T	T	
Traffic Volume (veh/h)	10	60	5	175	185	5
Future Volume (Veh/h)	10	60	5	175	185	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	60	5	175	185	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)					121	
pX, platoon unblocked						
vC, conflicting volume	372	188	190			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	372	188	190			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	98	93	100			
cM capacity (veh/h)	626	855	1384			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	70	180	190			
Volume Left	10	5	0			
Volume Right	60	0	5			
cSH	812	1384	1700			
Volume to Capacity	0.09	0.00	0.11			
Queue Length 95th (m)	2.0	0.1	0.0			
Control Delay (s)	9.9	0.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.9	0.2	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization		24.2%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
42: Denison Ave Ext. & Site Access 2

Future Total AM
Phase 2 - After Denison Extension

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	10	0	0	10	70	10
Future Volume (Veh/h)	10	0	0	10	70	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	10	0	0	10	70	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked					25	5
vC, conflicting volume	10					
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	10				25	5
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	99				93	99
cM capacity (veh/h)	1610				985	1078
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	10	10	80			
Volume Left	10	0	70			
Volume Right	0	10	10			
cSH	1610	1700	995			
Volume to Capacity	0.01	0.01	0.08			
Queue Length 95th (m)	0.1	0.0	1.8			
Control Delay (s)	7.3	0.0	8.9			
Lane LOS	A		A			
Approach Delay (s)	7.3	0.0	8.9			
Approach LOS			A			
Intersection Summary						
Average Delay			7.9			
Intersection Capacity Utilization		18.4%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	95	20	5	5	10	40	0	220	30	15	190	170
Future Volume (Veh/h)	95	20	5	5	10	40	0	220	30	15	190	170
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	95	20	5	5	10	40	0	220	30	15	190	170
Pedestrians		7			58			73			2	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			5			6			0	
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)											17	
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91		0.91					
vC, conflicting volume	594	620	355	686	690	295	367			308		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	501	530	238	603	607	295	251			308		
IC, single (s)	7.1	6.6	6.2	7.1	6.8	6.2	4.1			4.2		
IC, 2 stage (s)												
IF (s)	3.5	4.1	3.3	3.5	4.2	3.3	2.2			2.3		
p0 queue free %	75	95	99	98	97	94	100			99		
cM capacity (veh/h)	381	371	683	304	323	700	1196			1166		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	120	55	250	375								
Volume Left	95	5	0	15								
Volume Right	5	40	30	170								
cSH	386	526	1196	1166								
Volume to Capacity	0.31	0.10	0.00	0.01								
Queue Length 95th (m)	9.1	2.4	0.0	0.3								
Control Delay (s)	18.5	12.6	0.0	0.5								
Lane LOS	C	B		A								
Approach Delay (s)	18.5	12.6	0.0	0.5								
Approach LOS	C	B										
Intersection Summary												
Average Delay				3.9								
Intersection Capacity Utilization		53.9%			ICU Level of Service	A						
Analysis Period (min)		15										

HCM Unsignalized Intersection Capacity Analysis
10: Mill St N & Church St W

Future Total PM
Phase 2 - After Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		R			R
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	200	130	265	90	55	175
Future Volume (vph)	200	130	265	90	55	175
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	200	130	265	90	55	175
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	355	230			
Volume Left (vph)	200	0	55			
Volume Right (vph)	130	90	0			
Hadj (s)	-0.10	-0.15	0.06			
Departure Headway (s)	5.3	5.1	5.4			
Degree Utilization, x	0.49	0.50	0.35			
Capacity (veh/h)	637	672	623			
Control Delay (s)	13.2	13.0	11.3			
Approach Delay (s)	13.2	13.0	11.3			
Approach LOS	B	B	B			
Intersection Summary						
Delay	12.6					
Level of Service	B					
Intersection Capacity Utilization	61.1%		ICU Level of Service	B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
13: Mill St N & Nelson St W

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		R			R			R			R	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	60	130	15	15	215	30	50	160	25	50	130	70
Future Volume (vph)	60	130	15	15	215	30	50	160	25	50	130	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	60	130	15	15	215	30	50	160	25	50	130	70
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	205	260	235	250								
Volume Left (vph)	60	15	50	50								
Volume Right (vph)	15	30	25	70								
Hadj (s)	0.05	-0.03	-0.02	-0.12								
Departure Headway (s)	5.8	5.7	5.7	5.6								
Degree Utilization, x	0.33	0.41	0.37	0.39								
Capacity (veh/h)	555	581	572	587								
Control Delay (s)	11.7	12.5	12.0	12.1								
Approach Delay (s)	11.7	12.5	12.0	12.1								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay	12.1											
Level of Service	B											
Intersection Capacity Utilization	54.0%		ICU Level of Service	A								
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
21: Park St & Railroad St

Future Total PM
Phase 2 - After Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	115	0	45	255	5	20
Future Volume (Veh/h)	115	0	45	255	5	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	115	0	45	255	5	20
Pedestrians					15	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			130		475	130
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			130		475	130
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			97		99	98
cM capacity (veh/h)			1450		528	914
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	115	300	25			
Volume Left	0	45	5			
Volume Right	0	0	20			
cSH	1700	1450	797			
Volume to Capacity	0.07	0.03	0.03			
Queue Length 95th (m)	0.0	0.7	0.7			
Control Delay (s)	0.0	1.4	9.7			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.4	9.7			
Approach LOS			A			
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization		32.6%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
22: Denison Ave & Park St

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Traffic Volume (veh/h)	5	0	5	20	40	5
Future Volume (Veh/h)	5	0	5	20	40	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	0	5	20	40	5
Pedestrians					8	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	33				33	23
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	33				33	23
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	100				96	100
cM capacity (veh/h)	1581				976	1053
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	5	25	45			
Volume Left	5	0	40			
Volume Right	0	20	5			
cSH	1581	1700	984			
Volume to Capacity	0.00	0.01	0.05			
Queue Length 95th (m)	0.1	0.0	1.0			
Control Delay (s)	7.3	0.0	8.8			
Lane LOS	A		A			
Approach Delay (s)	7.3	0.0	8.8			
Approach LOS			A			
Intersection Summary						
Average Delay			5.8			
Intersection Capacity Utilization		15.7%		ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
23: Park St & Nelson St W

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	0	150	0	25	250	60	30	55	25	30	15	0
Future Volume (Veh/h)	0	150	0	25	250	60	30	55	25	30	15	0
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	150	0	25	250	60	30	55	25	30	15	0
Pedestrians					2		3		4			
Lane Width (m)					3.6		3.6		3.6			
Walking Speed (m/s)					1.2		1.2		1.2			
Percent Blockage					0		0		0			
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	314			153			490	517	155	538	487	284
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	314			153			490	517	155	538	487	284
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.3	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	100			98			94	88	97	92	97	100
cM capacity (veh/h)	1253			1436			470	454	892	362	473	757
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	150	335	110	45								
Volume Left	0	25	30	30								
Volume Right	0	60	25	0								
cSH	1253	1436	517	393								
Volume to Capacity	0.00	0.02	0.21	0.11								
Queue Length 95th (m)	0.0	0.4	5.6	2.7								
Control Delay (s)	0.0	0.7	13.8	15.4								
Lane LOS	A		B	C								
Approach Delay (s)	0.0	0.7	13.8	15.4								
Approach LOS	B		C									
Intersection Summary												
Average Delay			3.8									
Intersection Capacity Utilization			43.2%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
33: GO/Site Access & Railroad St

Future Total PM
Phase 2 - After Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↔			↔	↔		
Traffic Volume (veh/h)	110	25	10	170	60	10	
Future Volume (Veh/h)	110	25	10	170	60	10	
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	110	25	10	170	60	10	
Pedestrians				24			
Lane Width (m)				3.6			
Walking Speed (m/s)				1.2			
Percent Blockage				2			
Right turn flare (veh)							
Median type	None		None				
Median storage (veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume			159	336	146		
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			159	336	146		
IC, single (s)			4.1	6.4	6.2		
IC, 2 stage (s)							
IF (s)			2.2	3.5	3.3		
p0 queue free %			99	91	99		
cM capacity (veh/h)			1404	645	888		
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	135	180	70				
Volume Left	0	10	60				
Volume Right	25	0	10				
cSH	1700	1404	671				
Volume to Capacity	0.08	0.01	0.10				
Queue Length 95th (m)	0.0	0.2	2.4				
Control Delay (s)	0.0	0.5	11.0				
Lane LOS	A		B				
Approach Delay (s)	0.0	0.5	11.0				
Approach LOS	B						
Intersection Summary							
Average Delay			2.2				
Intersection Capacity Utilization			27.7%	ICU Level of Service	A		
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis
35: GO Access & Railroad St

Future Total PM
Phase 2 - After Denison Extension

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	130	5	0	230	70	5
Future Volume (Veh/h)	130	5	0	230	70	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	130	5	0	230	70	5
Pedestrians					25	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			160		388	158
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			160		388	158
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			100		88	99
cM capacity (veh/h)			1402		607	875
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	135	230	75			
Volume Left	0	0	70			
Volume Right	5	0	5			
cSH	1700	1402	620			
Volume to Capacity	0.08	0.00	0.12			
Queue Length 95th (m)	0.0	0.0	2.9			
Control Delay (s)	0.0	0.0	11.6			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	11.6			
Approach LOS			B			
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			23.0%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
39: Park St & Denison Ave Ext.

Future Total PM
Phase 2 - After Denison Extension

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Volume (veh/h)	5	0	25	90	0	40
Future Volume (Veh/h)	5	0	25	90	0	40
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	0	25	90	0	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	110	70			115	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	110	70			115	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
IF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	887	993			1474	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	5	115	40			
Volume Left	5	0	0			
Volume Right	0	90	0			
cSH	887	1700	1474			
Volume to Capacity	0.01	0.07	0.00			
Queue Length 95th (m)	0.1	0.0	0.0			
Control Delay (s)	9.1	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.1	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			16.9%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
40: Mill St N & Denison Ave Ext.

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			↑	↑	
Traffic Volume (veh/h)	0	50	0	250	200	0
Future Volume (Veh/h)	0	50	0	250	200	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	50	0	250	200	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				117		
pX, platoon unblocked						
vC, conflicting volume	450	200	200			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	450	200	200			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	94	100			
cM capacity (veh/h)	567	841	1372			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	50	250	200			
Volume Left	0	0	0			
Volume Right	50	0	0			
cSH	841	1372	1700			
Volume to Capacity	0.06	0.00	0.12			
Queue Length 95th (m)	1.3	0.0	0.0			
Control Delay (s)	9.6	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	9.6	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.0				
Intersection Capacity Utilization		23.2%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
42: Denison Ave Ext. & Site Access 2

Future Total PM
Phase 2 - After Denison Extension

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		W	W
Traffic Volume (veh/h)	90	0	0	0	50	5
Future Volume (Veh/h)	90	0	0	0	50	5
Sign Control		Free	Free		Stop	Stop
Grade		0%	0%		0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	90	0	0	0	50	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	0				180	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				180	0
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)						
IF (s)	2.2				3.5	3.3
p0 queue free %	94				93	100
cM capacity (veh/h)	1623				765	1085
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	90	0	55			
Volume Left	90	0	50			
Volume Right	0	0	5			
cSH	1623	1700	786			
Volume to Capacity	0.06	0.00	0.07			
Queue Length 95th (m)	1.2	0.0	1.6			
Control Delay (s)	7.3	0.0	9.9			
Lane LOS	A		A			
Approach Delay (s)	7.3	0.0	9.9			
Approach LOS	A		A			
Intersection Summary						
Average Delay		8.3				
Intersection Capacity Utilization		15.0%		ICU Level of Service	A	
Analysis Period (min)		15				

**APPENDIX I:
Synchro Analysis Sheets – Peak 5 Minute at Mill / Railroad**

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Existing AM
Peak 5 min - GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				↔
Traffic Volume (veh/h)	56	64	8	0	16	20	4	176	32	20	108	168
Future Volume (Veh/h)	56	64	8	0	16	20	4	176	32	20	108	168
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	56	64	8	0	16	20	4	176	32	20	108	168
Pedestrians	4			96			80			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			8			7			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	20											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	468	548	276	648	616	292	280			304		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	394	479	188	587	552	292	192			304		
tC, single (s)	*8.5	*8.5	6.2	7.1	*10.0	*10.0	4.1			4.1		
tC, 2 stage (s)												
tF (s)	*6.4	*6.4	3.3	3.5	*10.0	*10.0	2.2			2.2		
p0 queue free %	74	72	99	100	87	91	100			98		
cM capacity (veh/h)	217	226	746	243	127	214	1296			1167		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	128	36	212	296								
Volume Left	56	0	4	20								
Volume Right	8	20	32	168								
cSH	232	164	1296	1167								
Volume to Capacity	0.55	0.22	0.00	0.02								
Queue Length 95th (m)	21.1	5.6	0.1	0.4								
Control Delay (s)	38.2	33.0	0.2	0.7								
Lane LOS	E	D	A	A								
Approach Delay (s)	38.2	33.0	0.2	0.7								
Approach LOS	E	D										
Intersection Summary												
Average Delay	9.4											
Intersection Capacity Utilization	48.5%			ICU Level of Service	A							
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Existing PM
Peak 5 min - GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔				↔
Traffic Volume (veh/h)	111	28	4	4	8	67	0	424	28	16	372	190
Future Volume (Veh/h)	111	28	4	4	8	67	0	424	28	16	372	190
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	111	28	4	4	8	67	0	424	28	16	372	190
Pedestrians	24			215			211			8		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	2			18			18			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	20											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	1040	1190	702	1381	1271	661	586			667		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1008	1168	646	1373	1255	661	521			667		
tC, single (s)	*7.2	*6.8	*6.8	*8.8	*8.6	*8.6	4.1			4.2		
tC, 2 stage (s)												
tF (s)	*3.1	*2.8	*2.8	*4.2	*4.0	*4.0	2.2			2.3		
p0 queue free %	0	82	99	85	87	69	100			98		
cM capacity (veh/h)	109	158	364	27	61	214	966			738		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	143	79	452	578								
Volume Left	111	4	0	16								
Volume Right	4	67	28	190								
cSH	119	134	966	738								
Volume to Capacity	1.20	0.59	0.00	0.02								
Queue Length 95th (m)	63.0	21.1	0.0	0.5								
Control Delay (s)	217.7	65.0	0.0	0.6								
Lane LOS	F	F		A								
Approach Delay (s)	217.7	65.0	0.0	0.6								
Approach LOS	F	F										
Intersection Summary												
Average Delay	29.2											
Intersection Capacity Utilization	66.8%			ICU Level of Service	C							
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Existing PM
Peak 5 min - CN

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	112	28	0	0	28	84	0	419	84	56	251	502
Future Volume (Veh/h)	112	28	0	0	28	84	0	419	84	56	251	502
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	112	28	0	0	28	84	0	419	84	56	251	502
Pedestrians	56			698			809					
Lane Width (m)	3.6			3.6			3.6					
Walking Speed (m/s)	1.2			1.2			1.2					
Percent Blockage	5			58			67					
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	20											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93	0.93						
vC, conflicting volume	1229	1871	1367	2596	2080	1159	809	1201				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1210	1897	1358	2673	2121	1159	760	1201				
tC, single (s)	*4.9	*4.9	*6.8	*8.8	*2.5	*2.5	4.1	4.2				
tC, 2 stage (s)												
tF (s)	*2.8	*2.8	*2.8	*4.2	*2.5	*2.5	2.2	2.3				
p0 queue free %	0	47	100	100	84	79	100	76				
cM capacity (veh/h)	105	53	46	0	179	392	766	236				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	140	112	503	809								
Volume Left	112	0	0	56								
Volume Right	0	84	84	502								
cSH	88	302	766	236								
Volume to Capacity	1.60	0.37	0.00	0.24								
Queue Length 95th (m)	78.6	11.6	0.0	6.3								
Control Delay (s)	399.1	23.7	0.0	11.6								
Lane LOS	F	C		B								
Approach Delay (s)	399.1	23.7	0.0	11.6								
Approach LOS	F	C										
Intersection Summary												
Average Delay	43.4											
Intersection Capacity Utilization	103.1%			ICU Level of Service			G					
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Background AM
Peak 5 min - GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	56	64	8	0	16	20	4	176	32	20	108	168
Future Volume (Veh/h)	56	64	8	0	16	20	4	176	32	20	108	168
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	56	64	8	0	16	20	4	176	32	20	108	168
Pedestrians	4			96			80			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			8			7			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	19											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93	0.93						
vC, conflicting volume	468	548	276	648	616	292	280	304				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	394	479	188	587	552	292	192	304				
tC, single (s)	*8.5	*8.5	6.2	7.1	*10.0	*10.0	4.1	4.1				
tC, 2 stage (s)												
tF (s)	*6.4	*6.4	3.3	3.5	*10.0	*10.0	2.2	2.2				
p0 queue free %	74	72	99	100	87	91	100	98				
cM capacity (veh/h)	217	226	746	243	127	214	1296	1167				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	128	36	212	296								
Volume Left	56	0	4	20								
Volume Right	8	20	32	168								
cSH	232	164	1296	1167								
Volume to Capacity	0.55	0.22	0.00	0.02								
Queue Length 95th (m)	24.1	6.4	0.1	0.4								
Control Delay (s)	38.2	33.0	0.2	0.7								
Lane LOS	E	D	A	A								
Approach Delay (s)	38.2	33.0	0.2	0.7								
Approach LOS	E	D										
Intersection Summary												
Average Delay	9.4											
Intersection Capacity Utilization	48.5%			ICU Level of Service			A					
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Phase 1 - Peak 5 mins GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	81	84	23	0	21	20	14	176	32	20	108	188
Future Volume (Veh/h)	81	84	23	0	21	20	14	176	32	20	108	188
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	81	84	23	0	21	20	14	176	32	20	108	188
Pedestrians	4			96			80			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			8			7			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	19											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93	0.93						
vC, conflicting volume	500	578	286	703	656	292	300	304				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	428	511	198	645	595	292	213	304				
IC, single (s)	*8.5	*8.5	6.2	7.1	*10.0	*10.0	4.1	4.1				
IC, 2 stage (s)												
IF (s)	*6.4	*6.4	3.3	3.5	*10.0	*10.0	2.2	2.2				
p0 queue free %	58	61	97	100	82	91	99	98				
cM capacity (veh/h)	195	213	736	192	117	214	1272	1167				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	188	41	222	316								
Volume Left	81	0	14	20								
Volume Right	23	20	32	188								
cSH	223	150	1272	1167								
Volume to Capacity	0.84	0.27	0.01	0.02								
Queue Length 95th (m)	45.3	7.3	0.2	0.4								
Control Delay (s)	71.5	37.7	0.6	0.7								
Lane LOS	F	E	A	A								
Approach Delay (s)	71.5	37.7	0.6	0.7								
Approach LOS	F	E										
Intersection Summary												
Average Delay	20.0											
Intersection Capacity Utilization	48.2%			ICU Level of Service			A					
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Interim Phase 2 Construction - Peak 5 min GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	81	84	38	0	21	20	19	176	32	20	108	188
Future Volume (Veh/h)	81	84	38	0	21	20	19	176	32	20	108	188
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	81	84	38	0	21	20	19	176	32	20	108	188
Pedestrians	4			96			80			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			8			7			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	19											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93	0.93						
vC, conflicting volume	510	588	286	728	666	292	300	304				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	439	522	198	672	606	292	213	304				
IC, single (s)	*8.5	*8.5	6.2	7.1	*10.0	*10.0	4.1	4.1				
IC, 2 stage (s)												
IF (s)	*6.4	*6.4	3.3	3.5	*10.0	*10.0	2.2	2.2				
p0 queue free %	57	60	95	100	82	91	99	98				
cM capacity (veh/h)	190	208	736	178	115	214	1272	1167				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	203	41	227	316								
Volume Left	81	0	19	20								
Volume Right	38	20	32	188								
cSH	230	148	1272	1167								
Volume to Capacity	0.88	0.28	0.01	0.02								
Queue Length 95th (m)	50.2	7.4	0.3	0.4								
Control Delay (s)	76.9	38.4	0.8	0.7								
Lane LOS	F	E	A	A								
Approach Delay (s)	76.9	38.4	0.8	0.7								
Approach LOS	F	E										
Intersection Summary												
Average Delay	22.3											
Intersection Capacity Utilization	48.3%			ICU Level of Service			A					
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total PM
Interim Phase 2 Construction - Peak 5 min GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	111	28	74	4	8	67	0	424	28	16	372	200
Future Volume (Veh/h)	111	28	74	4	8	67	0	424	28	16	372	200
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	111	28	74	4	8	67	0	424	28	16	372	200
Pedestrians	24			215			211			8		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	2			18			18			1		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	17											
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91	0.91						
vC, conflicting volume	1045	1195	707	1456	1281	661	596	667				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	999	1164	628	1452	1259	661	506	667				
IC, single (s)	*7.2	*6.8	*6.8	*8.8	*8.6	*8.6	4.1	4.2				
IC, 2 stage (s)												
IF (s)	*3.1	*2.8	*2.8	*4.2	*4.0	*4.0	2.2	2.3				
p0 queue free %	0	82	80	78	86	69	100	98				
cM capacity (veh/h)	107	155	365	18	59	214	953	738				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	213	79	452	588								
Volume Left	111	4	0	16								
Volume Right	74	67	28	200								
cSH	150	118	953	738								
Volume to Capacity	1.42	0.67	0.00	0.02								
Queue Length 95th (m)	95.9	24.7	0.0	0.5								
Control Delay (s)	278.8	82.4	0.0	0.6								
Lane LOS	F	F	A									
Approach Delay (s)	278.8	82.4	0.0	0.6								
Approach LOS	F	F										
Intersection Summary												
Average Delay	49.7											
Intersection Capacity Utilization	74.3%			ICU Level of Service			D					
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total PM
Interim Phase 2 Construction - Peak 5 min CN

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	112	28	70	0	28	84	0	419	84	56	251	512
Future Volume (Veh/h)	112	28	70	0	28	84	0	419	84	56	251	512
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	112	28	70	0	28	84	0	419	84	56	251	512
Pedestrians	56			698			809			8		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	5			58			67					
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	17											
pX, platoon unblocked	0.91	0.91	0.91	0.91	0.91	0.91						
vC, conflicting volume	1234	1876	1372	2671	2090	1159	819	1201				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1207	1914	1359	2788	2149	1159	751	1201				
IC, single (s)	*4.9	*4.9	*4.9	7.1	*2.8	*2.8	4.1	4.2				
IC, 2 stage (s)												
IF (s)	*2.5	*2.5	*2.5	3.5	*2.5	*2.5	2.2	2.3				
p0 queue free %	0	47	29	100	81	76	100	76				
cM capacity (veh/h)	104	53	99	0	144	356	752	236				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	210	112	503	819								
Volume Left	112	0	0	56								
Volume Right	70	84	84	512								
cSH	91	260	752	236								
Volume to Capacity	2.32	0.43	0.00	0.24								
Queue Length 95th (m)	133.3	14.3	0.0	6.3								
Control Delay (s)	699.6	28.9	0.0	11.7								
Lane LOS	F	D	B									
Approach Delay (s)	699.6	28.9	0.0	11.7								
Approach LOS	F	D										
Intersection Summary												
Average Delay	97.2											
Intersection Capacity Utilization	111.8%			ICU Level of Service			H					
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Phase 2 - B4 Extension - Peak 5 min GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	91	84	23	0	21	20	14	176	32	20	108	193
Future Volume (Veh/h)	91	84	23	0	21	20	14	176	32	20	108	193
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	91	84	23	0	21	20	14	176	32	20	108	193
Pedestrians	4			96			80			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			8			7			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	19											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	503	580	288	706	661	292	305			304		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	429	512	199	647	599	292	217			304		
IC, single (s)	*8.5	*8.5	6.2	7.1	*10.0	*10.0	4.1			4.1		
IC, 2 stage (s)												
IF (s)	*6.4	*6.4	3.3	3.5	*10.0	*10.0	2.2			2.2		
p0 queue free %	53	60	97	100	82	91	99			98		
cM capacity (veh/h)	194	212	734	191	116	214	1267			1167		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	198	41	222	321								
Volume Left	91	0	14	20								
Volume Right	23	20	32	193								
cSH	221	150	1267	1167								
Volume to Capacity	0.90	0.27	0.01	0.02								
Queue Length 95th (m)	51.2	7.4	0.2	0.4								
Control Delay (s)	82.5	37.9	0.6	0.7								
Lane LOS	F	E	A	A								
Approach Delay (s)	82.5	37.9	0.6	0.7								
Approach LOS	F	E										
Intersection Summary												
Average Delay	23.3											
Intersection Capacity Utilization	49.0%			ICU Level of Service			A					
Analysis Period (min)	15											
* User Entered Value												

HCM Unsignalized Intersection Capacity Analysis
8: Mill St N & Railroad St

Future Total AM
Phase 2 - After Extension - Peak 5 min GO

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	81	84	23	0	21	20	14	186	32	20	113	188
Future Volume (Veh/h)	81	84	23	0	21	20	14	186	32	20	113	188
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	81	84	23	0	21	20	14	186	32	20	113	188
Pedestrians	4			96			80			4		
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			8			7			0		
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (m)	19											
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	516	593	291	718	671	302	305			314		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	443	526	201	660	610	302	217			314		
IC, single (s)	*8.5	*8.5	6.2	7.1	*10.0	*10.0	4.1			4.1		
IC, 2 stage (s)												
IF (s)	*6.4	*6.4	3.3	3.5	*10.0	*10.0	2.2			2.2		
p0 queue free %	57	60	97	100	82	91	99			98		
cM capacity (veh/h)	189	208	731	185	114	211	1267			1157		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	188	41	232	321								
Volume Left	81	0	14	20								
Volume Right	23	20	32	188								
cSH	217	147	1267	1157								
Volume to Capacity	0.87	0.28	0.01	0.02								
Queue Length 95th (m)	47.4	7.5	0.2	0.4								
Control Delay (s)	77.1	38.7	0.6	0.7								
Lane LOS	F	E	A	A								
Approach Delay (s)	77.1	38.7	0.6	0.7								
Approach LOS	F	E										
Intersection Summary												
Average Delay	21.0											
Intersection Capacity Utilization	48.6%			ICU Level of Service			A					
Analysis Period (min)	15											
* User Entered Value												

TECHNICAL MEMORANDUM



Appendix B – Traffic Counts

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Brampton
Site #: 1901700001
Intersection: Denison Ave & West St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

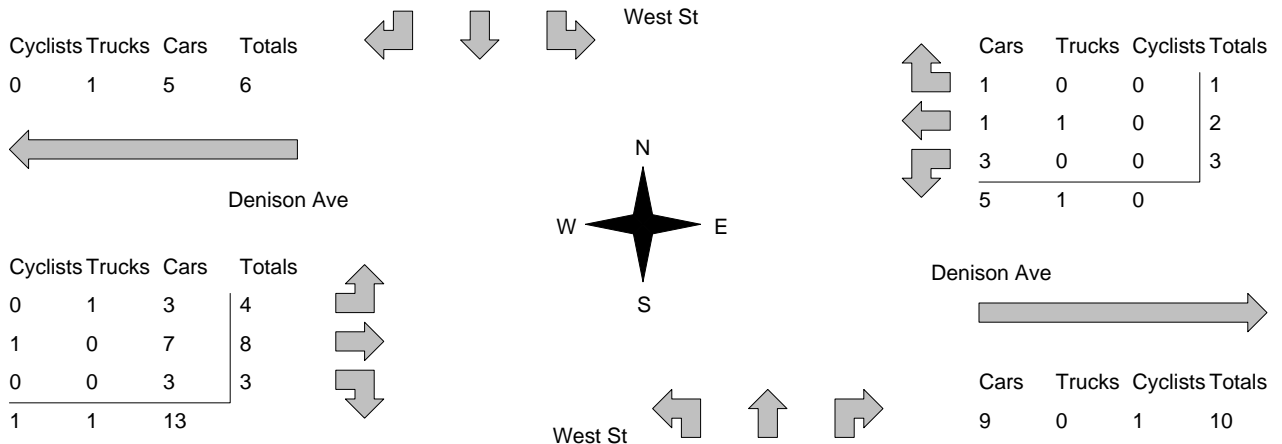
North Leg Total: 27
 North Entering: 13
 North Peds: 10
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	3	8	2	13
Totals	3	8	2	



Cyclists	0
Trucks	1
Cars	13
Totals	14

East Leg Total: 16
 East Entering: 6
 East Peds: 0
 Peds Cross: \bowtie



Peds Cross: \bowtie
 West Peds: 2
 West Entering: 15
 West Leg Total: 21

Cars	14
Trucks	0
Cyclists	0
Totals	14



Cars	1	9	0	10
Trucks	0	0	0	0
Cyclists	0	0	0	0
Totals	1	9	0	

Peds Cross: \bowtie
 South Peds: 3
 South Entering: 10
 South Leg Total: 24

Comments

Ontario Traffic Inc.

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 12:00:00

To: 13:00:00

Municipality: Brampton
Site #: 1901700001
Intersection: Denison Ave & West St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

North Leg Total: 18
 North Entering: 8
 North Peds: 6
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	3	5	0	8
Totals	3	5	0	



Cyclists	0
Trucks	0
Cars	10
Totals	10

East Leg Total: 7
 East Entering: 5
 East Peds: 0
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
1	0	8	9

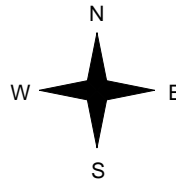


West St

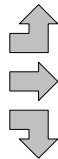
Cars	Trucks	Cyclists	Totals
0	0	0	0
3	0	1	4
1	0	0	1
4	0	1	



Denison Ave



Cyclists	Trucks	Cars	Totals
0	0	4	4
0	0	1	1
0	0	4	4
0	0	9	



Denison Ave



Peds Cross: \bowtie
 West Peds: 0
 West Entering: 9
 West Leg Total: 18

Cars	10
Trucks	0
Cyclists	0
Totals	10



Cars	2	6	1	9
Trucks	0	0	0	0
Cyclists	0	0	0	0
Totals	2	6	1	



West St

Cars	Trucks	Cyclists	Totals
2	0	0	2

Peds Cross: \bowtie
 South Peds: 0
 South Entering: 9
 South Leg Total: 19

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 15:00:00
To: 18:00:00

One Hour Peak

From: 17:00:00
To: 18:00:00

Municipality: Brampton
Site #: 1901700001
Intersection: Denison Ave & West St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

North Leg Total: 36
North Entering: 21
North Peds: 12
Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	2	19	0	21
Totals	2	19	0	



Cyclists	0
Trucks	0
Cars	15
Totals	15

East Leg Total: 17
East Entering: 7
East Peds: 5
Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
0	0	6	6

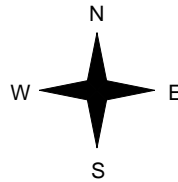


West St

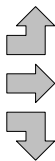
Cars	Trucks	Cyclists	Totals
0	0	0	0
4	0	0	4
3	0	0	3
7	0	0	



Denison Ave



Cyclists	Trucks	Cars	Totals
0	0	2	2
0	0	6	6
0	0	1	1
0	0	9	



Denison Ave



West St



Cars	Trucks	Cyclists	Totals
10	0	0	10

Peds Cross: \bowtie
West Peds: 4
West Entering: 9
West Leg Total: 15

Cars	23
Trucks	0
Cyclists	0
Totals	23



Cars	0	13	4	17
Trucks	0	0	0	0
Cyclists	0	0	0	0
Totals	0	13	4	

Peds Cross: \bowtie
South Peds: 1
South Entering: 17
South Leg Total: 40

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Brampton
Site #: 1901700001
Intersection: Denison Ave & West St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

North Leg Total: 166
 North Entering: 86
 North Peds: 47
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	2	0	2
Cars	12	66	6	84
Totals	12	68	6	



Cyclists 0
 Trucks 4
 Cars 76
 Totals 80

East Leg Total: 73
 East Entering: 31
 East Peds: 11
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
3	2	35	40

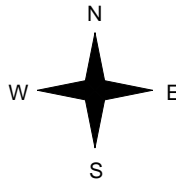


West St

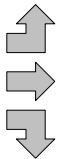
Cars	Trucks	Cyclists	Totals
3	0	0	3
15	2	3	20
8	0	0	8
26	2	3	



Denison Ave



Cyclists	Trucks	Cars	Totals
0	1	20	21
1	1	27	29
0	0	11	11
1	2	58	



Denison Ave



Peds Cross: \bowtie
 West Peds: 7
 West Entering: 61
 West Leg Total: 101

Cars	85	Cars	8	53	7	68
Trucks	2	Trucks	0	3	0	3
Cyclists	0	Cyclists	0	0	0	0
Totals	87	Totals	8	56	7	



West St



Cars	Trucks	Cyclists	Totals
40	1	1	42

Peds Cross: \bowtie
 South Peds: 8
 South Entering: 71
 South Leg Total: 158

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Denison Ave & West St

Count Date: 16-Jan-19

Municipality: Brampton

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	1	10	1	12	14	18	8:00:00	0	6	0	6	0
9:00:00	1	7	3	11	5	21	9:00:00	1	9	0	10	4
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	1	5	0	6	0	8	12:00:00	1	1	0	2	0
13:00:00	0	5	3	8	6	17	13:00:00	2	6	1	9	0
14:00:00	1	3	1	5	3	10	14:00:00	0	5	0	5	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	10	2	12	3	19	16:00:00	2	5	0	7	0
17:00:00	2	9	0	11	4	26	17:00:00	2	11	2	15	3
18:00:00	0	19	2	21	12	38	18:00:00	0	13	4	17	1
Totals:	6	68	12	86	47	157		8	56	7	71	8
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	1	1	2	1	18	8:00:00	6	6	4	16	1
9:00:00	3	3	1	7	2	18	9:00:00	2	7	2	11	2
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	1	0	1	1	6	12:00:00	4	1	0	5	0
13:00:00	1	4	0	5	0	14	13:00:00	4	1	4	9	0
14:00:00	1	0	0	1	2	4	14:00:00	1	2	0	3	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	4	0	4	0	10	16:00:00	2	4	0	6	0
17:00:00	0	3	1	4	0	6	17:00:00	0	2	0	2	0
18:00:00	3	4	0	7	5	16	18:00:00	2	6	1	9	4
Totals:	8	20	3	31	11	92		21	29	11	61	7
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	8:00	9:00	12:00	13:00		14:00	16:00	17:00	18:00			
Crossing Values:	13	15	8	8		8	12	15	28			

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700001

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
7:45:00	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
8:00:00	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
8:15:00	2	2	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0
8:30:00	2	0	2	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0
8:45:00	3	1	2	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
9:00:00	3	0	3	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	2
9:02:27	3	0	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0
11:00:00	3	0	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0
11:15:00	3	0	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	4	1
11:30:00	3	0	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
11:45:00	3	0	4	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
12:00:00	3	0	4	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
12:15:00	3	0	5	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
12:30:00	3	0	6	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
12:45:00	4	1	6	0	2	0	0	0	1	0	0	0	0	0	1	1	0	0	4	0
13:00:00	4	0	7	1	2	0	0	0	1	0	0	0	0	0	1	0	0	0	4	0
13:15:00	5	1	7	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	4	0
13:30:00	5	0	7	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	4	0
13:45:00	5	0	7	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	5	1
14:00:00	5	0	7	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	6	1
14:02:03	5	0	7	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	6	0
15:00:00	5	0	7	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	6	0
15:15:00	5	0	7	0	2	0	0	0	1	0	0	0	0	0	2	1	0	0	6	0
15:30:00	5	0	7	0	2	0	0	0	1	0	0	0	0	0	2	0	0	0	6	0
15:45:00	5	0	8	1	2	0	0	0	1	0	0	0	0	0	2	0	0	0	6	0
16:00:00	5	0	8	0	2	0	0	0	2	1	0	0	0	0	3	1	0	0	6	0
16:15:00	5	0	8	0	2	0	0	0	2	0	0	0	0	0	3	0	0	0	6	0
16:30:00	5	0	10	2	2	0	0	0	2	0	0	0	0	0	3	0	0	0	6	0
16:45:00	5	0	10	0	2	0	0	0	2	0	0	0	0	0	3	0	0	0	6	0
17:00:00	5	0	11	1	3	1	0	0	2	0	0	0	0	0	3	0	0	0	6	0
17:15:00	6	1	12	1	3	0	0	0	2	0	0	0	0	0	3	0	0	0	7	1
17:30:00	6	0	14	2	3	0	0	0	2	0	0	0	0	0	3	0	0	0	8	1
17:45:00	7	1	14	0	3	0	0	0	2	0	0	0	0	0	3	0	0	0	10	2
18:00:00	8	1	15	1	3	0	0	0	2	0	0	0	0	0	3	0	0	0	11	1
18:15:00	8	0	15	0	3	0	0	0	2	0	0	0	0	0	3	0	0	0	11	0
18:17:16	8	0	15	0	3	0	0	0	2	0	0	0	0	0	3	0	0	0	11	0

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700001

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	3	2	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
7:45:00	4	1	5	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
8:00:00	6	2	6	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
8:15:00	7	1	7	1	4	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0
8:30:00	7	0	8	1	6	2	1	0	0	0	0	0	0	0	0	0	0	0	3	2
8:45:00	7	0	12	4	6	0	1	0	0	0	0	0	0	0	1	1	0	0	3	0
9:00:00	7	0	12	0	6	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
9:02:27	7	0	12	0	6	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
11:00:00	7	0	12	0	6	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
11:15:00	9	2	13	1	6	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
11:30:00	9	0	13	0	6	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
11:45:00	9	0	13	0	6	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
12:00:00	11	2	13	0	6	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
12:15:00	12	1	14	1	8	2	1	0	0	0	0	0	0	0	1	0	0	0	3	0
12:30:00	13	1	14	0	9	1	1	0	0	0	0	0	0	0	1	0	0	0	3	0
12:45:00	14	1	14	0	9	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
13:00:00	15	1	14	0	10	1	1	0	0	0	0	0	0	0	1	0	0	0	3	0
13:15:00	16	1	14	0	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
13:30:00	16	0	14	0	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
13:45:00	16	0	15	1	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
14:00:00	16	0	16	1	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
14:02:03	16	0	16	0	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
15:00:00	16	0	16	0	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
15:15:00	16	0	16	0	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
15:30:00	18	2	17	1	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
15:45:00	18	0	19	2	10	0	1	0	0	0	0	0	0	0	1	0	0	0	3	0
16:00:00	18	0	19	0	10	0	1	0	1	1	0	0	0	0	1	0	0	0	3	0
16:15:00	18	0	19	0	10	0	1	0	1	0	0	0	0	0	1	0	0	0	3	0
16:30:00	18	0	20	1	10	0	1	0	1	0	0	0	0	0	1	0	0	0	3	0
16:45:00	18	0	21	1	10	0	1	0	1	0	0	0	0	0	1	0	0	0	3	0
17:00:00	18	0	21	0	10	0	1	0	1	0	0	0	0	0	1	0	0	0	3	0
17:15:00	19	1	22	1	10	0	1	0	1	0	0	0	0	0	1	0	0	0	5	2
17:30:00	20	1	24	2	10	0	1	0	1	0	0	0	0	0	1	0	0	0	5	0
17:45:00	20	0	24	0	10	0	1	0	1	0	0	0	0	0	1	0	0	0	7	2
18:00:00	20	0	27	3	11	1	1	0	1	0	0	0	0	0	1	0	0	0	7	0
18:15:00	20	0	27	0	11	0	1	0	1	0	0	0	0	0	1	0	0	0	7	0
18:17:16	20	0	27	0	11	0	1	0	1	0	0	0	0	0	1	0	0	0	7	0

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Brampton
Site #: 1901700002
Intersection: Denison Ave & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

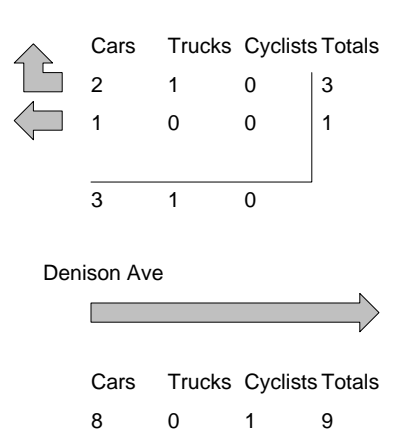
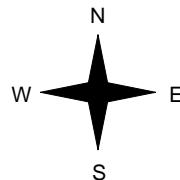
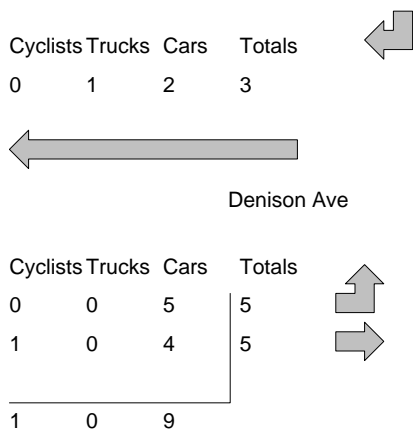
North Leg Total: 14
 North Entering: 6
 North Peds: 9
 Peds Cross: \times

Cyclists	0	0	0
Trucks	1	0	1
Cars	1	4	5
Totals	2	4	



Cyclists	0
Trucks	1
Cars	7
Totals	8

East Leg Total: 13
 East Entering: 4
 East Peds: 5
 Peds Cross: \times



Peds Cross: \times
 West Peds: 0
 West Entering: 10
 West Leg Total: 13

Comments

Ontario Traffic Inc.

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 11:45:00

To: 12:45:00

Municipality: Brampton
Site #: 1901700002
Intersection: Denison Ave & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

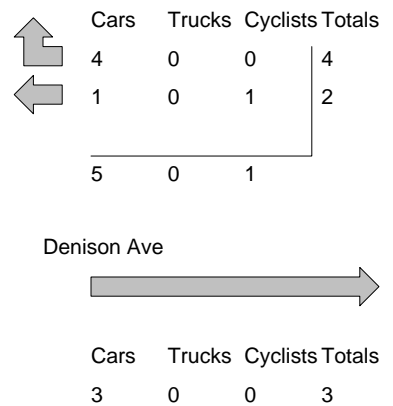
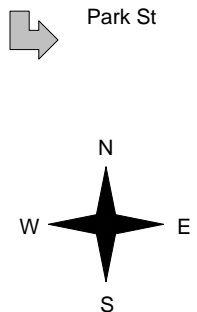
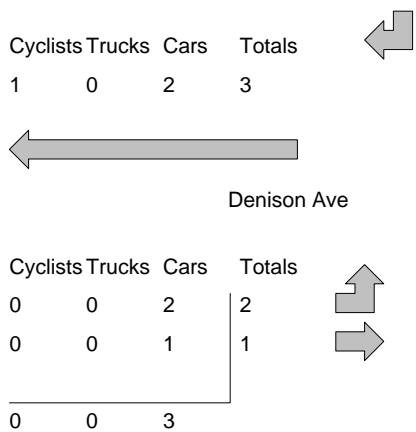
North Leg Total: 9
 North Entering: 3
 North Peds: 3
 Peds Cross: \times

Cyclists	0	0	0
Trucks	0	0	0
Cars	1	2	3
Totals	1	2	



Cyclists	0
Trucks	0
Cars	6
Totals	6

East Leg Total: 9
 East Entering: 6
 East Peds: 1
 Peds Cross: \times



Peds Cross: \times
 West Peds: 0
 West Entering: 3
 West Leg Total: 6

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 17:00:00

To: 18:00:00

Municipality: Brampton
Site #: 1901700002
Intersection: Denison Ave & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

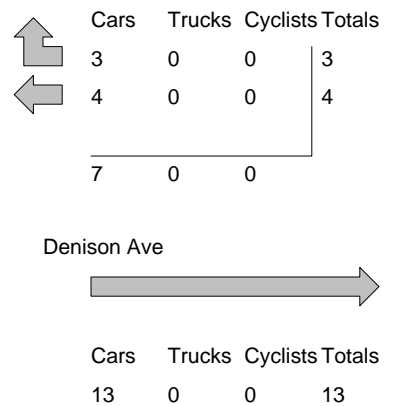
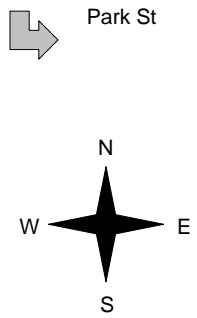
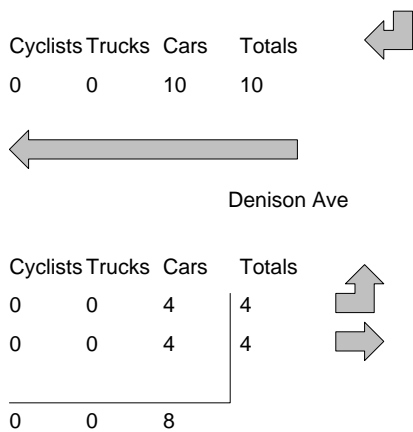
North Leg Total: 22
 North Entering: 15
 North Peds: 12
 Peds Cross: \times

Cyclists	0	0	0
Trucks	0	0	0
Cars	6	9	15
Totals	6	9	



Cyclists	0
Trucks	0
Cars	7
Totals	7

East Leg Total: 20
 East Entering: 7
 East Peds: 3
 Peds Cross: \times



Peds Cross: \times
 West Peds: 0
 West Entering: 8
 West Leg Total: 18

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Brampton
Site #: 1901700002
Intersection: Denison Ave & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Denison Ave runs W/E

North Leg Total: 79
 North Entering: 41
 North Peds: 42
 Peds Cross: ⚡

Cyclists	1	0	1
Trucks	2	0	2
Cars	14	24	38
Totals	17	24	



Cyclists	0
Trucks	3
Cars	35
Totals	38

East Leg Total: 80
 East Entering: 34
 East Peds: 14
 Peds Cross: ⚡

Cyclists	Trucks	Cars	Totals
3	2	24	29



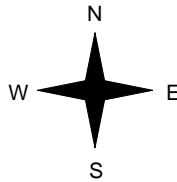
Park St



Cars	Trucks	Cyclists	Totals
19	3	0	22
10	0	2	12
<hr/>			
29	3	2	



Denison Ave



Cyclists	Trucks	Cars	Totals
0	0	16	16
1	1	20	22
<hr/>			
1	1	36	



Denison Ave



Cars	Trucks	Cyclists	Totals
44	1	1	46

Peds Cross: ⚡
 West Peds: 2
 West Entering: 38
 West Leg Total: 67

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Denison Ave & Park St

Count Date: 16-Jan-19

Municipality: Brampton

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	2	0	2	4	14	4	8:00:00	0	0	0	0	0
9:00:00	3	0	2	5	5	5	9:00:00	0	0	0	0	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	0	0	0	0	0	12:00:00	0	0	0	0	0
13:00:00	2	0	1	3	4	3	13:00:00	0	0	0	0	0
14:00:00	2	0	0	2	4	2	14:00:00	0	0	0	0	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	1	0	4	5	1	5	16:00:00	0	0	0	0	0
17:00:00	5	0	2	7	2	7	17:00:00	0	0	0	0	0
18:00:00	9	0	6	15	12	15	18:00:00	0	0	0	0	0
Totals:	24	0	17	41	42	41		0	0	0	0	0

East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	0	4	4	2	11	8:00:00	2	5	0	7	0
9:00:00	0	2	1	3	3	11	9:00:00	5	3	0	8	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	0	2	2	0	5	12:00:00	1	2	0	3	0
13:00:00	0	3	3	6	1	8	13:00:00	1	1	0	2	0
14:00:00	0	1	2	3	2	6	14:00:00	0	3	0	3	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	1	3	4	1	8	16:00:00	0	4	0	4	2
17:00:00	0	1	4	5	2	8	17:00:00	3	0	0	3	0
18:00:00	0	4	3	7	3	15	18:00:00	4	4	0	8	0
Totals:	0	12	22	34	14	72		16	22	0	38	2

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	4	6	0	3	4	4	7	12

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700002

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians		
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross		
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
7:30:00	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4
7:45:00	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	2
8:00:00	2	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	5
8:15:00	3	1	0	0	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	15	1
8:30:00	4	1	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	17	2
8:45:00	5	1	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	18	1
9:00:00	5	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	19	1
9:01:24	5	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	19	0
11:00:00	5	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	19	0
11:15:00	5	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	19	0
11:30:00	5	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	19	0
11:45:00	5	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	19	0
12:00:00	5	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	19	0
12:15:00	7	2	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	21	2
12:30:00	7	0	0	0	4	1	0	0	0	0	1	0	0	0	0	0	0	0	0	22	1
12:45:00	7	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	22	0
13:00:00	7	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	23	1
13:15:00	7	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	24	1
13:30:00	7	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	24	0
13:45:00	9	2	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	27	3
14:00:00	9	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	27	0
14:02:27	9	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	27	0
15:00:00	9	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	27	0
15:15:00	10	1	0	0	4	0	0	0	0	0	1	0	0	0	0	0	1	1	0	27	0
15:30:00	10	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	1	0	0	27	0
15:45:00	10	0	0	0	5	1	0	0	0	0	1	0	0	0	0	0	1	0	0	28	1
16:00:00	10	0	0	0	6	1	0	0	0	0	2	1	0	0	0	0	1	0	0	28	0
16:15:00	11	1	0	0	7	1	0	0	0	0	2	0	0	0	0	0	1	0	0	28	0
16:30:00	12	1	0	0	7	0	0	0	0	0	2	0	0	0	0	0	1	0	0	29	1
16:45:00	15	3	0	0	7	0	0	0	0	0	2	0	0	0	0	0	1	0	0	29	0
17:00:00	15	0	0	0	8	1	0	0	0	0	2	0	0	0	0	0	1	0	0	30	1
17:15:00	15	0	0	0	10	2	0	0	0	0	2	0	0	0	0	0	1	0	0	33	3
17:30:00	17	2	0	0	12	2	0	0	0	0	2	0	0	0	0	0	1	0	0	39	6
17:45:00	19	2	0	0	12	0	0	0	0	0	2	0	0	0	0	0	1	0	0	40	1
18:00:00	24	5	0	0	14	2	0	0	0	0	2	0	0	0	0	0	1	0	0	42	2
18:15:00	24	0	0	0	14	0	0	0	0	0	2	0	0	0	0	0	1	0	0	42	0
18:16:25	24	0	0	0	14	0	0	0	0	0	2	0	0	0	0	0	1	0	0	42	0

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700002

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	0	0	0	0	3	1	0	0	0	0	0	1	1	0	0	0	0	0	0	2
8:15:00	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
8:30:00	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
8:45:00	0	0	1	1	4	1	0	0	0	0	0	1	0	0	0	0	0	0	0	5
9:00:00	0	0	2	1	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
9:01:24	0	0	2	0	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
11:00:00	0	0	2	0	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
11:15:00	0	0	2	0	5	1	0	0	0	0	0	1	0	0	0	0	0	0	0	5
11:30:00	0	0	2	0	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
11:45:00	0	0	2	0	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
12:00:00	0	0	2	0	6	1	0	0	0	0	0	1	0	0	0	0	0	0	0	5
12:15:00	0	0	3	1	7	1	0	0	0	0	0	1	0	0	0	0	0	0	0	6
12:30:00	0	0	3	0	8	1	0	0	0	0	0	1	0	0	0	0	0	0	0	6
12:45:00	0	0	3	0	9	1	0	0	0	0	0	1	0	0	0	1	1	0	0	6
13:00:00	0	0	4	1	9	0	0	0	0	0	0	1	0	0	0	1	0	0	0	6
13:15:00	0	0	4	0	9	0	0	0	0	0	0	1	0	0	0	1	0	0	0	6
13:30:00	0	0	4	0	10	1	0	0	0	0	0	1	0	0	0	1	0	0	0	7
13:45:00	0	0	4	0	11	1	0	0	0	0	0	1	0	0	0	1	0	0	0	7
14:00:00	0	0	5	1	11	0	0	0	0	0	0	1	0	0	0	1	0	0	0	8
14:02:27	0	0	5	0	11	0	0	0	0	0	0	1	0	0	0	1	0	0	0	8
15:00:00	0	0	5	0	11	0	0	0	0	0	0	1	0	0	0	1	0	0	0	8
15:15:00	0	0	5	0	12	1	0	0	0	0	0	1	0	0	0	1	0	0	0	8
15:30:00	0	0	5	0	12	0	0	0	0	0	0	1	0	0	0	1	0	0	0	8
15:45:00	0	0	5	0	12	0	0	0	0	0	0	3	2	0	0	1	0	0	0	9
16:00:00	0	0	5	0	12	0	0	0	0	0	0	3	0	0	0	2	1	0	0	9
16:15:00	0	0	5	0	14	2	0	0	0	0	0	3	0	0	0	2	0	0	0	10
16:30:00	0	0	6	1	14	0	0	0	0	0	0	3	0	0	0	2	0	0	0	10
16:45:00	0	0	6	0	16	2	0	0	0	0	0	3	0	0	0	2	0	0	0	11
17:00:00	0	0	6	0	16	0	0	0	0	0	0	3	0	0	0	2	0	0	0	11
17:15:00	0	0	6	0	16	0	0	0	0	0	0	3	0	0	0	2	0	0	0	13
17:30:00	0	0	6	0	18	2	0	0	0	0	0	3	0	0	0	2	0	0	0	13
17:45:00	0	0	6	0	18	0	0	0	0	0	0	3	0	0	0	2	0	0	0	13
18:00:00	0	0	10	4	19	1	0	0	0	0	0	3	0	0	0	2	0	0	0	14
18:15:00	0	0	10	0	19	0	0	0	0	0	0	3	0	0	0	2	0	0	0	14
18:16:25	0	0	10	0	19	0	0	0	0	0	0	3	0	0	0	2	0	0	0	14

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700002

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	2	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	2	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	2	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30:00	3	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45:00	7	4	7	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
9:00:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
9:01:24	7	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11:00:00	7	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11:15:00	7	0	9	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11:30:00	7	0	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11:45:00	7	0	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12:00:00	8	1	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12:15:00	9	1	10	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12:30:00	9	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12:45:00	9	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
13:00:00	9	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
13:15:00	9	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
13:30:00	9	0	11	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
13:45:00	9	0	12	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
14:00:00	9	0	13	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
14:02:27	9	0	13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
15:00:00	9	0	13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
15:15:00	9	0	13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
15:30:00	9	0	14	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2
15:45:00	9	0	16	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0
16:00:00	9	0	16	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	2	0
16:15:00	10	1	16	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
16:30:00	11	1	16	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
16:45:00	11	0	16	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
17:00:00	12	1	16	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
17:15:00	12	0	16	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
17:30:00	16	4	17	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
17:45:00	16	0	17	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
18:00:00	16	0	20	3	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
18:15:00	16	0	20	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0
18:16:25	16	0	20	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	0

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Brampton
Site #: 1901700003
Intersection: Nelson St W & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Nelson St W runs W/E

North Leg Total: 15
 North Entering: 10
 North Peds: 1
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	0	2	2
Cars	1	3	4	8
Totals	1	3	6	



Cyclists	0
Trucks	1
Cars	4
Totals	5

East Leg Total: 486
 East Entering: 138
 East Peds: 4
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
0	4	104	108

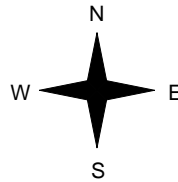


Park St

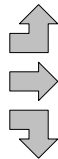
Cars	Trucks	Cyclists	Totals
1	1	0	2
102	3	0	105
31	0	0	31
134	4	0	



Nelson St W



Cyclists	Trucks	Cars	Totals
0	0	1	1
0	3	288	291
0	0	3	3
0	3	292	



Park St

Nelson St W



Cars	Trucks	Cyclists	Totals
343	5	0	348

Peds Cross: \bowtie
 West Peds: 0
 West Entering: 295
 West Leg Total: 403

Cars	37
Trucks	0
Cyclists	0
Totals	37



Cars	1	2	51	54
Trucks	1	0	0	1
Cyclists	0	0	0	0
Totals	2	2	51	

Peds Cross: \bowtie
 South Peds: 1
 South Entering: 55
 South Leg Total: 92

Comments

Ontario Traffic Inc.

Mid-day Peak Diagram

Specified Period

From: 11:00:00
To: 14:00:00

One Hour Peak

From: 12:00:00
To: 13:00:00

Municipality: Brampton
Site #: 1901700003
Intersection: Nelson St W & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Nelson St W runs W/E

North Leg Total: 7
North Entering: 4
North Peds: 5
Peds Cross: \times

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	1	2	1	4
Totals	1	2	1	



Cyclists	0
Trucks	0
Cars	3
Totals	3

East Leg Total: 184
East Entering: 97
East Peds: 0
Peds Cross: \times

Cyclists	0
Trucks	1
Cars	78
Totals	79

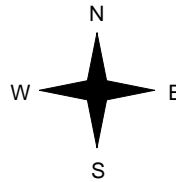


Park St

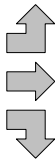
Cars	1	0	0	1
Trucks	75	1	0	76
Cyclists	20	0	0	20
Totals	96	1	0	



Nelson St W



Cyclists	0
Trucks	0
Cars	0
Totals	0
Cyclists	0
Trucks	2
Cars	71
Totals	73
Cyclists	0
Trucks	1
Cars	1
Totals	2
Cyclists	0
Trucks	3
Cars	72
Totals	



Park St

Nelson St W



Cars	84	3	0	87
Trucks				
Cyclists				
Totals				

Peds Cross: \times
West Peds: 0
West Entering: 75
West Leg Total: 154

Cars	23
Trucks	1
Cyclists	0
Totals	24



Cars	2	2	12	16
Trucks	0	0	1	1
Cyclists	0	0	0	0
Totals	2	2	13	

Peds Cross: \times
South Peds: 5
South Entering: 17
South Leg Total: 41

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 15:00:00
To: 18:00:00

One Hour Peak

From: 17:00:00
To: 18:00:00

Municipality: Brampton
Site #: 1901700003
Intersection: Nelson St W & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Nelson St W runs W/E

North Leg Total: 20
North Entering: 13
North Peds: 16
Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	2	4	7	13
Totals	2	4	7	



Cyclists	0
Trucks	0
Cars	7
Totals	7

East Leg Total: 487
East Entering: 266
East Peds: 1
Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
1	0	255	256

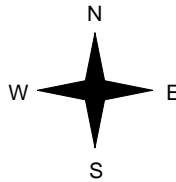


Park St

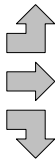
Cars	Trucks	Cyclists	Totals
3	0	0	3
251	0	1	252
11	0	0	11
265	0	1	



Nelson St W



Cyclists	Trucks	Cars	Totals
0	0	1	1
0	0	168	168
0	1	2	3
0	1	171	



Nelson St W



Peds Cross: \bowtie
West Peds: 0
West Entering: 172
West Leg Total: 428

Cars	17	Cars	2	3	46	51
Trucks	1	Trucks	0	0	0	0
Cyclists	0	Cyclists	0	0	0	0
Totals	18	Totals	2	3	46	



Peds Cross: \bowtie
South Peds: 1
South Entering: 51
South Leg Total: 69

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Brampton
Site #: 1901700003
Intersection: Nelson St W & Park St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Nelson St W runs W/E

North Leg Total: 103
 North Entering: 62
 North Peds: 46
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	0	2	3	5
Cars	5	25	27	57
Totals	5	27	30	



Cyclists 0
 Trucks 4
 Cars 37
 Totals 41

East Leg Total: 2573
 East Entering: 1143
 East Peds: 14
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
1	12	995	1008

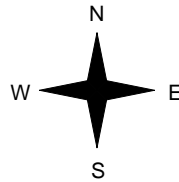


Park St

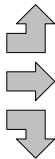
Cars	Trucks	Cyclists	Totals
16	1	0	17
981	11	1	993
133	0	0	133
1130	12	1	



Nelson St W



Cyclists	Trucks	Cars	Totals
0	0	2	2
1	17	1157	1175
0	4	11	15
1	21	1170	



Nelson St W



Peds Cross: \bowtie
 West Peds: 2
 West Entering: 1192
 West Leg Total: 2200

Cars	169
Trucks	6
Cyclists	0
Totals	175



Cars	9	19	221	249
Trucks	1	3	3	7
Cyclists	0	0	1	1
Totals	10	22	225	

Park St



Cars	Trucks	Cyclists	Totals
1405	23	2	1430

Peds Cross: \bowtie
 South Peds: 21
 South Entering: 257
 South Leg Total: 432

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Nelson St W & Park St

Count Date: 16-Jan-19

Municipality: Brampton

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	8	3	1	12	5	51	8:00:00	0	2	37	39	0
9:00:00	1	2	1	4	5	49	9:00:00	2	1	42	45	1
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	1	3	0	4	4	18	12:00:00	0	2	12	14	4
13:00:00	1	2	1	4	5	21	13:00:00	2	2	13	17	5
14:00:00	3	3	0	6	4	20	14:00:00	1	2	11	14	2
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	6	6	0	12	2	43	16:00:00	2	2	27	31	4
17:00:00	3	4	0	7	5	53	17:00:00	1	8	37	46	4
18:00:00	7	4	2	13	16	64	18:00:00	2	3	46	51	1
Totals:	30	27	5	62	46	319		10	22	225	257	21
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	11	77	4	92	1	305	8:00:00	0	213	0	213	0
9:00:00	31	114	1	146	4	446	9:00:00	1	295	4	300	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	15	60	2	77	3	147	12:00:00	0	69	1	70	0
13:00:00	20	76	1	97	0	172	13:00:00	0	73	2	75	0
14:00:00	7	74	2	83	1	159	14:00:00	0	75	1	76	1
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	19	133	3	155	1	302	16:00:00	0	145	2	147	1
17:00:00	19	207	1	227	3	366	17:00:00	0	137	2	139	0
18:00:00	11	252	3	266	1	438	18:00:00	1	168	3	172	0
Totals:	133	993	17	1143	14	2335		2	1175	15	1192	2
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	8:00	9:00	12:00	13:00		14:00	16:00	17:00	18:00			
Crossing Values:	12	9	7	5		9	16	15	14			

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700003

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians		
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross		
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15:00	1	1	19	19	2	2	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1
7:30:00	5	4	40	21	2	0	0	0	2	1	0	0	0	0	0	0	0	0	0	1	0
7:45:00	8	3	59	19	2	0	0	0	3	1	0	0	0	0	0	0	0	0	0	1	0
8:00:00	11	3	73	14	3	1	0	0	4	1	1	1	0	0	0	0	0	0	0	1	0
8:15:00	22	11	103	30	3	0	0	0	6	2	1	0	0	0	0	0	0	0	0	3	2
8:30:00	30	8	136	33	3	0	0	0	6	0	1	0	0	0	0	0	0	0	0	4	1
8:45:00	39	9	161	25	3	0	0	0	6	0	1	0	0	0	0	0	0	0	0	5	1
9:00:00	42	3	185	24	4	1	0	0	6	0	1	0	0	0	0	0	0	0	0	5	0
9:01:56	42	0	185	0	4	0	0	0	6	0	1	0	0	0	0	0	0	0	0	5	0
11:00:00	42	0	185	0	4	0	0	0	6	0	1	0	0	0	0	0	0	0	0	5	0
11:15:00	44	2	201	16	4	0	0	0	6	0	1	0	0	0	0	0	0	0	0	5	0
11:30:00	48	4	212	11	5	1	0	0	6	0	1	0	0	0	0	0	0	0	0	8	3
11:45:00	51	3	231	19	5	0	0	0	6	0	1	0	0	0	0	0	0	0	0	8	0
12:00:00	57	6	245	14	6	1	0	0	6	0	1	0	0	0	0	0	0	0	0	8	0
12:15:00	66	9	265	20	6	0	0	0	6	0	1	0	0	0	0	0	0	0	0	8	0
12:30:00	71	5	277	12	6	0	0	0	6	0	1	0	0	0	0	0	0	0	0	8	0
12:45:00	76	5	298	21	7	1	0	0	6	0	1	0	0	0	0	0	0	0	0	8	0
13:00:00	77	1	320	22	7	0	0	0	7	1	1	0	0	0	0	0	0	0	0	8	0
13:15:00	79	2	344	24	8	1	0	0	8	1	1	0	0	0	0	0	0	0	0	8	0
13:30:00	80	1	353	9	9	1	0	0	8	0	1	0	0	0	0	0	0	0	0	8	0
13:45:00	81	1	370	17	9	0	0	0	8	0	1	0	0	0	0	0	0	0	0	8	0
14:00:00	84	3	393	23	9	0	0	0	8	0	1	0	0	0	0	0	0	0	0	9	1
14:01:59	84	0	393	0	9	0	0	0	8	0	1	0	0	0	0	0	0	0	0	9	0
15:00:00	84	0	393	0	9	0	0	0	8	0	1	0	0	0	0	0	0	0	0	9	0
15:15:00	86	2	425	32	11	2	0	0	8	0	1	0	0	0	0	0	0	0	0	10	1
15:30:00	91	5	455	30	11	0	0	0	8	0	1	0	0	0	0	0	0	0	0	10	0
15:45:00	99	8	490	35	11	0	0	0	9	1	1	0	0	0	0	0	0	0	0	10	0
16:00:00	103	4	524	34	12	1	0	0	10	1	1	0	0	0	0	0	0	0	0	10	0
16:15:00	106	3	561	37	12	0	0	0	11	1	1	0	0	0	0	0	0	0	0	10	0
16:30:00	112	6	616	55	13	1	0	0	11	0	1	0	0	0	0	0	0	0	0	10	0
16:45:00	116	4	663	47	13	0	0	0	11	0	1	0	0	0	0	0	0	0	0	11	1
17:00:00	122	6	730	67	13	0	0	0	11	0	1	0	0	0	0	0	0	0	0	13	2
17:15:00	124	2	792	62	13	0	0	0	11	0	1	0	0	0	1	1	0	0	0	13	0
17:30:00	125	1	848	56	14	1	0	0	11	0	1	0	0	0	1	0	0	0	0	13	0
17:45:00	127	2	907	59	16	2	0	0	11	0	1	0	0	0	1	0	0	0	0	13	0
18:00:00	133	6	981	74	16	0	0	0	11	0	1	0	0	0	1	0	0	0	0	14	1
18:15:00	133	0	981	0	16	0	0	0	11	0	1	0	0	0	1	0	0	0	0	14	0
18:17:27	133	0	981	0	16	0	0	0	11	0	1	0	0	0	1	0	0	0	0	14	0

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700003

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	1	1	13	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	0	0	1	0	20	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	0	0	2	1	37	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	0	0	2	0	51	14	1	1	0	0	0	0	0	0	0	0	0	0	1	1
8:30:00	1	1	2	0	58	7	1	0	0	0	0	0	0	0	0	0	0	0	1	0
8:45:00	1	0	3	1	71	13	1	0	0	0	0	0	0	0	0	0	0	0	1	0
9:00:00	1	0	3	0	79	8	1	0	0	0	0	0	0	0	0	0	0	0	1	0
9:01:56	1	0	3	0	79	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
11:00:00	1	0	3	0	79	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
11:15:00	1	0	4	1	80	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
11:30:00	1	0	4	0	83	3	1	0	0	0	1	1	0	0	0	0	0	0	3	2
11:45:00	1	0	5	1	86	3	1	0	0	0	1	0	0	0	0	0	0	0	4	1
12:00:00	1	0	5	0	90	4	1	0	0	0	1	0	0	0	0	0	0	0	5	1
12:15:00	1	0	5	0	94	4	1	0	0	0	2	1	0	0	0	0	0	0	6	1
12:30:00	2	1	7	2	96	2	1	0	0	0	2	0	0	0	0	0	0	0	8	2
12:45:00	2	0	7	0	100	4	1	0	0	0	2	0	0	0	0	0	0	0	9	1
13:00:00	3	1	7	0	102	2	1	0	0	0	2	0	0	0	0	0	0	0	10	1
13:15:00	3	0	7	0	102	0	1	0	0	0	2	0	0	0	0	0	0	0	11	1
13:30:00	3	0	7	0	106	4	1	0	0	0	2	0	0	0	0	0	0	0	12	1
13:45:00	3	0	8	1	111	5	1	0	0	0	2	0	0	0	0	0	0	0	12	0
14:00:00	4	1	9	1	113	2	1	0	0	0	2	0	0	0	0	0	0	0	12	0
14:01:59	4	0	9	0	113	0	1	0	0	0	2	0	0	0	0	0	0	0	12	0
15:00:00	4	0	9	0	113	0	1	0	0	0	2	0	0	0	0	0	0	0	12	0
15:15:00	4	0	9	0	115	2	1	0	0	0	2	0	0	0	0	0	0	0	13	1
15:30:00	4	0	9	0	122	7	1	0	0	0	3	1	0	0	0	0	0	0	14	1
15:45:00	6	2	9	0	131	9	1	0	2	2	3	0	0	0	0	0	0	0	15	1
16:00:00	6	0	9	0	139	8	1	0	2	0	3	0	0	0	0	0	0	0	16	1
16:15:00	6	0	11	2	147	8	1	0	2	0	3	0	0	0	0	0	0	0	17	1
16:30:00	6	0	13	2	151	4	1	0	3	1	3	0	0	0	0	0	0	0	17	0
16:45:00	7	1	16	3	167	16	1	0	3	0	3	0	0	0	0	0	0	0	19	2
17:00:00	7	0	16	0	175	8	1	0	3	0	3	0	0	0	0	0	1	1	20	1
17:15:00	8	1	16	0	194	19	1	0	3	0	3	0	0	0	0	0	1	0	20	0
17:30:00	8	0	16	0	205	11	1	0	3	0	3	0	0	0	0	0	1	0	20	0
17:45:00	9	1	16	0	216	11	1	0	3	0	3	0	0	0	0	0	1	0	21	1
18:00:00	9	0	19	3	221	5	1	0	3	0	3	0	0	0	0	0	1	0	21	0
18:15:00	9	0	19	0	221	0	1	0	3	0	3	0	0	0	0	0	1	0	21	0
18:17:27	9	0	19	0	221	0	1	0	3	0	3	0	0	0	0	0	1	0	21	0

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700003

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	86	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	0	0	129	43	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
8:00:00	0	0	211	82	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
8:15:00	0	0	280	69	1	1	0	0	3	1	0	0	0	0	0	0	0	0	0	0
8:30:00	0	0	370	90	3	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0
8:45:00	1	1	417	47	3	0	0	0	5	2	0	0	0	0	0	0	0	0	0	0
9:00:00	1	0	501	84	3	0	0	0	7	2	1	1	0	0	0	0	0	0	0	0
9:01:56	1	0	501	0	3	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0
11:00:00	1	0	501	0	3	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0
11:15:00	1	0	519	18	3	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0
11:30:00	1	0	542	23	4	1	0	0	7	0	1	0	0	0	0	0	0	0	0	0
11:45:00	1	0	555	13	4	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0
12:00:00	1	0	570	15	4	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0
12:15:00	1	0	586	16	5	1	0	0	7	0	1	0	0	0	0	0	0	0	0	0
12:30:00	1	0	600	14	5	0	0	0	8	1	1	0	0	0	0	0	0	0	0	0
12:45:00	1	0	622	22	5	0	0	0	9	1	2	1	0	0	0	0	0	0	0	0
13:00:00	1	0	641	19	5	0	0	0	9	0	2	0	0	0	0	0	0	0	0	0
13:15:00	1	0	653	12	5	0	0	0	9	0	2	0	0	0	1	1	0	0	0	0
13:30:00	1	0	673	20	5	0	0	0	9	0	2	0	0	0	1	0	0	0	0	0
13:45:00	1	0	690	17	5	0	0	0	9	0	2	0	0	0	1	0	0	0	0	0
14:00:00	1	0	715	25	6	1	0	0	9	0	2	0	0	0	1	0	0	0	1	1
14:01:59	1	0	715	0	6	0	0	0	9	0	2	0	0	0	1	0	0	0	1	0
15:00:00	1	0	715	0	6	0	0	0	9	0	2	0	0	0	1	0	0	0	1	0
15:15:00	1	0	749	34	6	0	0	0	10	1	2	0	0	0	1	0	0	0	1	0
15:30:00	1	0	788	39	6	0	0	0	12	2	2	0	0	0	1	0	0	0	2	1
15:45:00	1	0	819	31	6	0	0	0	14	2	3	1	0	0	1	0	0	0	2	0
16:00:00	1	0	855	36	7	1	0	0	14	0	3	0	0	0	1	0	0	0	2	0
16:15:00	1	0	889	34	8	1	0	0	15	1	3	0	0	0	1	0	0	0	2	0
16:30:00	1	0	926	37	8	0	0	0	16	1	3	0	0	0	1	0	0	0	2	0
16:45:00	1	0	952	26	9	1	0	0	17	1	3	0	0	0	1	0	0	0	2	0
17:00:00	1	0	989	37	9	0	0	0	17	0	3	0	0	0	1	0	0	0	2	0
17:15:00	1	0	1032	43	9	0	0	0	17	0	3	0	0	0	1	0	0	0	2	0
17:30:00	2	1	1073	41	11	2	0	0	17	0	3	0	0	0	1	0	0	0	2	0
17:45:00	2	0	1115	42	11	0	0	0	17	0	3	0	0	0	1	0	0	0	2	0
18:00:00	2	0	1157	42	11	0	0	0	17	0	4	1	0	0	1	0	0	0	2	0
18:15:00	2	0	1157	0	11	0	0	0	17	0	4	0	0	0	1	0	0	0	2	0
18:17:27	2	0	1157	0	11	0	0	0	17	0	4	0	0	0	1	0	0	0	2	0

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 7:00:00
To: 9:00:00

One Hour Peak

From: 8:00:00
To: 9:00:00

Municipality: Brampton
Site #: 1901700005
Intersection: Mill St N & Railroad St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Mill St N runs N/S

North Leg Total: 593
North Entering: 304
North Peds: 1
Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	1	1	0	2
Cars	78	191	33	302
Totals	79	192	33	



Cyclists 1
Trucks 3
Cars 285
Totals 289

East Leg Total: 140
East Entering: 38
East Peds: 20
Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
0	3	87	90

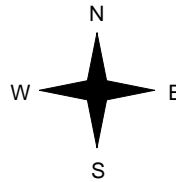


Mill St N

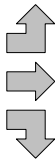
Cars	Trucks	Cyclists	Totals
25	0	0	25
9	2	0	11
2	0	0	2
36	2	0	



Railroad St



Cyclists	Trucks	Cars	Totals
1	0	99	100
0	3	33	36
0	0	4	4
1	3	136	



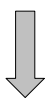
Railroad St



Cars	Trucks	Cyclists	Totals
99	3	0	102

Peds Cross: \bowtie
West Peds: 4
West Entering: 140
West Leg Total: 230

Cars	197	Cars	0	161	33	194
Trucks	1	Trucks	0	3	0	3
Cyclists	0	Cyclists	0	0	0	0
Totals	198	Totals	0	164	33	



Peds Cross: \bowtie
South Peds: 24
South Entering: 197
South Leg Total: 395

Comments

Ontario Traffic Inc.

Mid-day Peak Diagram

Specified Period

From: 11:00:00
To: 14:00:00

One Hour Peak

From: 11:45:00
To: 12:45:00

Municipality: Brampton
Site #: 1901700005
Intersection: Mill St N & Railroad St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Mill St N runs N/S

North Leg Total: 391
North Entering: 203
North Peds: 3
Peds Cross: \bowtie

Cyclists	1	0	1	2
Trucks	1	2	0	3
Cars	73	106	19	198
Totals	75	108	20	



Cyclists	1
Trucks	2
Cars	185
Totals	188

East Leg Total: 76
East Entering: 34
East Peds: 10
Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
1	3	82	86

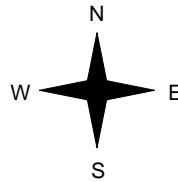


Mill St N

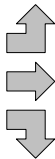
Cars	Trucks	Cyclists	Totals
23	2	1	26
5	2	0	7
1	0	0	1
29	4	1	



Railroad St



Cyclists	Trucks	Cars	Totals
0	0	64	64
0	3	12	15
0	0	7	7
0	3	83	



Railroad St



Peds Cross: \bowtie
West Peds: 6
West Entering: 86
West Leg Total: 172

Cars	114
Trucks	2
Cyclists	0
Totals	116



Cars	4	98	7	109
Trucks	0	0	0	0
Cyclists	0	0	0	0
Totals	4	98	7	



Mill St N

Cars	Trucks	Cyclists	Totals
38	3	1	42

Peds Cross: \bowtie
South Peds: 9
South Entering: 109
South Leg Total: 225

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 15:00:00
To: 18:00:00

One Hour Peak

From: 17:00:00
To: 18:00:00

Municipality: Brampton
Site #: 1901700005
Intersection: Mill St N & Railroad St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Mill St N runs N/S

North Leg Total: 645
North Entering: 346
North Peds: 5
Peds Cross: \times

Cyclists	0	0	0	0
Trucks	0	0	1	1
Cars	161	162	22	345
Totals	161	162	23	



Cyclists	2
Trucks	1
Cars	296
Totals	299

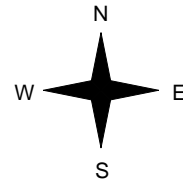
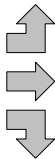
East Leg Total: 132
East Entering: 52
East Peds: 29
Peds Cross: \times

Cyclists	Trucks	Cars	Totals
0	3	178	181



Railroad St

Cyclists	Trucks	Cars	Totals
1	0	70	71
0	2	19	21
0	0	7	7
1	2	96	



Mill St N

Cars	Trucks	Cyclists	Totals
28	1	0	29
14	3	0	17
6	0	0	6
48	4	0	

Railroad St



Cars	Trucks	Cyclists	Totals
77	3	0	80

Peds Cross: \times
West Peds: 4
West Entering: 99
West Leg Total: 280

Cars	175	Cars	3	198	36	237
Trucks	0	Trucks	0	0	0	0
Cyclists	0	Cyclists	0	1	0	1
Totals	175	Totals	3	199	36	



Peds Cross: \times
South Peds: 113
South Entering: 238
South Leg Total: 413

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Brampton
Site #: 1901700005
Intersection: Mill St N & Railroad St
TFR File #: 1
Count date: 16-Jan-19

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Mill St N runs N/S

North Leg Total: 3892
 North Entering: 1995
 North Peds: 17
 Peds Cross: ⚡

Cyclists	3	0	2	5
Trucks	5	12	2	19
Cars	786	1021	164	1971
Totals	794	1033	168	



Cyclists	4
Trucks	22
Cars	1871
Totals	1897

East Leg Total: 863
 East Entering: 323
 East Peds: 162
 Peds Cross: ⚡

Cyclists	Trucks	Cars	Totals
3	27	874	904

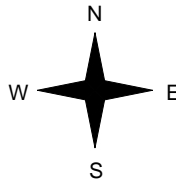


Mill St N

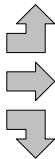
Cars	Trucks	Cyclists	Totals
191	7	1	199
74	22	0	96
28	0	0	28
293	29	1	



Railroad St



Cyclists	Trucks	Cars	Totals
2	0	561	563
2	22	164	188
0	1	28	29
4	23	753	



Railroad St



Peds Cross: ⚡
 West Peds: 38
 West Entering: 780
 West Leg Total: 1684

Cars	1077
Trucks	13
Cyclists	0
Totals	1090



Cars	14	1119	183	1316
Trucks	0	15	1	16
Cyclists	0	1	0	1
Totals	14	1135	184	

Peds Cross: ⚡
 South Peds: 311
 South Entering: 1333
 South Leg Total: 2423

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Mill St N & Railroad St

Count Date: 16-Jan-19

Municipality: Brampton

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	32	96	56	184	3	366	8:00:00	5	107	70	182	60
9:00:00	33	192	79	304	1	501	9:00:00	0	164	33	197	24
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	21	90	66	177	1	277	12:00:00	0	94	6	100	7
13:00:00	20	97	70	187	3	286	13:00:00	4	85	10	99	11
14:00:00	8	77	77	162	0	261	14:00:00	1	95	3	99	16
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	12	153	136	301	2	483	16:00:00	0	173	9	182	26
17:00:00	19	166	149	334	2	570	17:00:00	1	218	17	236	54
18:00:00	23	162	161	346	5	584	18:00:00	3	199	36	238	113
Totals:	168	1033	794	1995	17	3328		14	1135	184	1333	311
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	6	13	21	40	63	167	8:00:00	67	55	5	127	2
9:00:00	2	11	25	38	20	178	9:00:00	100	36	4	140	4
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	2	8	21	31	4	106	12:00:00	63	11	1	75	5
13:00:00	2	11	28	41	10	117	13:00:00	54	16	6	76	5
14:00:00	6	11	14	31	5	114	14:00:00	59	22	2	83	3
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	2	10	29	41	6	125	16:00:00	72	12	0	84	6
17:00:00	2	15	32	49	25	145	17:00:00	77	15	4	96	9
18:00:00	6	17	29	52	29	151	18:00:00	71	21	7	99	4
Totals:	28	96	199	323	162	1103		563	188	29	780	38
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	8:00	9:00	12:00	13:00		14:00	16:00	17:00	18:00			
Crossing Values:	191	163	84	86		103	114	150	216			

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700005

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	12	12	18	18	17	17	0	0	0	0	0	0	0	0	0	0	0	0	2	2
7:30:00	19	7	41	23	28	11	0	0	2	2	0	0	0	0	0	0	0	0	3	1
7:45:00	24	5	67	26	40	12	0	0	2	0	0	0	0	0	0	0	0	0	3	0
8:00:00	32	8	93	26	56	16	0	0	3	1	0	0	0	0	0	0	0	0	3	0
8:15:00	39	7	153	60	84	28	0	0	4	1	0	0	0	0	0	0	0	0	4	1
8:30:00	50	11	202	49	102	18	0	0	4	0	0	0	0	0	0	0	0	0	4	0
8:45:00	58	8	248	46	118	16	0	0	4	0	0	0	0	0	0	0	0	0	4	0
9:00:00	65	7	284	36	134	16	0	0	4	0	1	1	0	0	0	0	0	0	4	0
9:00:12	65	0	284	0	134	0	0	0	4	0	1	0	0	0	0	0	0	0	4	0
11:00:00	65	0	284	0	134	0	0	0	4	0	1	0	0	0	0	0	0	0	4	0
11:15:00	70	5	299	15	141	7	0	0	4	0	1	0	0	0	0	0	0	0	4	0
11:30:00	75	5	317	18	157	16	0	0	5	1	1	0	0	0	0	0	1	1	4	0
11:45:00	79	4	344	27	176	19	1	1	6	1	1	0	0	0	0	0	1	0	5	1
12:00:00	84	5	372	28	198	22	1	0	6	0	2	1	1	1	0	0	1	0	5	0
12:15:00	89	5	405	33	219	21	1	0	6	0	2	0	1	0	0	0	1	0	6	1
12:30:00	90	1	423	18	230	11	1	0	7	1	2	0	1	0	0	0	1	0	7	1
12:45:00	98	8	450	27	249	19	1	0	8	1	2	0	1	0	0	0	2	1	8	1
13:00:00	104	6	467	17	267	18	1	0	8	0	2	0	1	0	0	0	2	0	8	0
13:15:00	105	1	487	20	283	16	1	0	8	0	2	0	1	0	0	0	2	0	8	0
13:30:00	107	2	505	18	313	30	1	0	8	0	2	0	1	0	0	0	2	0	8	0
13:45:00	111	4	521	16	327	14	1	0	8	0	2	0	1	0	0	0	2	0	8	0
14:00:00	112	1	544	23	343	16	1	0	8	0	3	1	1	0	0	0	2	0	8	0
14:01:34	112	0	544	0	343	0	1	0	8	0	3	0	1	0	0	0	2	0	8	0
15:00:00	112	0	544	0	343	0	1	0	8	0	3	0	1	0	0	0	2	0	8	0
15:15:00	113	1	574	30	369	26	1	0	9	1	3	0	2	1	0	0	3	1	8	0
15:30:00	118	5	618	44	403	34	1	0	9	0	4	1	2	0	0	0	3	0	8	0
15:45:00	120	2	655	37	439	36	1	0	11	2	4	0	2	0	0	0	3	0	8	0
16:00:00	123	3	693	38	477	38	1	0	12	1	4	0	2	0	0	0	3	0	10	2
16:15:00	128	5	728	35	508	31	1	0	12	0	4	0	2	0	0	0	3	0	10	0
16:30:00	135	7	767	39	549	41	1	0	12	0	4	0	2	0	0	0	3	0	10	0
16:45:00	139	4	805	38	592	43	1	0	12	0	5	1	2	0	0	0	3	0	12	2
17:00:00	142	3	859	54	625	33	1	0	12	0	5	0	2	0	0	0	3	0	12	0
17:15:00	146	4	895	36	658	33	2	1	12	0	5	0	2	0	0	0	3	0	12	0
17:30:00	152	6	926	31	675	17	2	0	12	0	5	0	2	0	0	0	3	0	13	1
17:45:00	158	6	975	49	731	56	2	0	12	0	5	0	2	0	0	0	3	0	14	1
18:00:00	164	6	1021	46	786	55	2	0	12	0	5	0	2	0	0	0	3	0	17	3
18:15:00	164	0	1021	0	786	0	2	0	12	0	5	0	2	0	0	0	3	0	17	0
18:17:04	164	0	1021	0	786	0	2	0	12	0	5	0	2	0	0	0	3	0	17	0

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700005

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	3	3	5	5	0	0	1	1	0	0	0	0	0	0	0	0	15	15
7:30:00	3	2	5	2	12	7	0	0	1	0	0	0	0	0	0	0	0	0	39	24
7:45:00	3	0	7	2	17	5	0	0	2	1	1	1	0	0	0	0	0	0	44	5
8:00:00	6	3	10	3	20	3	0	0	3	1	1	0	0	0	0	0	0	0	63	19
8:15:00	7	1	14	4	27	7	0	0	3	0	1	0	0	0	0	0	0	0	70	7
8:30:00	8	1	16	2	38	11	0	0	4	1	1	0	0	0	0	0	0	0	80	10
8:45:00	8	0	19	3	41	3	0	0	5	1	1	0	0	0	0	0	0	0	81	1
9:00:00	8	0	19	0	45	4	0	0	5	0	1	0	0	0	0	0	0	0	83	2
9:00:12	8	0	19	0	45	0	0	0	5	0	1	0	0	0	0	0	0	0	83	0
11:00:00	8	0	19	0	45	0	0	0	5	0	1	0	0	0	0	0	0	0	83	0
11:15:00	10	2	21	2	49	4	0	0	5	0	1	0	0	0	0	0	0	0	85	2
11:30:00	10	0	23	2	54	5	0	0	6	1	1	0	0	0	0	0	0	0	85	0
11:45:00	10	0	24	1	61	7	0	0	7	1	1	0	0	0	0	0	0	0	85	0
12:00:00	10	0	25	1	66	5	0	0	7	0	1	0	0	0	0	0	0	0	87	2
12:15:00	10	0	26	1	73	7	0	0	8	1	1	0	0	0	0	0	0	0	89	2
12:30:00	11	1	27	1	75	2	0	0	9	1	3	2	0	0	0	0	0	0	90	1
12:45:00	11	0	29	2	84	9	0	0	9	0	3	0	0	0	0	0	1	1	95	5
13:00:00	12	1	33	4	91	7	0	0	10	1	3	0	0	0	0	0	1	0	97	2
13:15:00	15	3	35	2	95	4	0	0	10	0	3	0	0	0	0	0	1	0	97	0
13:30:00	15	0	36	1	97	2	0	0	11	1	3	0	0	0	0	0	1	0	97	0
13:45:00	17	2	40	4	101	4	0	0	12	1	3	0	0	0	0	0	1	0	99	2
14:00:00	18	1	42	2	105	4	0	0	12	0	3	0	0	0	0	0	1	0	102	3
14:01:34	18	0	42	0	105	0	0	0	12	0	3	0	0	0	0	0	1	0	102	0
15:00:00	18	0	42	0	105	0	0	0	12	0	3	0	0	0	0	0	1	0	102	0
15:15:00	18	0	43	1	111	6	0	0	13	1	3	0	0	0	0	0	1	0	102	0
15:30:00	18	0	46	3	119	8	0	0	14	1	4	1	0	0	0	0	1	0	103	1
15:45:00	19	1	47	1	127	8	0	0	14	0	4	0	0	0	0	0	1	0	108	5
16:00:00	20	1	48	1	133	6	0	0	16	2	4	0	0	0	0	0	1	0	108	0
16:15:00	20	0	51	3	137	4	0	0	18	2	5	1	0	0	0	0	1	0	109	1
16:30:00	21	1	54	3	141	4	0	0	18	0	6	1	0	0	0	0	1	0	123	14
16:45:00	21	0	55	1	156	15	0	0	19	1	6	0	0	0	0	0	1	0	123	0
17:00:00	22	1	60	5	163	7	0	0	19	0	6	0	0	0	0	0	1	0	133	10
17:15:00	23	1	63	3	169	6	0	0	20	1	7	1	0	0	0	0	1	0	135	2
17:30:00	23	0	68	5	171	2	0	0	20	0	7	0	0	0	0	0	1	0	139	4
17:45:00	23	0	72	4	180	9	0	0	21	1	7	0	0	0	0	0	1	0	141	2
18:00:00	28	5	74	2	191	11	0	0	22	1	7	0	0	0	0	0	1	0	162	21
18:15:00	28	0	74	0	191	0	0	0	22	0	7	0	0	0	0	0	1	0	162	0
18:17:04	28	0	74	0	191	0	0	0	22	0	7	0	0	0	0	0	1	0	162	0

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700005

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	23	23	23	23	0	0	0	0	0	0	0	0	0	0	0	0	13	13
7:30:00	3	2	52	29	51	28	0	0	0	0	0	0	0	0	0	0	0	37	24	
7:45:00	3	0	81	29	52	1	0	0	0	0	0	0	0	0	0	0	0	44	7	
8:00:00	5	2	106	25	69	17	0	0	1	1	1	1	0	0	0	0	0	60	16	
8:15:00	5	0	147	41	74	5	0	0	1	0	1	0	0	0	0	0	0	67	7	
8:30:00	5	0	187	40	91	17	0	0	1	0	1	0	0	0	0	0	0	74	7	
8:45:00	5	0	224	37	95	4	0	0	2	1	1	0	0	0	0	0	0	81	7	
9:00:00	5	0	267	43	102	7	0	0	4	2	1	0	0	0	0	0	0	84	3	
9:00:12	5	0	267	0	102	0	0	0	4	0	1	0	0	0	0	0	0	84	0	
11:00:00	5	0	267	0	102	0	0	0	4	0	1	0	0	0	0	0	0	84	0	
11:15:00	5	0	293	26	102	0	0	0	5	1	1	0	0	0	0	0	0	86	2	
11:30:00	5	0	314	21	103	1	0	0	5	0	1	0	0	0	0	0	0	88	2	
11:45:00	5	0	330	16	107	4	0	0	6	1	1	0	0	0	0	0	0	90	2	
12:00:00	5	0	359	29	108	1	0	0	6	0	1	0	0	0	0	0	0	91	1	
12:15:00	7	2	385	26	110	2	0	0	6	0	1	0	0	0	0	0	0	97	6	
12:30:00	7	0	404	19	112	2	0	0	6	0	1	0	0	0	0	0	0	97	0	
12:45:00	9	2	428	24	114	2	0	0	6	0	1	0	0	0	0	0	0	99	2	
13:00:00	9	0	444	16	118	4	0	0	6	0	1	0	0	0	0	0	0	102	3	
13:15:00	10	1	465	21	120	2	0	0	6	0	1	0	0	0	0	0	0	106	4	
13:30:00	10	0	486	21	120	0	0	0	6	0	1	0	0	0	0	0	0	110	4	
13:45:00	10	0	514	28	121	1	0	0	6	0	1	0	0	0	0	0	0	113	3	
14:00:00	10	0	539	25	121	0	0	0	6	0	1	0	0	0	0	0	0	118	5	
14:01:34	10	0	539	0	121	0	0	0	6	0	1	0	0	0	0	0	0	118	0	
15:00:00	10	0	539	0	121	0	0	0	6	0	1	0	0	0	0	0	0	118	0	
15:15:00	10	0	571	32	124	3	0	0	8	2	1	0	0	0	0	0	0	123	5	
15:30:00	10	0	604	33	124	0	0	0	11	3	1	0	0	0	0	0	0	126	3	
15:45:00	10	0	642	38	127	3	0	0	11	0	1	0	0	0	0	0	0	135	9	
16:00:00	10	0	707	65	130	3	0	0	11	0	1	0	0	0	0	0	0	144	9	
16:15:00	10	0	748	41	131	1	0	0	12	1	1	0	0	0	0	0	0	147	3	
16:30:00	10	0	803	55	134	3	0	0	13	1	1	0	0	0	0	0	0	166	19	
16:45:00	10	0	868	65	140	6	0	0	15	2	1	0	0	0	0	0	0	167	1	
17:00:00	11	1	921	53	147	7	0	0	15	0	1	0	0	0	0	0	0	198	31	
17:15:00	11	0	980	59	152	5	0	0	15	0	1	0	0	0	1	1	0	203	5	
17:30:00	11	0	1016	36	164	12	0	0	15	0	1	0	0	0	1	0	0	264	61	
17:45:00	12	1	1070	54	170	6	0	0	15	0	1	0	0	0	1	0	0	265	1	
18:00:00	14	2	1119	49	183	13	0	0	15	0	1	0	0	0	1	0	0	311	46	
18:15:00	14	0	1119	0	183	0	0	0	15	0	1	0	0	0	1	0	0	311	0	
18:17:04	14	0	1119	0	183	0	0	0	15	0	1	0	0	0	1	0	0	311	0	

Ontario Traffic Inc.

Count Date: 16-Jan-19 Site #: 1901700005

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	20	20	11	11	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
7:30:00	29	9	34	23	3	1	0	0	1	1	0	0	0	0	1	1	0	0	1	0
7:45:00	42	13	37	3	4	1	0	0	1	0	0	0	0	0	1	0	0	0	2	1
8:00:00	67	25	52	15	4	0	0	0	2	1	1	1	0	0	1	0	0	0	2	0
8:15:00	87	20	62	10	5	1	0	0	3	1	1	0	0	0	1	0	0	0	2	0
8:30:00	109	22	73	11	6	1	0	0	3	0	1	0	0	0	1	0	0	0	4	2
8:45:00	138	29	79	6	6	0	0	0	4	1	1	0	0	0	1	0	0	0	4	0
9:00:00	166	28	85	6	8	2	0	0	5	1	1	0	1	1	1	0	0	0	6	2
9:00:12	166	0	85	0	8	0	0	0	5	0	1	0	1	0	1	0	0	0	6	0
11:00:00	166	0	85	0	8	0	0	0	5	0	1	0	1	0	1	0	0	0	6	0
11:15:00	186	20	90	5	8	0	0	0	6	1	1	0	1	0	1	0	0	0	6	0
11:30:00	196	10	92	2	8	0	0	0	7	1	1	0	1	0	1	0	0	0	7	1
11:45:00	207	11	92	0	8	0	0	0	7	0	1	0	1	0	1	0	0	0	8	1
12:00:00	229	22	93	1	9	1	0	0	8	1	1	0	1	0	1	0	0	0	11	3
12:15:00	244	15	95	2	10	1	0	0	8	0	1	0	1	0	1	0	0	0	12	1
12:30:00	252	8	100	5	13	3	0	0	9	1	1	0	1	0	1	0	0	0	14	2
12:45:00	271	19	104	4	15	2	0	0	10	1	1	0	1	0	1	0	0	0	14	0
13:00:00	283	12	107	3	15	0	0	0	10	0	1	0	1	0	1	0	0	0	16	2
13:15:00	302	19	113	6	15	0	0	0	11	1	1	0	1	0	2	1	0	0	17	1
13:30:00	316	14	116	3	16	1	0	0	11	0	1	0	1	0	2	0	0	0	17	0
13:45:00	327	11	122	6	17	1	0	0	12	1	1	0	1	0	2	0	0	0	17	0
14:00:00	342	15	125	3	17	0	0	0	13	1	1	0	1	0	2	0	0	0	19	2
14:01:34	342	0	125	0	17	0	0	0	13	0	1	0	1	0	2	0	0	0	19	0
15:00:00	342	0	125	0	17	0	0	0	13	0	1	0	1	0	2	0	0	0	19	0
15:15:00	352	10	126	1	17	0	0	0	13	0	1	0	1	0	2	0	0	0	20	1
15:30:00	376	24	127	1	17	0	0	0	14	1	1	0	1	0	2	0	0	0	20	0
15:45:00	394	18	131	4	17	0	0	0	16	2	1	0	1	0	2	0	0	0	21	1
16:00:00	414	20	134	3	17	0	0	0	16	0	1	0	1	0	2	0	0	0	25	4
16:15:00	440	26	135	1	17	0	0	0	18	2	1	0	1	0	2	0	0	0	26	1
16:30:00	457	17	141	6	19	2	0	0	19	1	1	0	1	0	2	0	0	0	27	1
16:45:00	479	22	142	1	19	0	0	0	19	0	1	0	1	0	2	0	0	0	30	3
17:00:00	491	12	145	3	21	2	0	0	20	1	1	0	1	0	2	0	0	0	34	4
17:15:00	506	15	147	2	23	2	0	0	20	0	1	0	2	1	2	0	0	0	34	0
17:30:00	520	14	155	8	25	2	0	0	21	1	1	0	2	0	2	0	0	0	34	0
17:45:00	538	18	158	3	25	0	0	0	21	0	1	0	2	0	2	0	0	0	36	2
18:00:00	561	23	164	6	28	3	0	0	22	1	1	0	2	0	2	0	0	0	38	2
18:15:00	561	0	164	0	28	0	0	0	22	0	1	0	2	0	2	0	0	0	38	0
18:17:04	561	0	164	0	28	0	0	0	22	0	1	0	2	0	2	0	0	0	38	0

TECHNICAL MEMORANDUM



Appendix C – Synchro Results

Intersection

Int Delay, s/veh 4.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	8	3	1	9	0	4	8	3	3	2	1
Future Vol, veh/h	2	8	3	1	9	0	4	8	3	3	2	1
Conflicting Peds, #/hr	0	0	2	2	0	0	10	0	3	3	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	25	2	2	2	50	2
Mvmt Flow	2	9	3	1	10	0	4	9	3	3	2	1

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	10	0	0	14
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1610	-	-	1604
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1595	-	-	1600
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	1.1	0.7	9.1	9
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	904	1600	-	-	1595	-	898
HCM Lane V/C Ratio	0.018	0.001	-	-	0.001	-	0.007
HCM Control Delay (s)	9.1	7.3	0	-	7.3	0	9
HCM Lane LOS	A	A	A	-	A	A	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	0

Intersection

Int Delay, s/veh 4.5

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	4	2	5	5	1	3
Future Vol, veh/h	4	2	5	5	1	3
Conflicting Peds, #/hr	5	0	9	0	0	9
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	2	2	2	33	2
Mvmt Flow	4	2	5	5	1	3

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	33	12	13	0	-	0
Stage 1	12	-	-	-	-	-
Stage 2	21	-	-	-	-	-
Critical Hdwy	6.9	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	871	1069	1606	-	-	-
Stage 1	900	-	-	-	-	-
Stage 2	891	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	854	1060	1606	-	-	-
Mov Cap-2 Maneuver	854	-	-	-	-	-
Stage 1	893	-	-	-	-	-
Stage 2	881	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	9	3.6	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1606	-	913	-	-
HCM Lane V/C Ratio	0.003	-	0.007	-	-
HCM Control Delay (s)	7.2	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

06/18/2019

Intersection

Int Delay, s/veh 2

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	3	1	2	2	51	1	291	3	31	105	2
Future Vol, veh/h	6	3	1	2	2	51	1	291	3	31	105	2
Conflicting Peds, #/hr	4	0	0	0	0	4	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	33	2	2	50	2	2	2	2	2	2	3	50
Mvmt Flow	7	3	1	2	2	55	1	316	3	34	114	2

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	537	507	116	506	506	323	117	0	0	321	0	0
Stage 1	184	184	-	321	321	-	-	-	-	-	-	-
Stage 2	353	323	-	185	185	-	-	-	-	-	-	-
Critical Hdwy	7.43	6.52	6.22	7.6	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.797	4.018	3.318	3.95	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	410	468	936	408	469	718	1471	-	-	1239	-	-
Stage 1	751	747	-	600	652	-	-	-	-	-	-	-
Stage 2	604	650	-	717	747	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	367	453	935	396	454	715	1471	-	-	1234	-	-
Mov Cap-2 Maneuver	367	453	-	396	454	-	-	-	-	-	-	-
Stage 1	750	725	-	599	651	-	-	-	-	-	-	-
Stage 2	553	649	-	692	725	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	13.9	10.8	0	1.8
HCM LOS	B	B		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1471	-	-	681	416	1234	-
HCM Lane V/C Ratio	0.001	-	-	0.088	0.026	0.027	-
HCM Control Delay (s)	7.4	0	-	10.8	13.9	8	0
HCM Lane LOS	A	A	-	B	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.3	0.1	0.1	-

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	33	106	58	5	67	31	115	211	13	16	84	17
Future Vol, veh/h	33	106	58	5	67	31	115	211	13	16	84	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	20	2	2	2	2	8	2	2	2
Mvmt Flow	36	115	63	5	73	34	125	229	14	17	91	18
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.8	10	13.6	9.6
HCM LOS	B	A	B	A

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	34%	5%	17%	14%
Vol Thru, %	62%	65%	54%	72%
Vol Right, %	4%	30%	29%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	339	103	197	117
LT Vol	115	5	33	16
Through Vol	211	67	106	84
RT Vol	13	31	58	17
Lane Flow Rate	368	112	214	127
Geometry Grp	1	1	1	1
Degree of Util (X)	0.524	0.179	0.315	0.189
Departure Headway (Hd)	5.117	5.747	5.301	5.343
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	707	624	677	671
Service Time	3.117	3.791	3.34	3.381
HCM Lane V/C Ratio	0.521	0.179	0.316	0.189
HCM Control Delay	13.6	10	10.8	9.6
HCM Lane LOS	B	A	B	A
HCM 95th-tile Q	3.1	0.6	1.3	0.7

Intersection												
Int Delay, s/veh	4.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	100	36	4	2	11	25	0	164	33	33	192	79
Future Vol, veh/h	100	36	4	2	11	25	0	164	33	33	192	79
Conflicting Peds, #/hr	1	0	24	24	0	1	4	0	20	20	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	8	2	2	18	2	2	2	2	2	2	2
Mvmt Flow	109	39	4	2	12	27	0	178	36	36	209	86

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	544	561	280	585	586	217	299	0	0	234	0	0
Stage 1	327	327	-	216	216	-	-	-	-	-	-	-
Stage 2	217	234	-	369	370	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.58	6.22	7.12	6.68	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.072	3.318	3.518	4.162	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	450	428	759	422	401	823	1262	-	-	1333	-	-
Stage 1	686	637	-	786	695	-	-	-	-	-	-	-
Stage 2	785	700	-	651	593	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	412	405	739	364	379	807	1234	-	-	1332	-	-
Mov Cap-2 Maneuver	412	405	-	364	379	-	-	-	-	-	-	-
Stage 1	683	614	-	771	682	-	-	-	-	-	-	-
Stage 2	745	687	-	573	571	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB		
HCM Control Delay, s	18.6		11.7		0		0.8		
HCM LOS	C		B						

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1234	-	-	415	580	1332	-
HCM Lane V/C Ratio	-	-	-	0.367	0.071	0.027	-
HCM Control Delay (s)	0	-	-	18.6	11.7	7.8	0
HCM Lane LOS	A	-	-	C	B	A	A
HCM 95th %tile Q(veh)	0	-	-	1.7	0.2	0.1	-

Intersection

Int Delay, s/veh 2.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	19	2	0	13	4	2	6	1	3	4	0
Future Vol, veh/h	0	19	2	0	13	4	2	6	1	3	4	0
Conflicting Peds, #/hr	5	0	4	4	0	5	12	0	1	1	0	12
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	21	2	0	14	4	2	7	1	3	4	0

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	23	0	0	27
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1592	-	-	1587
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1574	-	-	1586
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-




Approach	SE	NW	NE	SW
HCM Control Delay, s	0	0	9.2	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	874	1586	-	-	1574	-	-
HCM Lane V/C Ratio	0.011	-	-	-	-	-	0.009
HCM Control Delay (s)	9.2	0	-	-	0	-	9.1
HCM Lane LOS	A	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	0

Intersection

Int Delay, s/veh 5.3

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	9	6	4	4	4	3
Future Vol, veh/h	9	6	4	4	4	3
Conflicting Peds, #/hr	3	0	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	7	4	4	4	3

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	34	18	20	0	-	0
Stage 1	18	-	-	-	-	-
Stage 2	16	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	979	1061	1596	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	1007	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	955	1049	1596	-	-	-
Mov Cap-2 Maneuver	955	-	-	-	-	-
Stage 1	994	-	-	-	-	-
Stage 2	993	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	8.7	3.6	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1596	-	991	-	-
HCM Lane V/C Ratio	0.003	-	0.016	-	-
HCM Control Delay (s)	7.3	0	8.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

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Intersection												
Int Delay, s/veh	1.5											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	7	4	2	2	3	46	1	168	3	11	252	3
Future Vol, veh/h	7	4	2	2	3	46	1	168	3	11	252	3
Conflicting Peds, #/hr	4	0	0	0	0	4	16	0	1	1	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	33	2	2	2
Mvmt Flow	8	4	2	2	3	50	1	183	3	12	274	3

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	532	504	292	490	504	189	293	0	0	187	0	0
Stage 1	315	315	-	187	187	-	-	-	-	-	-	-
Stage 2	217	189	-	303	317	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	458	470	747	489	470	853	1269	-	-	1387	-	-
Stage 1	696	656	-	815	745	-	-	-	-	-	-	-
Stage 2	785	744	-	706	654	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	417	458	736	480	458	849	1269	-	-	1382	-	-
Mov Cap-2 Maneuver	417	458	-	480	458	-	-	-	-	-	-	-
Stage 1	685	640	-	813	744	-	-	-	-	-	-	-
Stage 2	732	743	-	692	638	-	-	-	-	-	-	-

Approach	SE		NW		NE		SW	
HCM Control Delay, s	13.1		9.9		0		0.3	
HCM LOS	B		A					

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1269	-	-	786	460	1382	-
HCM Lane V/C Ratio	0.001	-	-	0.071	0.031	0.009	-
HCM Control Delay (s)	7.8	0	-	9.9	13.1	7.6	0
HCM Lane LOS	A	A	-	A	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0	-

Intersection	
Intersection Delay, s/veh	11
Intersection LOS	B

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	108	59	8	121	28	94	119	6	13	193	22
Future Vol, veh/h	8	108	59	8	121	28	94	119	6	13	193	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	7	2	2	2	2	2	2
Mvmt Flow	9	117	64	9	132	30	102	129	7	14	210	24
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.5	10.4	11.4	11.3
HCM LOS	B	B	B	B

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	43%	5%	5%	6%
Vol Thru, %	54%	77%	62%	85%
Vol Right, %	3%	18%	34%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	219	157	175	228
LT Vol	94	8	8	13
Through Vol	119	121	108	193
RT Vol	6	28	59	22
Lane Flow Rate	238	171	190	248
Geometry Grp	1	1	1	1
Degree of Util (X)	0.357	0.259	0.283	0.363
Departure Headway (Hd)	5.392	5.473	5.347	5.267
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	667	655	671	682
Service Time	3.43	3.518	3.389	3.306
HCM Lane V/C Ratio	0.357	0.261	0.283	0.364
HCM Control Delay	11.4	10.4	10.5	11.3
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.6	1	1.2	1.7

Intersection

Int Delay, s/veh 3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	71	21	7	16	17	29	3	199	36	23	162	161
Future Vol, veh/h	71	21	7	16	17	29	3	199	36	23	162	161
Conflicting Peds, #/hr	5	0	113	113	0	5	4	0	29	29	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	29	2	2	10	2	2	2	2	4	2	2
Mvmt Flow	77	23	8	17	18	32	3	216	39	25	176	175

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	590	609	381	713	676	270	355	0	0	284	0	0
Stage 1	318	318	-	271	271	-	-	-	-	-	-	-
Stage 2	272	291	-	442	405	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.79	6.22	7.12	6.6	6.22	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.261	3.318	3.518	4.09	3.318	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	419	376	666	347	365	769	1204	-	-	1267	-	-
Stage 1	693	608	-	735	671	-	-	-	-	-	-	-
Stage 2	734	625	-	594	585	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	374	354	594	278	344	745	1078	-	-	1261	-	-
Mov Cap-2 Maneuver	374	354	-	278	344	-	-	-	-	-	-	-
Stage 1	688	591	-	713	651	-	-	-	-	-	-	-
Stage 2	678	606	-	492	568	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	18.2		15.1		0.1		0.5	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1078	-	-	379	425	1261	-
HCM Lane V/C Ratio	0.003	-	-	0.284	0.159	0.02	-
HCM Control Delay (s)	8.3	0	-	18.2	15.1	7.9	0
HCM Lane LOS	A	A	-	C	C	A	A
HCM 95th %tile Q(veh)	0	-	-	1.2	0.6	0.1	-

Intersection

Int Delay, s/veh 4.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	12	5	2	14	0	6	12	5	5	3	2
Future Vol, veh/h	3	12	5	2	14	0	6	12	5	5	3	2
Conflicting Peds, #/hr	0	0	2	2	0	0	10	0	3	3	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	25	2	2	2	50	2
Mvmt Flow	3	13	5	2	15	0	7	13	5	5	3	2

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	15	0	0	20
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1603	-	-	1596
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1588	-	-	1592
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-




Approach	SE	NW	NE	SW
HCM Control Delay, s	1.1	0.9	9.2	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	889	1592	-	-	1588	-	-
HCM Lane V/C Ratio	0.028	0.001	-	-	0.002	-	-
HCM Control Delay (s)	9.2	7.3	0	-	7.3	0	-
HCM Lane LOS	A	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-

Intersection

Int Delay, s/veh 4.2

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	5	3	8	8	2	5
Future Vol, veh/h	5	3	8	8	2	5
Conflicting Peds, #/hr	5	0	9	0	0	9
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	2	2	2	33	2
Mvmt Flow	5	3	9	9	2	5

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	45	14	17	0	-	0
Stage 1	14	-	-	-	-	-
Stage 2	31	-	-	-	-	-
Critical Hdwy	6.9	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	857	1066	1600	-	-	-
Stage 1	898	-	-	-	-	-
Stage 2	881	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	838	1057	1600	-	-	-
Mov Cap-2 Maneuver	838	-	-	-	-	-
Stage 1	891	-	-	-	-	-
Stage 2	868	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	9	3.6	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1600	-	909	-	-
HCM Lane V/C Ratio	0.005	-	0.01	-	-
HCM Control Delay (s)	7.3	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection												
Int Delay, s/veh	2.9											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	15	2	3	13	77	2	440	5	47	159	3
Future Vol, veh/h	9	15	2	3	13	77	2	440	5	47	159	3
Conflicting Peds, #/hr	4	0	0	0	0	4	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	33	2	2	50	2	2	2	2	2	2	3	50
Mvmt Flow	10	16	2	3	14	84	2	478	5	51	173	3

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	816	767	175	772	765	486	177	0	0	485	0	0
Stage 1	278	278	-	486	486	-	-	-	-	-	-	-
Stage 2	538	489	-	286	279	-	-	-	-	-	-	-
Critical Hdwy	7.43	6.52	6.22	7.6	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.797	4.018	3.318	3.95	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	262	332	868	265	333	581	1399	-	-	1078	-	-
Stage 1	666	680	-	482	551	-	-	-	-	-	-	-
Stage 2	475	549	-	629	680	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	206	313	867	243	314	578	1399	-	-	1074	-	-
Mov Cap-2 Maneuver	206	313	-	243	314	-	-	-	-	-	-	-
Stage 1	664	643	-	481	549	-	-	-	-	-	-	-
Stage 2	394	547	-	579	643	-	-	-	-	-	-	-

Approach	SE		NW		NE		SW	
HCM Control Delay, s	19.5		14.1		0		1.9	
HCM LOS	C		B					

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1399	-	-	497	277	1074	-
HCM Lane V/C Ratio	0.002	-	-	0.203	0.102	0.048	-
HCM Control Delay (s)	7.6	0	-	14.1	19.5	8.5	0
HCM Lane LOS	A	A	-	B	C	A	A
HCM 95th %tile Q(veh)	0	-	-	0.8	0.3	0.1	-

Intersection	
Intersection Delay, s/veh	44.9
Intersection LOS	E

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	80	205	88	8	106	47	174	319	20	24	127	26
Future Vol, veh/h	80	205	88	8	106	47	174	319	20	24	127	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	20	2	2	2	2	8	2	2	2
Mvmt Flow	87	223	96	9	115	51	189	347	22	26	138	28
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	30.7	15.9	74.5	15.6
HCM LOS	D	C	F	C

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	34%	5%	21%	14%
Vol Thru, %	62%	66%	55%	72%
Vol Right, %	4%	29%	24%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	513	161	373	177
LT Vol	174	8	80	24
Through Vol	319	106	205	127
RT Vol	20	47	88	26
Lane Flow Rate	558	175	405	192
Geometry Grp	1	1	1	1
Degree of Util (X)	1.037	0.382	0.779	0.398
Departure Headway (Hd)	6.697	8.053	7.069	7.627
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	546	450	515	475
Service Time	4.697	6.053	5.069	5.627
HCM Lane V/C Ratio	1.022	0.389	0.786	0.404
HCM Control Delay	74.5	15.9	30.7	15.6
HCM Lane LOS	F	C	D	C
HCM 95th-tile Q	15.8	1.8	7	1.9

Intersection												
Int Delay, s/veh	26.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	161	64	21	3	22	38	0	258	50	50	295	119
Future Vol, veh/h	161	64	21	3	22	38	0	258	50	50	295	119
Conflicting Peds, #/hr	1	0	24	24	0	1	4	0	20	20	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	8	2	2	18	2	2	2	2	2	2	2
Mvmt Flow	175	70	23	3	24	41	0	280	54	54	321	129

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	839	853	413	892	891	329	454	0	0	355	0	0
Stage 1	498	498	-	328	328	-	-	-	-	-	-	-
Stage 2	341	355	-	564	563	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.58	6.22	7.12	6.68	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.072	3.318	3.518	4.162	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	285	290	639	263	265	712	1107	-	-	1204	-	-
Stage 1	554	534	-	685	619	-	-	-	-	-	-	-
Stage 2	674	619	-	510	484	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	235	266	623	185	243	698	1082	-	-	1203	-	-
Mov Cap-2 Maneuver	235	266	-	185	243	-	-	-	-	-	-	-
Stage 1	552	500	-	672	608	-	-	-	-	-	-	-
Stage 2	609	608	-	388	453	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	111	16.2	0	0.9
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1082	-	-	256	391	1203	-
HCM Lane V/C Ratio	-	-	-	1.044	0.175	0.045	-
HCM Control Delay (s)	0	-	-	111	16.2	8.1	0
HCM Lane LOS	A	-	-	F	C	A	A
HCM 95th %tile Q(veh)	0	-	-	10.8	0.6	0.1	-

Intersection

Int Delay, s/veh 2.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	24	3	0	16	5	3	8	1	4	5	0
Future Vol, veh/h	0	24	3	0	16	5	3	8	1	4	5	0
Conflicting Peds, #/hr	5	0	4	4	0	5	12	0	1	1	0	12
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	26	3	0	17	5	3	9	1	4	5	0

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	28	0	0	33
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1585	-	-	1579
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1567	-	-	1578
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-




Approach	SE	NW	NE	SW
HCM Control Delay, s	0	0	9.3	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	858	1578	-	-	1567	-	866
HCM Lane V/C Ratio	0.015	-	-	-	-	-	0.011
HCM Control Delay (s)	9.3	0	-	-	0	-	9.2
HCM Lane LOS	A	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	0

Intersection

Int Delay, s/veh 5.3

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	11	8	5	5	5	4
Future Vol, veh/h	11	8	5	5	5	4
Conflicting Peds, #/hr	3	0	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	9	5	5	5	4

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	39	20	22	0	-	0
Stage 1	20	-	-	-	-	-
Stage 2	19	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	973	1058	1593	-	-	-
Stage 1	1003	-	-	-	-	-
Stage 2	1004	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	949	1046	1593	-	-	-
Mov Cap-2 Maneuver	949	-	-	-	-	-
Stage 1	992	-	-	-	-	-
Stage 2	990	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	8.7	3.6	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1593	-	988	-	-
HCM Lane V/C Ratio	0.003	-	0.021	-	-
HCM Control Delay (s)	7.3	0	8.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

06/18/2019

Intersection

Int Delay, s/veh 2.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	10	3	3	44	58	1	211	4	14	316	54
Future Vol, veh/h	9	10	3	3	44	58	1	211	4	14	316	54
Conflicting Peds, #/hr	4	0	0	0	0	4	16	0	1	1	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	33	2	2	2
Mvmt Flow	10	11	3	3	48	63	1	229	4	15	343	59

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	712	656	389	645	684	237	418	0	0	235	0	0
Stage 1	419	419	-	235	235	-	-	-	-	-	-	-
Stage 2	293	237	-	410	449	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	347	385	659	385	371	802	1141	-	-	1332	-	-
Stage 1	612	590	-	768	710	-	-	-	-	-	-	-
Stage 2	715	709	-	619	572	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	278	373	649	370	359	798	1141	-	-	1327	-	-
Mov Cap-2 Maneuver	278	373	-	370	359	-	-	-	-	-	-	-
Stage 1	602	573	-	767	709	-	-	-	-	-	-	-
Stage 2	611	708	-	595	555	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	16.2	13.9	0	0.3
HCM LOS	C	B		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1141	-	-	516	345	1327	-
HCM Lane V/C Ratio	0.001	-	-	0.221	0.069	0.011	-
HCM Control Delay (s)	8.2	0	-	13.9	16.2	7.7	0
HCM Lane LOS	A	A	-	B	C	A	A
HCM 95th %tile Q(veh)	0	-	-	0.8	0.2	0	-

Intersection	
Intersection Delay, s/veh	17.1
Intersection LOS	C

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	40	155	74	25	152	35	118	149	8	16	277	28
Future Vol, veh/h	40	155	74	25	152	35	118	149	8	16	277	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	7	2	2	2	2	2	2
Mvmt Flow	43	168	80	27	165	38	128	162	9	17	301	30
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	16.5	14.7	17.2	19
HCM LOS	C	B	C	C

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	43%	12%	15%	5%
Vol Thru, %	54%	72%	58%	86%
Vol Right, %	3%	17%	28%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	275	212	269	321
LT Vol	118	25	40	16
Through Vol	149	152	155	277
RT Vol	8	35	74	28
Lane Flow Rate	299	230	292	349
Geometry Grp	1	1	1	1
Degree of Util (X)	0.543	0.428	0.525	0.613
Departure Headway (Hd)	6.539	6.683	6.466	6.327
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	550	537	556	569
Service Time	4.615	4.763	4.541	4.399
HCM Lane V/C Ratio	0.544	0.428	0.525	0.613
HCM Control Delay	17.2	14.7	16.5	19
HCM Lane LOS	C	B	C	C
HCM 95th-tile Q	3.2	2.1	3	4.1

Intersection												
Int Delay, s/veh	5.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	89	26	9	20	21	36	4	249	45	29	203	207
Future Vol, veh/h	89	26	9	20	21	36	4	249	45	29	203	207
Conflicting Peds, #/hr	5	0	113	113	0	5	4	0	29	29	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	29	2	2	10	2	2	2	2	4	2	2
Mvmt Flow	97	28	10	22	23	39	4	271	49	32	221	225

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	740	757	450	861	846	329	450	0	0	349	0	0
Stage 1	400	400	-	333	333	-	-	-	-	-	-	-
Stage 2	340	357	-	528	513	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.79	6.22	7.12	6.6	6.22	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.261	3.318	3.518	4.09	3.318	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	333	307	609	276	290	712	1110	-	-	1199	-	-
Stage 1	626	557	-	681	630	-	-	-	-	-	-	-
Stage 2	675	583	-	534	523	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	282	285	543	211	269	690	994	-	-	1193	-	-
Mov Cap-2 Maneuver	282	285	-	211	269	-	-	-	-	-	-	-
Stage 1	621	534	-	659	610	-	-	-	-	-	-	-
Stage 2	607	565	-	428	502	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	27.3		18.9		0.1		0.5	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	994	-	-	293	342	1193	-
HCM Lane V/C Ratio	0.004	-	-	0.46	0.245	0.026	-
HCM Control Delay (s)	8.6	0	-	27.3	18.9	8.1	0
HCM Lane LOS	A	A	-	D	C	A	A
HCM 95th %tile Q(veh)	0	-	-	2.3	0.9	0.1	-

Intersection

Int Delay, s/veh 7.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	12	5	2	14	0	6	78	5	5	22	2
Future Vol, veh/h	3	12	5	2	14	0	6	78	5	5	22	2
Conflicting Peds, #/hr	0	0	2	2	0	0	10	0	3	3	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	25	2	2	2	50	2
Mvmt Flow	3	13	5	2	15	0	7	85	5	5	24	2

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	15	0	0	20
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1603	-	-	1596
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1588	-	-	1592
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-




Approach	SE	NW	NE	SW
HCM Control Delay, s	1.1	0.9	9.8	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	853	1592	-	-	1588	-	-
HCM Lane V/C Ratio	0.113	0.001	-	-	0.002	-	-
HCM Control Delay (s)	9.8	7.3	0	-	7.3	0	-
HCM Lane LOS	A	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-

Intersection

Int Delay, s/veh 1.2

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	6	3	8	74	21	5
Future Vol, veh/h	6	3	8	74	21	5
Conflicting Peds, #/hr	5	0	9	0	0	9
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	2	2	2	33	2
Mvmt Flow	7	3	9	80	23	5

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	138	35	37	0	-	0
Stage 1	35	-	-	-	-	-
Stage 2	103	-	-	-	-	-
Critical Hdwy	6.9	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	754	1038	1574	-	-	-
Stage 1	877	-	-	-	-	-
Stage 2	814	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	737	1029	1574	-	-	-
Mov Cap-2 Maneuver	737	-	-	-	-	-
Stage 1	870	-	-	-	-	-
Stage 2	802	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	9.5	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1574	-	814	-	-
HCM Lane V/C Ratio	0.006	-	0.012	-	-
HCM Control Delay (s)	7.3	0	9.5	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

06/18/2019

Intersection												
Int Delay, s/veh	3.3											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	15	10	3	13	77	19	374	5	47	131	3
Future Vol, veh/h	9	15	10	3	13	77	19	374	5	47	131	3
Conflicting Peds, #/hr	4	0	0	0	0	4	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	33	2	2	50	2	2	2	2	2	2	3	50
Mvmt Flow	10	16	11	3	14	84	21	407	5	51	142	3

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	750	701	145	712	701	414	147	0	0	413	0	0
Stage 1	247	247	-	452	452	-	-	-	-	-	-	-
Stage 2	503	454	-	260	249	-	-	-	-	-	-	-
Critical Hdwy	7.43	6.52	6.22	7.6	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.797	4.018	3.318	3.95	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	292	363	902	292	363	638	1435	-	-	1146	-	-
Stage 1	693	702	-	505	570	-	-	-	-	-	-	-
Stage 2	498	569	-	650	701	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	232	338	901	263	338	635	1435	-	-	1142	-	-
Mov Cap-2 Maneuver	232	338	-	263	338	-	-	-	-	-	-	-
Stage 1	679	667	-	495	559	-	-	-	-	-	-	-
Stage 2	412	558	-	596	666	-	-	-	-	-	-	-

Approach	SE		NW		NE		SW	
HCM Control Delay, s	16.1		13.1		0.4		2.2	
HCM LOS	C		B					

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1435	-	-	543	361	1142	-
HCM Lane V/C Ratio	0.014	-	-	0.186	0.102	0.045	-
HCM Control Delay (s)	7.5	0	-	13.1	16.1	8.3	0
HCM Lane LOS	A	A	-	B	C	A	A
HCM 95th %tile Q(veh)	0	-	-	0.7	0.3	0.1	-

Intersection	
Intersection Delay, s/veh	24.7
Intersection LOS	C

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	80	205	79	8	106	47	156	253	20	24	108	45
Future Vol, veh/h	80	205	79	8	106	47	156	253	20	24	108	45
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	20	2	2	2	2	8	2	2	2
Mvmt Flow	87	223	86	9	115	51	170	275	22	26	117	49
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	24.3	14.5	33.3	14.2
HCM LOS	C	B	D	B

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	36%	5%	22%	14%
Vol Thru, %	59%	66%	56%	61%
Vol Right, %	5%	29%	22%	25%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	429	161	364	177
LT Vol	156	8	80	24
Through Vol	253	106	205	108
RT Vol	20	47	79	45
Lane Flow Rate	466	175	396	192
Geometry Grp	1	1	1	1
Degree of Util (X)	0.828	0.359	0.713	0.375
Departure Headway (Hd)	6.391	7.39	6.485	7.01
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	564	488	554	516
Service Time	4.485	5.404	4.584	5.01
HCM Lane V/C Ratio	0.826	0.359	0.715	0.372
HCM Control Delay	33.3	14.5	24.3	14.2
HCM Lane LOS	D	B	C	B
HCM 95th-tile Q	8.5	1.6	5.8	1.7

Intersection												
Int Delay, s/veh	26.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	161	64	21	3	22	38	0	258	50	50	295	119
Future Vol, veh/h	161	64	21	3	22	38	0	258	50	50	295	119
Conflicting Peds, #/hr	1	0	24	24	0	1	4	0	20	20	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	8	2	2	18	2	2	2	2	2	2	2
Mvmt Flow	175	70	23	3	24	41	0	280	54	54	321	129

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	839	853	413	892	891	329	454	0	0	355	0	0
Stage 1	498	498	-	328	328	-	-	-	-	-	-	-
Stage 2	341	355	-	564	563	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.58	6.22	7.12	6.68	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.072	3.318	3.518	4.162	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	285	290	639	263	265	712	1107	-	-	1204	-	-
Stage 1	554	534	-	685	619	-	-	-	-	-	-	-
Stage 2	674	619	-	510	484	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	235	266	623	185	243	698	1082	-	-	1203	-	-
Mov Cap-2 Maneuver	235	266	-	185	243	-	-	-	-	-	-	-
Stage 1	552	500	-	672	608	-	-	-	-	-	-	-
Stage 2	609	608	-	388	453	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB		
HCM Control Delay, s	111		16.2		0		0.9		
HCM LOS	F		C						

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1082	-	-	256	391	1203	-
HCM Lane V/C Ratio	-	-	-	1.044	0.175	0.045	-
HCM Control Delay (s)	0	-	-	111	16.2	8.1	0
HCM Lane LOS	A	-	-	F	C	A	A
HCM 95th %tile Q(veh)	0	-	-	10.8	0.6	0.1	-

Intersection

Int Delay, s/veh 5.6

Movement SEL SET NWT NWR SWL SWR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	66	15	6	27	19	19
Future Vol, veh/h	66	15	6	27	19	19
Conflicting Peds, #/hr	15	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	72	16	7	29	21	21

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	51	0	-	0	196	36
Stage 1	-	-	-	-	36	-
Stage 2	-	-	-	-	160	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1555	-	-	-	793	1037
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	869	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1555	-	-	-	735	1023
Mov Cap-2 Maneuver	-	-	-	-	735	-
Stage 1	-	-	-	-	972	-
Stage 2	-	-	-	-	817	-

Approach SE NW SW

HCM Control Delay, s	6.1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt NWT NWR SEL SETSWLn1

Capacity (veh/h)	-	-	1555	-	855
HCM Lane V/C Ratio	-	-	0.046	-	0.048
HCM Control Delay (s)	-	-	7.4	0	9.4
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	-	0.2

Intersection

Int Delay, s/veh 2.6

Movement SET SER NWL NWT NEL NER

Lane Configurations						
Traffic Vol, veh/h	313	14	24	298	27	116
Future Vol, veh/h	313	14	24	298	27	116
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	340	15	26	324	29	126

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	355	0	724	348
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	376	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1204	-	393	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	694	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1204	-	383	695
Mov Cap-2 Maneuver	-	-	-	-	383	-
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	676	-

Approach SE NW NE

HCM Control Delay, s	0	0.6	13
HCM LOS			B

Minor Lane/Major Mvmt NELn1 NWL NWT SET SER

Capacity (veh/h)	602	1204	-	-	-
HCM Lane V/C Ratio	0.258	0.022	-	-	-
HCM Control Delay (s)	13	8.1	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	1	0.1	-	-	-

Intersection

Int Delay, s/veh 6.3

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	29	3	0	20	6	3	47	2	5	50	0
Future Vol, veh/h	0	29	3	0	20	6	3	47	2	5	50	0
Conflicting Peds, #/hr	5	0	4	4	0	5	12	0	1	1	0	12
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	32	3	0	22	7	3	51	2	5	54	0

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	33	0	0	39
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1579	-	-	1571
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1561	-	-	1570
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0	0	9.7	9.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	821	1570	-	-	1561	-	818
HCM Lane V/C Ratio	0.069	-	-	-	-	-	0.073
HCM Control Delay (s)	9.7	0	-	-	0	-	9.7
HCM Lane LOS	A	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	0.2

Intersection

Int Delay, s/veh 2

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	14	9	6	44	5	50
Future Vol, veh/h	14	9	6	44	5	50
Conflicting Peds, #/hr	3	0	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	10	7	48	5	54

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	109	45	72	0	-	0
Stage 1	45	-	-	-	-	-
Stage 2	64	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	888	1025	1528	-	-	-
Stage 1	977	-	-	-	-	-
Stage 2	959	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	864	1014	1528	-	-	-
Mov Cap-2 Maneuver	864	-	-	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	944	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	9	0.9	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1528	-	917	-	-
HCM Lane V/C Ratio	0.004	-	0.027	-	-
HCM Control Delay (s)	7.4	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

06/18/2019

Intersection

Int Delay, s/veh 3.2

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	11	12	3	45	70	16	216	5	17	328	55
Future Vol, veh/h	11	11	12	3	45	70	16	216	5	17	328	55
Conflicting Peds, #/hr	4	0	0	0	0	4	16	0	1	1	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	33	2	2	2
Mvmt Flow	12	12	13	3	49	76	17	235	5	18	357	60

Major/Minor	Minor2		Minor1			Major1		Major2				
Conflicting Flow All	778	715	402	709	742	243	432	0	0	241	0	0
Stage 1	439	439	-	273	273	-	-	-	-	-	-	-
Stage 2	339	276	-	436	469	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	314	356	648	349	344	796	1128	-	-	1326	-	-
Stage 1	597	578	-	733	684	-	-	-	-	-	-	-
Stage 2	676	682	-	599	561	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	240	338	638	324	327	792	1128	-	-	1321	-	-
Mov Cap-2 Maneuver	240	338	-	324	327	-	-	-	-	-	-	-
Stage 1	578	559	-	720	672	-	-	-	-	-	-	-
Stage 2	555	670	-	564	543	-	-	-	-	-	-	-

Approach	SE		NW			NE		SW		
HCM Control Delay, s	16.5		14.6			0.6		0.3		
HCM LOS	C		B							

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1128	-	-	502	350	1321	-
HCM Lane V/C Ratio	0.015	-	-	0.255	0.106	0.014	-
HCM Control Delay (s)	8.2	0	-	14.6	16.5	7.8	0
HCM Lane LOS	A	A	-	B	C	A	A
HCM 95th %tile Q(veh)	0	-	-	1	0.4	0	-

Intersection	
Intersection Delay, s/veh	26.7
Intersection LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	42	183	80	27	183	42	128	142	9	20	283	77
Future Vol, veh/h	42	183	80	27	183	42	128	142	9	20	283	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	7	2	2	2	2	2	2
Mvmt Flow	46	199	87	29	199	46	139	154	10	22	308	84
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	24.9	20.8	23.3	34.6
HCM LOS	C	C	C	D

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	46%	11%	14%	5%
Vol Thru, %	51%	73%	60%	74%
Vol Right, %	3%	17%	26%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	279	252	305	380
LT Vol	128	27	42	20
Through Vol	142	183	183	283
RT Vol	9	42	80	77
Lane Flow Rate	303	274	332	413
Geometry Grp	1	1	1	1
Degree of Util (X)	0.64	0.58	0.681	0.816
Departure Headway (Hd)	7.601	7.621	7.391	7.109
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	476	471	491	508
Service Time	5.646	5.687	5.436	5.147
HCM Lane V/C Ratio	0.637	0.582	0.676	0.813
HCM Control Delay	23.3	20.8	24.9	34.6
HCM Lane LOS	C	C	C	D
HCM 95th-tile Q	4.4	3.6	5.1	7.9

Intersection												
Int Delay, s/veh	10											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	107	32	11	24	26	44	5	301	54	35	245	248
Future Vol, veh/h	107	32	11	24	26	44	5	301	54	35	245	248
Conflicting Peds, #/hr	5	0	113	113	0	5	4	0	29	29	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	29	2	2	10	2	2	2	2	4	2	2
Mvmt Flow	116	35	12	26	28	48	5	327	59	38	266	270

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	891	907	518	1010	1012	391	540	0	0	415	0	0
Stage 1	481	481	-	396	396	-	-	-	-	-	-	-
Stage 2	410	426	-	614	616	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.79	6.22	7.12	6.6	6.22	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.261	3.318	3.518	4.09	3.318	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	263	249	558	218	232	658	1028	-	-	1133	-	-
Stage 1	566	511	-	629	590	-	-	-	-	-	-	-
Stage 2	619	542	-	479	469	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	207	228	498	157	212	637	921	-	-	1128	-	-
Mov Cap-2 Maneuver	207	228	-	157	212	-	-	-	-	-	-	-
Stage 1	560	484	-	608	570	-	-	-	-	-	-	-
Stage 2	538	524	-	369	444	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB			
HCM Control Delay, s	56.6		25.9		0.1		0.6			
HCM LOS	F		D							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	921	-	-	221	273	1128	-
HCM Lane V/C Ratio	0.006	-	-	0.738	0.374	0.034	-
HCM Control Delay (s)	8.9	0	-	56.6	25.9	8.3	0
HCM Lane LOS	A	A	-	F	D	A	A
HCM 95th %tile Q(veh)	0	-	-	5	1.7	0.1	-

Intersection

Int Delay, s/veh 3.5

Movement SEL SET NWT NWR SWL SWR

Lane Configurations		↕	↔		↕	
Traffic Vol, veh/h	38	20	11	104	14	44
Future Vol, veh/h	38	20	11	104	14	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	22	12	113	15	48

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	125	0	-	0	172	68
Stage 1	-	-	-	-	68	-
Stage 2	-	-	-	-	104	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1462	-	-	-	818	995
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	920	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1462	-	-	-	795	995
Mov Cap-2 Maneuver	-	-	-	-	795	-
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	894	-

Approach SE NW SW

HCM Control Delay, s	4.9	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt NWT NWR SEL SETSWLn1

Capacity (veh/h)	-	-	1462	-	938
HCM Lane V/C Ratio	-	-	0.028	-	0.067
HCM Control Delay (s)	-	-	7.5	0	9.1
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	-	0.2

Intersection

Int Delay, s/veh 2

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	264	9	44	360	14	88
Future Vol, veh/h	264	9	44	360	14	88
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	287	10	48	391	15	96

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	297
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1264
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1264
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.9	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	644	1264	-	-	-
HCM Lane V/C Ratio	0.172	0.038	-	-	-
HCM Control Delay (s)	11.7	8	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.6	0.1	-	-	-

Intersection

Int Delay, s/veh 4.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	15	6	2	17	0	7	15	5	6	4	2
Future Vol, veh/h	4	15	6	2	17	0	7	15	5	6	4	2
Conflicting Peds, #/hr	0	0	2	2	0	0	10	0	3	3	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	25	2	2	2	50	2
Mvmt Flow	4	16	7	2	18	0	8	16	5	7	4	2

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	18	0	0	25
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1599	-	-	1589
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1584	-	-	1585
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-




Approach	SE	NW	NE	SW
HCM Control Delay, s	1.2	0.8	9.3	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	872	1585	-	-	1584	-	-
HCM Lane V/C Ratio	0.034	0.001	-	-	0.003	-	-
HCM Control Delay (s)	9.3	7.3	0	-	7.3	0	-
HCM Lane LOS	A	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-

Intersection

Int Delay, s/veh 4.5

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	7	4	9	9	6	2
Future Vol, veh/h	7	4	9	9	6	2
Conflicting Peds, #/hr	5	0	9	0	0	9
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	2	2	2	33	2
Mvmt Flow	8	4	10	10	7	2

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	51	17	18	0	-	0
Stage 1	17	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.9	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	850	1062	1599	-	-	-
Stage 1	895	-	-	-	-	-
Stage 2	878	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	831	1053	1599	-	-	-
Mov Cap-2 Maneuver	831	-	-	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	865	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	9.1	3.6	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1599	-	900	-	-
HCM Lane V/C Ratio	0.006	-	0.013	-	-
HCM Control Delay (s)	7.3	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

06/18/2019

Intersection												
Int Delay, s/veh	24.3											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	18	2	4	193	57	2	536	6	57	193	4
Future Vol, veh/h	11	18	2	4	193	57	2	536	6	57	193	4
Conflicting Peds, #/hr	4	0	0	0	0	4	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	33	2	2	50	2	2	2	2	2	2	3	50
Mvmt Flow	12	20	2	4	210	62	2	583	7	62	210	4

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1067	931	213	938	930	591	215	0	0	590	0	0
Stage 1	337	337	-	591	591	-	-	-	-	-	-	-
Stage 2	730	594	-	347	339	-	-	-	-	-	-	-
Critical Hdwy	7.43	6.52	6.22	7.6	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.797	4.018	3.318	3.95	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	175	267	827	201	267	507	1355	-	-	985	-	-
Stage 1	617	641	-	419	494	-	-	-	-	-	-	-
Stage 2	369	493	-	580	640	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	41	247	826	178	247	505	1355	-	-	981	-	-
Mov Cap-2 Maneuver	41	247	-	178	247	-	-	-	-	-	-	-
Stage 1	615	594	-	418	493	-	-	-	-	-	-	-
Stage 2	185	492	-	519	593	-	-	-	-	-	-	-

Approach	SE		NW		NE		SW	
HCM Control Delay, s	67.2		93.6		0		2	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1355	-	-	277	90	981	-
HCM Lane V/C Ratio	0.002	-	-	0.997	0.374	0.063	-
HCM Control Delay (s)	7.7	0	-	93.6	67.2	8.9	0
HCM Lane LOS	A	A	-	F	F	A	A
HCM 95th %tile Q(veh)	0	-	-	10.1	1.5	0.2	-

Intersection	
Intersection Delay, s/veh	122.3
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	97	250	107	9	130	57	212	389	24	29	155	31
Future Vol, veh/h	97	250	107	9	130	57	212	389	24	29	155	31
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	20	2	2	2	2	8	2	2	2
Mvmt Flow	105	272	116	10	141	62	230	423	26	32	168	34
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	72.9	22.3	223.9	22.4
HCM LOS	F	C	F	C

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	34%	5%	21%	13%
Vol Thru, %	62%	66%	55%	72%
Vol Right, %	4%	29%	24%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	625	196	454	215
LT Vol	212	9	97	29
Through Vol	389	130	250	155
RT Vol	24	57	107	31
Lane Flow Rate	679	213	493	234
Geometry Grp	1	1	1	1
Degree of Util (X)	1.423	0.503	1.001	0.534
Departure Headway (Hd)	7.543	9.811	8.358	9.278
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	482	371	439	393
Service Time	5.634	7.811	6.358	7.278
HCM Lane V/C Ratio	1.409	0.574	1.123	0.595
HCM Control Delay	223.9	22.3	72.9	22.4
HCM Lane LOS	F	C	F	C
HCM 95th-tile Q	32.6	2.7	12.7	3

Intersection												
Int Delay, s/veh	97.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	196	79	26	4	26	46	0	314	61	61	360	146
Future Vol, veh/h	196	79	26	4	26	46	0	314	61	61	360	146
Conflicting Peds, #/hr	1	0	24	24	0	1	4	0	20	20	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	8	2	2	18	2	2	2	2	2	2	2
Mvmt Flow	213	86	28	4	28	50	0	341	66	66	391	159

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1022	1035	499	1078	1081	395	554	0	0	428	0	0
Stage 1	607	607	-	394	394	-	-	-	-	-	-	-
Stage 2	415	428	-	684	687	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.58	6.22	7.12	6.68	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.072	3.318	3.518	4.162	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	214	226	572	196	204	654	1016	-	-	1131	-	-
Stage 1	483	477	-	631	578	-	-	-	-	-	-	-
Stage 2	615	574	-	439	424	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 162	202	557	112	182	641	993	-	-	1130	-	-
Mov Cap-2 Maneuver	~ 162	202	-	112	182	-	-	-	-	-	-	-
Stage 1	481	434	-	619	567	-	-	-	-	-	-	-
Stage 2	538	563	-	299	386	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	419.3	21.2	0	0.9
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	993	-	-	183	304	1130	-
HCM Lane V/C Ratio	-	-	-	1.788	0.272	0.059	-
HCM Control Delay (s)	0	-	-	\$ 419.3	21.2	8.4	0
HCM Lane LOS	A	-	-	F	C	A	A
HCM 95th %tile Q(veh)	0	-	-	23.3	1.1	0.2	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection												
Int Delay, s/veh	2.8											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	35	4	0	24	7	4	11	2	6	7	0
Future Vol, veh/h	0	35	4	0	24	7	4	11	2	6	7	0
Conflicting Peds, #/hr	5	0	4	4	0	5	12	0	1	1	0	12
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	38	4	0	26	8	4	12	2	7	8	0

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	39	0	0	46	0	0	90	83	45	83	81	47
Stage 1	-	-	-	-	-	-	44	44	-	35	35	-
Stage 2	-	-	-	-	-	-	46	39	-	48	46	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1571	-	-	1562	-	-	895	807	1025	904	809	1022
Stage 1	-	-	-	-	-	-	970	858	-	981	866	-
Stage 2	-	-	-	-	-	-	968	862	-	965	857	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1554	-	-	1561	-	-	875	800	1020	887	802	1006
Mov Cap-2 Maneuver	-	-	-	-	-	-	875	800	-	887	802	-
Stage 1	-	-	-	-	-	-	966	855	-	976	862	-
Stage 2	-	-	-	-	-	-	949	858	-	949	854	-




Approach	SE	NW	NE	SW
HCM Control Delay, s	0	0	9.4	9.4
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	838	1561	-	-	1554	-	839
HCM Lane V/C Ratio	0.022	-	-	-	-	-	0.017
HCM Control Delay (s)	9.4	0	-	-	0	-	9.4
HCM Lane LOS	A	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	0.1

Intersection

Int Delay, s/veh 5.5

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	17	11	7	6	7	6
Future Vol, veh/h	17	11	7	6	7	6
Conflicting Peds, #/hr	3	0	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	12	8	7	8	7

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	48	23	26	0	-	0
Stage 1	23	-	-	-	-	-
Stage 2	25	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	962	1054	1588	-	-	-
Stage 1	1000	-	-	-	-	-
Stage 2	998	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	936	1042	1588	-	-	-
Mov Cap-2 Maneuver	936	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	982	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	8.8	3.9	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1588	-	975	-	-
HCM Lane V/C Ratio	0.005	-	0.031	-	-
HCM Control Delay (s)	7.3	0	8.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

06/18/2019

Intersection												
Int Delay, s/veh	3.7											
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	13	13	4	4	54	85	2	309	6	20	464	66
Future Vol, veh/h	13	13	4	4	54	85	2	309	6	20	464	66
Conflicting Peds, #/hr	4	0	0	0	0	4	16	0	1	1	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	33	2	2	2
Mvmt Flow	14	14	4	4	59	92	2	336	7	22	504	72

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1023	948	556	937	980	344	592	0	0	343	0	0
Stage 1	600	600	-	344	344	-	-	-	-	-	-	-
Stage 2	423	348	-	593	636	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	214	261	531	245	250	699	984	-	-	1216	-	-
Stage 1	488	490	-	671	637	-	-	-	-	-	-	-
Stage 2	609	634	-	492	472	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	144	249	523	227	239	696	984	-	-	1212	-	-
Mov Cap-2 Maneuver	144	249	-	227	239	-	-	-	-	-	-	-
Stage 1	479	470	-	668	635	-	-	-	-	-	-	-
Stage 2	476	632	-	460	452	-	-	-	-	-	-	-

Approach	SE		NW		NE		SW	
HCM Control Delay, s	26.5		20.2		0.1		0.3	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	984	-	-	391	200	1212	-
HCM Lane V/C Ratio	0.002	-	-	0.398	0.163	0.018	-
HCM Control Delay (s)	8.7	0	-	20.2	26.5	8	0
HCM Lane LOS	A	A	-	C	D	A	A
HCM 95th %tile Q(veh)	0	-	-	1.9	0.6	0.1	-

Intersection	
Intersection Delay, s/veh	100.4
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	51	183	89	33	223	52	173	219	11	24	398	41
Future Vol, veh/h	51	183	89	33	223	52	173	219	11	24	398	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	7	2	2	2	2	2	2
Mvmt Flow	55	199	97	36	242	57	188	238	12	26	433	45
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	56.3	52	107.2	157.6
HCM LOS	F	F	F	F

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	43%	11%	16%	5%
Vol Thru, %	54%	72%	57%	86%
Vol Right, %	3%	17%	28%	9%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	403	308	323	463
LT Vol	173	33	51	24
Through Vol	219	223	183	398
RT Vol	11	52	89	41
Lane Flow Rate	438	335	351	503
Geometry Grp	1	1	1	1
Degree of Util (X)	1.096	0.858	0.887	1.243
Departure Headway (Hd)	9.789	10.295	10.147	9.331
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	372	355	362	393
Service Time	7.789	8.295	8.147	7.331
HCM Lane V/C Ratio	1.177	0.944	0.97	1.28
HCM Control Delay	107.2	52	56.3	157.6
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	14.7	7.9	8.6	20.5

Intersection												
Int Delay, s/veh	36.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	131	39	13	29	31	53	6	367	66	42	298	303
Future Vol, veh/h	131	39	13	29	31	53	6	367	66	42	298	303
Conflicting Peds, #/hr	5	0	113	113	0	5	4	0	29	29	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	29	2	2	10	2	2	2	2	4	2	2
Mvmt Flow	142	42	14	32	34	58	7	399	72	46	324	329

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1082	1097	606	1198	1226	469	657	0	0	500	0	0
Stage 1	584	584	-	477	477	-	-	-	-	-	-	-
Stage 2	498	513	-	721	749	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.79	6.22	7.12	6.6	6.22	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.261	3.318	3.518	4.09	3.318	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	195	191	497	162	172	594	931	-	-	1054	-	-
Stage 1	498	457	-	569	543	-	-	-	-	-	-	-
Stage 2	554	494	-	419	408	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 136	170	443	104	153	575	834	-	-	1049	-	-
Mov Cap-2 Maneuver	~ 136	170	-	104	153	-	-	-	-	-	-	-
Stage 1	491	422	-	548	523	-	-	-	-	-	-	-
Stage 2	459	475	-	303	377	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	242.7		49.5		0.1		0.6	
HCM LOS	F		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	834	-	-	150	197	1049	-
HCM Lane V/C Ratio	0.008	-	-	1.326	0.623	0.044	-
HCM Control Delay (s)	9.4	0	-	242.7	49.5	8.6	0
HCM Lane LOS	A	A	-	F	E	A	A
HCM 95th %tile Q(veh)	0	-	-	12.2	3.6	0.1	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 7.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	15	6	2	17	0	7	95	6	6	27	2
Future Vol, veh/h	4	15	6	2	17	0	7	95	6	6	27	2
Conflicting Peds, #/hr	0	0	2	2	0	0	10	0	3	3	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	25	2	2	2	50	2
Mvmt Flow	4	16	7	2	18	0	8	103	7	7	29	2

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	18	0	0	25
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1599	-	-	1589
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1584	-	-	1585
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-




Approach	SE	NW	NE	SW
HCM Control Delay, s	1.2	0.8	10	10
HCM LOS			B	B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	842	1585	-	-	1584	-	-
HCM Lane V/C Ratio	0.139	0.001	-	-	0.003	-	-
HCM Control Delay (s)	10	7.3	0	-	7.3	0	-
HCM Lane LOS	B	A	A	-	A	A	-
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-

Intersection

Int Delay, s/veh 1.2

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	7	4	9	90	25	6
Future Vol, veh/h	7	4	9	90	25	6
Conflicting Peds, #/hr	5	0	9	0	0	9
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	2	2	2	33	2
Mvmt Flow	8	4	10	98	27	7

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	161	39	43	0	-	0
Stage 1	39	-	-	-	-	-
Stage 2	122	-	-	-	-	-
Critical Hdwy	6.9	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.9	-	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-	-
Follow-up Hdwy	3.95	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	730	1033	1566	-	-	-
Stage 1	873	-	-	-	-	-
Stage 2	797	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	713	1024	1566	-	-	-
Mov Cap-2 Maneuver	713	-	-	-	-	-
Stage 1	866	-	-	-	-	-
Stage 2	785	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	9.6	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1566	-	802	-	-
HCM Lane V/C Ratio	0.006	-	0.015	-	-
HCM Control Delay (s)	7.3	0	9.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection

Int Delay, s/veh 3.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	18	13	4	16	94	23	456	6	57	160	4
Future Vol, veh/h	11	18	13	4	16	94	23	456	6	57	160	4
Conflicting Peds, #/hr	4	0	0	0	0	4	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	33	2	2	50	2	2	2	2	2	2	3	50
Mvmt Flow	12	20	14	4	17	102	25	496	7	62	174	4

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	914	854	177	867	853	504	179	0	0	503	0	0
Stage 1	301	301	-	550	550	-	-	-	-	-	-	-
Stage 2	613	553	-	317	303	-	-	-	-	-	-	-
Critical Hdwy	7.43	6.52	6.22	7.6	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.43	5.52	-	6.6	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.797	4.018	3.318	3.95	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	224	296	866	227	296	568	1397	-	-	1061	-	-
Stage 1	646	665	-	443	516	-	-	-	-	-	-	-
Stage 2	431	514	-	603	664	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	162	269	865	197	269	565	1397	-	-	1057	-	-
Mov Cap-2 Maneuver	162	269	-	197	269	-	-	-	-	-	-	-
Stage 1	629	621	-	432	503	-	-	-	-	-	-	-
Stage 2	331	501	-	537	620	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	20.3	15.6	0.4	2.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1397	-	-	463	280	1057	-
HCM Lane V/C Ratio	0.018	-	-	0.268	0.163	0.059	-
HCM Control Delay (s)	7.6	0	-	15.6	20.3	8.6	0
HCM Lane LOS	A	A	-	C	C	A	A
HCM 95th %tile Q(veh)	0.1	-	-	1.1	0.6	0.2	-

Intersection	
Intersection Delay, s/veh	97
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	97	250	96	9	130	57	191	308	24	29	232	55
Future Vol, veh/h	97	250	96	9	130	57	191	308	24	29	232	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	20	2	2	2	2	8	2	2	2
Mvmt Flow	105	272	104	10	141	62	208	335	26	32	252	60
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	87.9	24.8	166.5	39.4
HCM LOS	F	C	F	E

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	37%	5%	22%	9%
Vol Thru, %	59%	66%	56%	73%
Vol Right, %	5%	29%	22%	17%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	523	196	443	316
LT Vol	191	9	97	29
Through Vol	308	130	250	232
RT Vol	24	57	96	55
Lane Flow Rate	568	213	482	343
Geometry Grp	1	1	1	1
Degree of Util (X)	1.276	0.542	1.05	0.792
Departure Headway (Hd)	8.351	10.276	8.666	9.217
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	438	354	424	395
Service Time	6.351	8.276	6.666	7.217
HCM Lane V/C Ratio	1.297	0.602	1.137	0.868
HCM Control Delay	166.5	24.8	87.9	39.4
HCM Lane LOS	F	C	F	E
HCM 95th-tile Q	23.6	3.1	14.2	6.8

Intersection

Int Delay, s/veh 97.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	196	79	26	4	26	46	0	314	61	61	360	146
Future Vol, veh/h	196	79	26	4	26	46	0	314	61	61	360	146
Conflicting Peds, #/hr	1	0	24	24	0	1	4	0	20	20	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	8	2	2	18	2	2	2	2	2	2	2
Mvmt Flow	213	86	28	4	28	50	0	341	66	66	391	159

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1022	1035	499	1078	1081	395	554	0	0	428	0	0
Stage 1	607	607	-	394	394	-	-	-	-	-	-	-
Stage 2	415	428	-	684	687	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.58	6.22	7.12	6.68	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.58	-	6.12	5.68	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.072	3.318	3.518	4.162	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	214	226	572	196	204	654	1016	-	-	1131	-	-
Stage 1	483	477	-	631	578	-	-	-	-	-	-	-
Stage 2	615	574	-	439	424	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 162	202	557	112	182	641	993	-	-	1130	-	-
Mov Cap-2 Maneuver	~ 162	202	-	112	182	-	-	-	-	-	-	-
Stage 1	481	434	-	619	567	-	-	-	-	-	-	-
Stage 2	538	563	-	299	386	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	419.3	21.2	0	0.9
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	993	-	-	183	304	1130	-
HCM Lane V/C Ratio	-	-	-	1.788	0.272	0.059	-
HCM Control Delay (s)	0	-	-	\$ 419.3	21.2	8.4	0
HCM Lane LOS	A	-	-	F	C	A	A
HCM 95th %tile Q(veh)	0	-	-	23.3	1.1	0.2	-

Notes

-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 5.7

Movement SEL SET NWT NWR SWL SWR

Lane Configurations		↔	↔		↔	
Traffic Vol, veh/h	80	18	7	33	23	23
Future Vol, veh/h	80	18	7	33	23	23
Conflicting Peds, #/hr	15	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	87	20	8	36	25	25

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	58	0	-	0	234	41
Stage 1	-	-	-	-	41	-
Stage 2	-	-	-	-	193	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1546	-	-	-	754	1030
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	840	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1546	-	-	-	691	1016
Mov Cap-2 Maneuver	-	-	-	-	691	-
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	781	-

Approach SE NW SW

HCM Control Delay, s	6.1	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt NWT NWR SEL SETSWLn1

Capacity (veh/h)	-	-	1546	-	823
HCM Lane V/C Ratio	-	-	0.056	-	0.061
HCM Control Delay (s)	-	-	7.5	0	9.7
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	-	0.2

Intersection

Int Delay, s/veh 3.3

Movement SET SER NWL NWT NEL NER

Lane Configurations						
Traffic Vol, veh/h	381	17	29	363	33	154
Future Vol, veh/h	381	17	29	363	33	154
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	414	18	32	395	36	167

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	433	0	881	423
Stage 1	-	-	-	-	423	-
Stage 2	-	-	-	-	458	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1127	-	317	631
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	637	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1127	-	306	631
Mov Cap-2 Maneuver	-	-	-	-	306	-
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	614	-

Approach SE NW NE

HCM Control Delay, s	0	0.6	15.9
HCM LOS			C

Minor Lane/Major Mvmt NELn1 NWL NWT SET SER

Capacity (veh/h)	531	1127	-	-	-
HCM Lane V/C Ratio	0.383	0.028	-	-	-
HCM Control Delay (s)	15.9	8.3	0	-	-
HCM Lane LOS	C	A	A	-	-
HCM 95th %tile Q(veh)	1.8	0.1	-	-	-

Intersection

Int Delay, s/veh 6.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	35	4	0	24	7	4	57	2	6	61	0
Future Vol, veh/h	0	35	4	0	24	7	4	57	2	6	61	0
Conflicting Peds, #/hr	5	0	4	4	0	5	12	0	1	1	0	12
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	38	4	0	26	8	4	62	2	7	66	0

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	39	0	0	46
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	1571	-	-	1562
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1554	-	-	1561
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0	0	9.9	9.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	805	1561	-	-	1554	-	803
HCM Lane V/C Ratio	0.085	-	-	-	-	-	0.091
HCM Control Delay (s)	9.9	0	-	-	0	-	9.9
HCM Lane LOS	A	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	0.3

Intersection

Int Delay, s/veh 2

Movement SEL SER NEL NET SWT SWR

Lane Configurations						
Traffic Vol, veh/h	17	11	7	54	61	6
Future Vol, veh/h	17	11	7	54	61	6
Conflicting Peds, #/hr	3	0	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	12	8	59	66	7

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	159	82	85	0	-	0
Stage 1	82	-	-	-	-	-
Stage 2	77	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	832	978	1512	-	-	-
Stage 1	941	-	-	-	-	-
Stage 2	946	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	810	967	1512	-	-	-
Mov Cap-2 Maneuver	810	-	-	-	-	-
Stage 1	931	-	-	-	-	-
Stage 2	931	-	-	-	-	-

Approach SE NE SW

HCM Control Delay, s	9.3	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt NEL NET SELn1 SWT SWR

Capacity (veh/h)	1512	-	865	-	-
HCM Lane V/C Ratio	0.005	-	0.035	-	-
HCM Control Delay (s)	7.4	0	9.3	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 2010 TWSC
3: Nelson St. & Park St.

06/19/2019

Intersection

Int Delay, s/veh 4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	13	13	15	4	54	85	19	263	6	20	400	66
Future Vol, veh/h	13	13	15	4	54	85	19	263	6	20	400	66
Conflicting Peds, #/hr	4	0	0	0	0	4	16	0	1	1	0	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	33	2	2	2
Mvmt Flow	14	14	16	4	59	92	21	286	7	22	435	72

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	940	865	487	860	897	294	523	0	0	293	0	0
Stage 1	530	530	-	331	331	-	-	-	-	-	-	-
Stage 2	410	335	-	529	566	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	244	292	581	276	279	745	1043	-	-	1269	-	-
Stage 1	533	527	-	682	645	-	-	-	-	-	-	-
Stage 2	619	643	-	533	507	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	167	274	572	248	262	742	1043	-	-	1264	-	-
Mov Cap-2 Maneuver	167	274	-	248	262	-	-	-	-	-	-	-
Stage 1	513	507	-	665	629	-	-	-	-	-	-	-
Stage 2	478	627	-	491	488	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	20.9	18.3	0.6	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1043	-	-	425	271	1264	-
HCM Lane V/C Ratio	0.02	-	-	0.366	0.164	0.017	-
HCM Control Delay (s)	8.5	0	-	18.3	20.9	7.9	0
HCM Lane LOS	A	A	-	C	C	A	A
HCM 95th %tile Q(veh)	0.1	-	-	1.6	0.6	0.1	-

Intersection	
Intersection Delay, s/veh	100.3
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	51	223	98	33	223	52	156	173	11	24	345	94
Future Vol, veh/h	51	223	98	33	223	52	156	173	11	24	345	94
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	7	2	2	2	2	2	2
Mvmt Flow	55	242	107	36	242	57	170	188	12	26	375	102
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	83.4	55.2	71.5	164.9
HCM LOS	F	F	F	F

Lane	NELn1	NWLn1	SELn1	SWLn1
Vol Left, %	46%	11%	14%	5%
Vol Thru, %	51%	72%	60%	75%
Vol Right, %	3%	17%	26%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	340	308	372	463
LT Vol	156	33	51	24
Through Vol	173	223	223	345
RT Vol	11	52	98	94
Lane Flow Rate	370	335	404	503
Geometry Grp	1	1	1	1
Degree of Util (X)	0.96	0.876	1.014	1.262
Departure Headway (Hd)	10.266	10.373	9.911	9.317
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	355	352	368	393
Service Time	8.266	8.373	7.911	7.317
HCM Lane V/C Ratio	1.042	0.952	1.098	1.28
HCM Control Delay	71.5	55.2	83.4	164.9
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	10.4	8.3	12.1	21.3

Intersection												
Int Delay, s/veh	36.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	131	39	13	29	31	53	6	367	66	42	298	303
Future Vol, veh/h	131	39	13	29	31	53	6	367	66	42	298	303
Conflicting Peds, #/hr	5	0	113	113	0	5	4	0	29	29	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	29	2	2	10	2	2	2	2	4	2	2
Mvmt Flow	142	42	14	32	34	58	7	399	72	46	324	329

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1082	1097	606	1198	1226	469	657	0	0	500	0	0
Stage 1	584	584	-	477	477	-	-	-	-	-	-	-
Stage 2	498	513	-	721	749	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.79	6.22	7.12	6.6	6.22	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.79	-	6.12	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.261	3.318	3.518	4.09	3.318	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	195	191	497	162	172	594	931	-	-	1054	-	-
Stage 1	498	457	-	569	543	-	-	-	-	-	-	-
Stage 2	554	494	-	419	408	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 136	170	443	104	153	575	834	-	-	1049	-	-
Mov Cap-2 Maneuver	~ 136	170	-	104	153	-	-	-	-	-	-	-
Stage 1	491	422	-	548	523	-	-	-	-	-	-	-
Stage 2	459	475	-	303	377	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	242.7	49.5	0.1	0.6
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	834	-	-	150	197	1049	-
HCM Lane V/C Ratio	0.008	-	-	1.326	0.623	0.044	-
HCM Control Delay (s)	9.4	0	-	242.7	49.5	8.6	0
HCM Lane LOS	A	A	-	F	E	A	A
HCM 95th %tile Q(veh)	0	-	-	12.2	3.6	0.1	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 3.6

Movement SEL SET NWT NWR SWL SWR

Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	46	24	13	127	17	53
Future Vol, veh/h	46	24	13	127	17	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	26	14	138	18	58

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	152	0	-	0	209	83
Stage 1	-	-	-	-	83	-
Stage 2	-	-	-	-	126	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1429	-	-	-	779	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	900	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1429	-	-	-	751	976
Mov Cap-2 Maneuver	-	-	-	-	751	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	868	-

Approach SE NW SW

HCM Control Delay, s	5	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt NWT NWR SEL SETSWLn1

Capacity (veh/h)	-	-	1429	-	910
HCM Lane V/C Ratio	-	-	0.035	-	0.084
HCM Control Delay (s)	-	-	7.6	0	9.3
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	-	0.3

Intersection

Int Delay, s/veh 2.2

Movement SET SER NWL NWT NEL NER

Lane Configurations						
Traffic Vol, veh/h	322	11	53	438	17	107
Future Vol, veh/h	322	11	53	438	17	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	350	12	58	476	18	116

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	362	0	947	356
Stage 1	-	-	-	-	356	-
Stage 2	-	-	-	-	591	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1197	-	290	688
Stage 1	-	-	-	-	709	-
Stage 2	-	-	-	-	553	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1197	-	271	688
Mov Cap-2 Maneuver	-	-	-	-	271	-
Stage 1	-	-	-	-	709	-
Stage 2	-	-	-	-	517	-

Approach SE NW NE

HCM Control Delay, s	0	0.9	13.3
HCM LOS			B

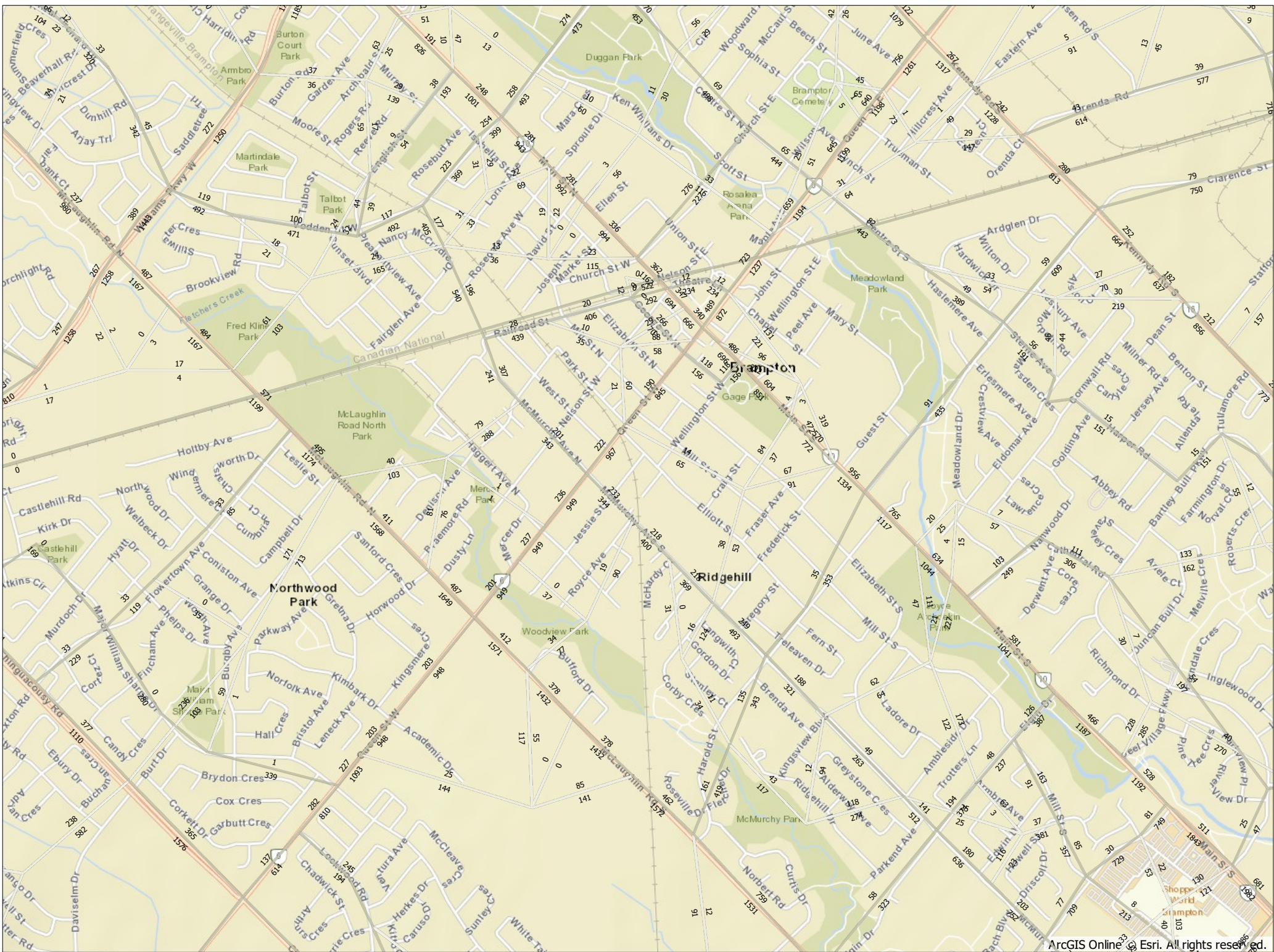
Minor Lane/Major Mvmt NELn1 NWL NWT SET SER

Capacity (veh/h)	568	1197	-	-	-
HCM Lane V/C Ratio	0.237	0.048	-	-	-
HCM Control Delay (s)	13.3	8.2	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.9	0.2	-	-	-

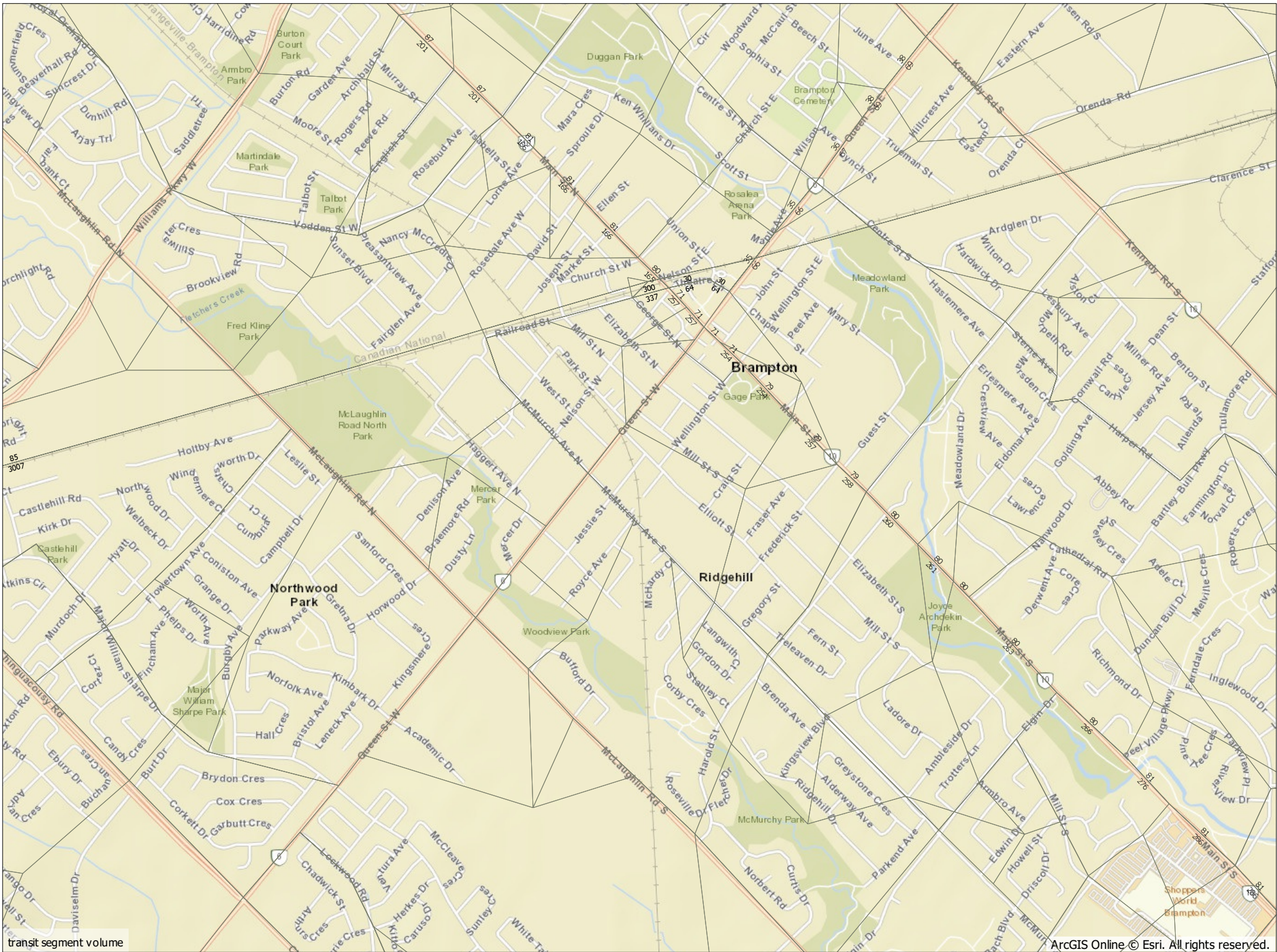
TECHNICAL MEMORANDUM

Appendix D – EMME Outputs Provided by The City

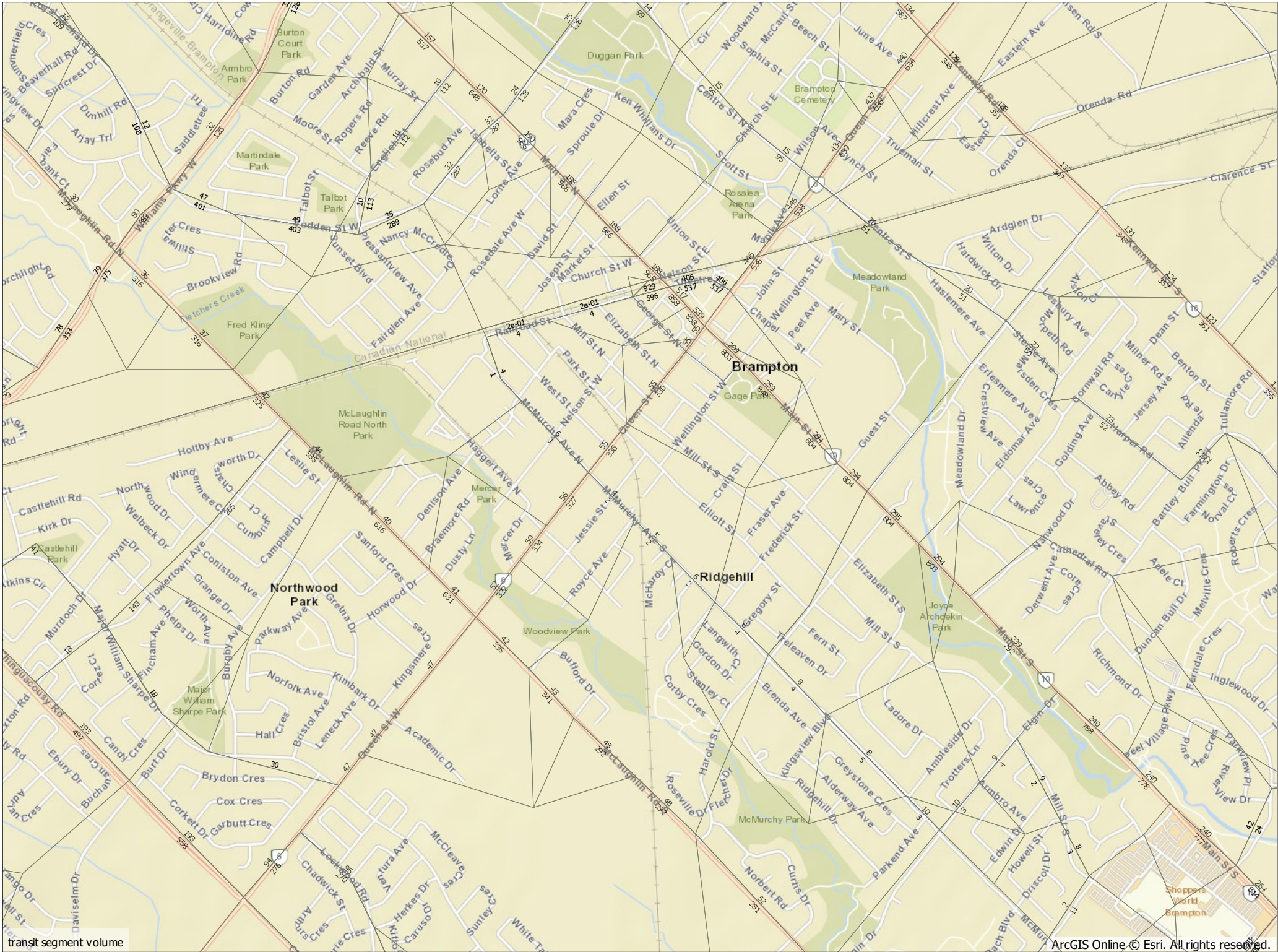
2011 AM Peak Hour Auto Volume



2011 AM Peak Period (6:00-9:00) GO Transit Volume



2011 AM Peak Period (6:00-9:00) Local Transit Volume



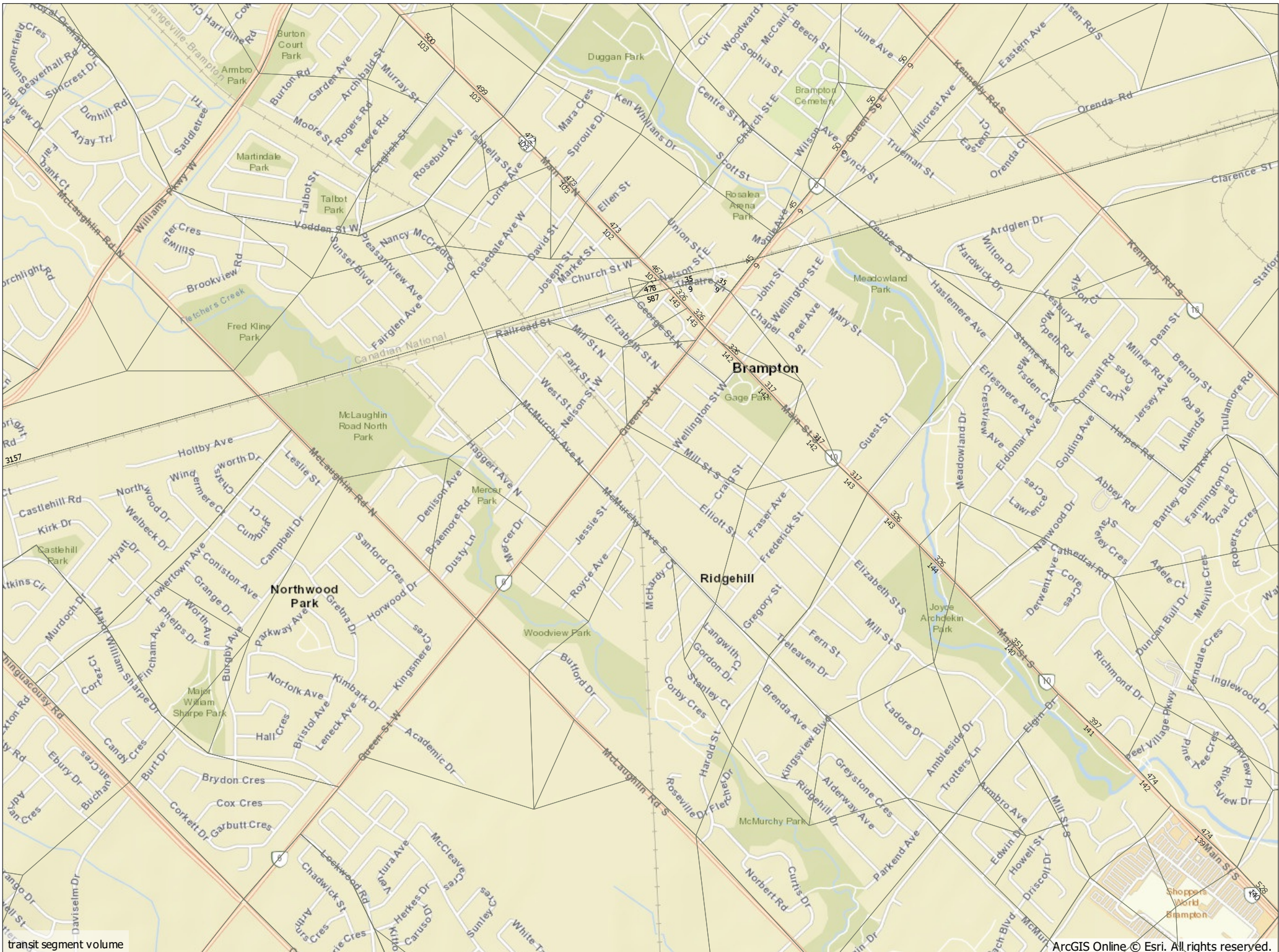
transit segment volume

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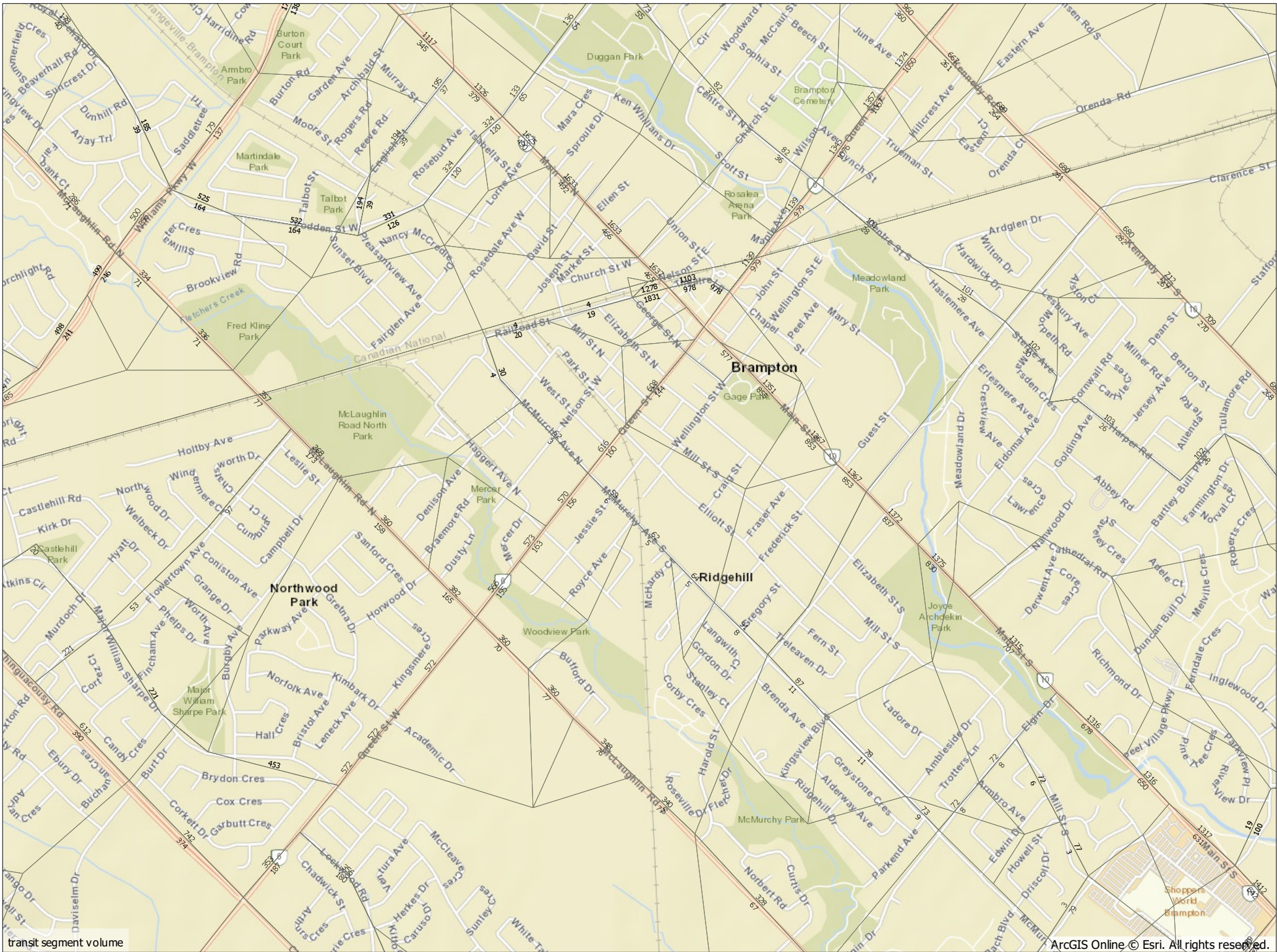
2011 PM Peak Hour Auto Volume



2011 PM Peak Period (15:00-19:00) GO Transit Volume



2011 PM Peak Period (15:00-17:00) Local Transit Volume



transit segment volume

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2031 AM Peak Hour Auto Volume

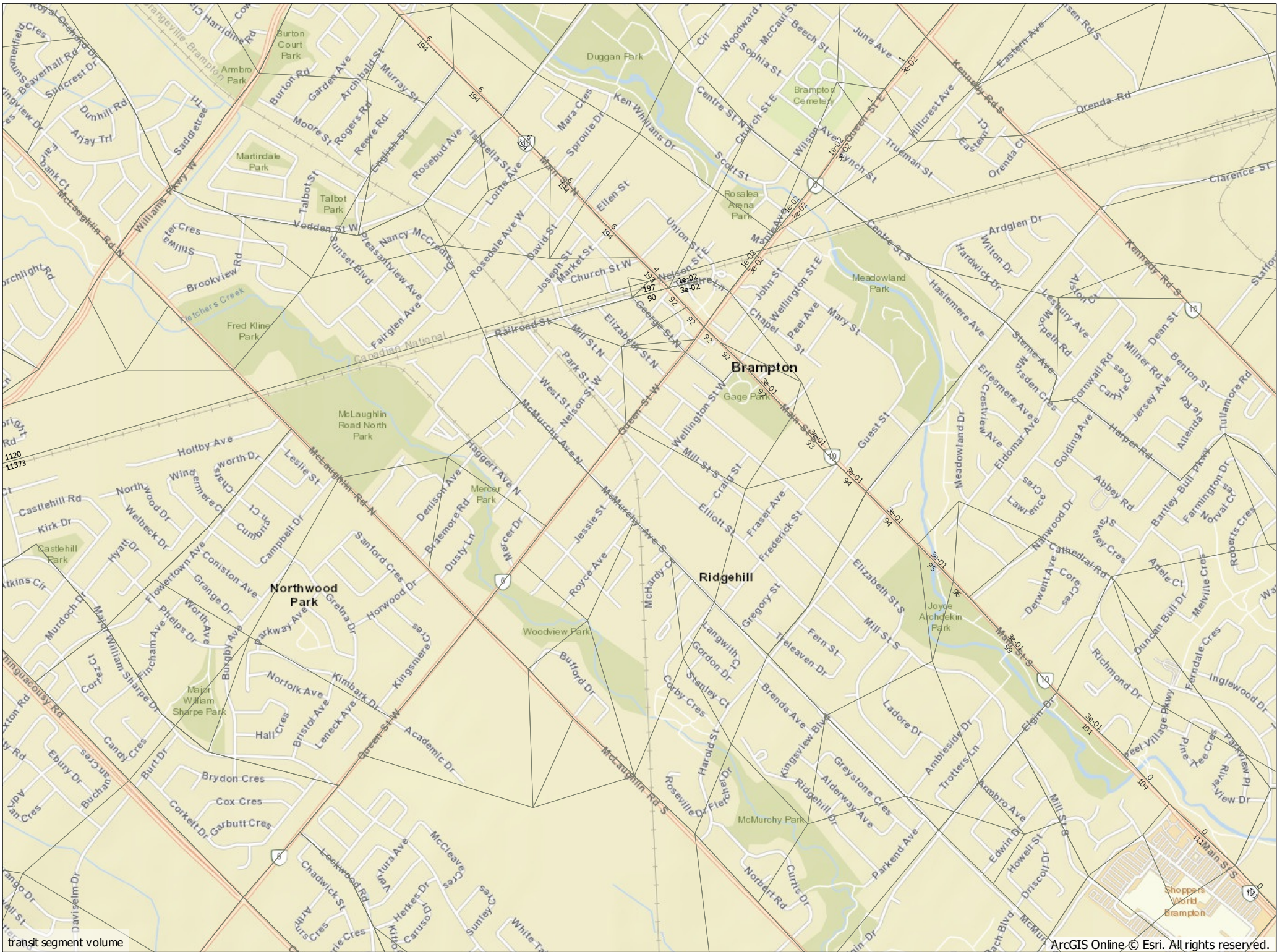


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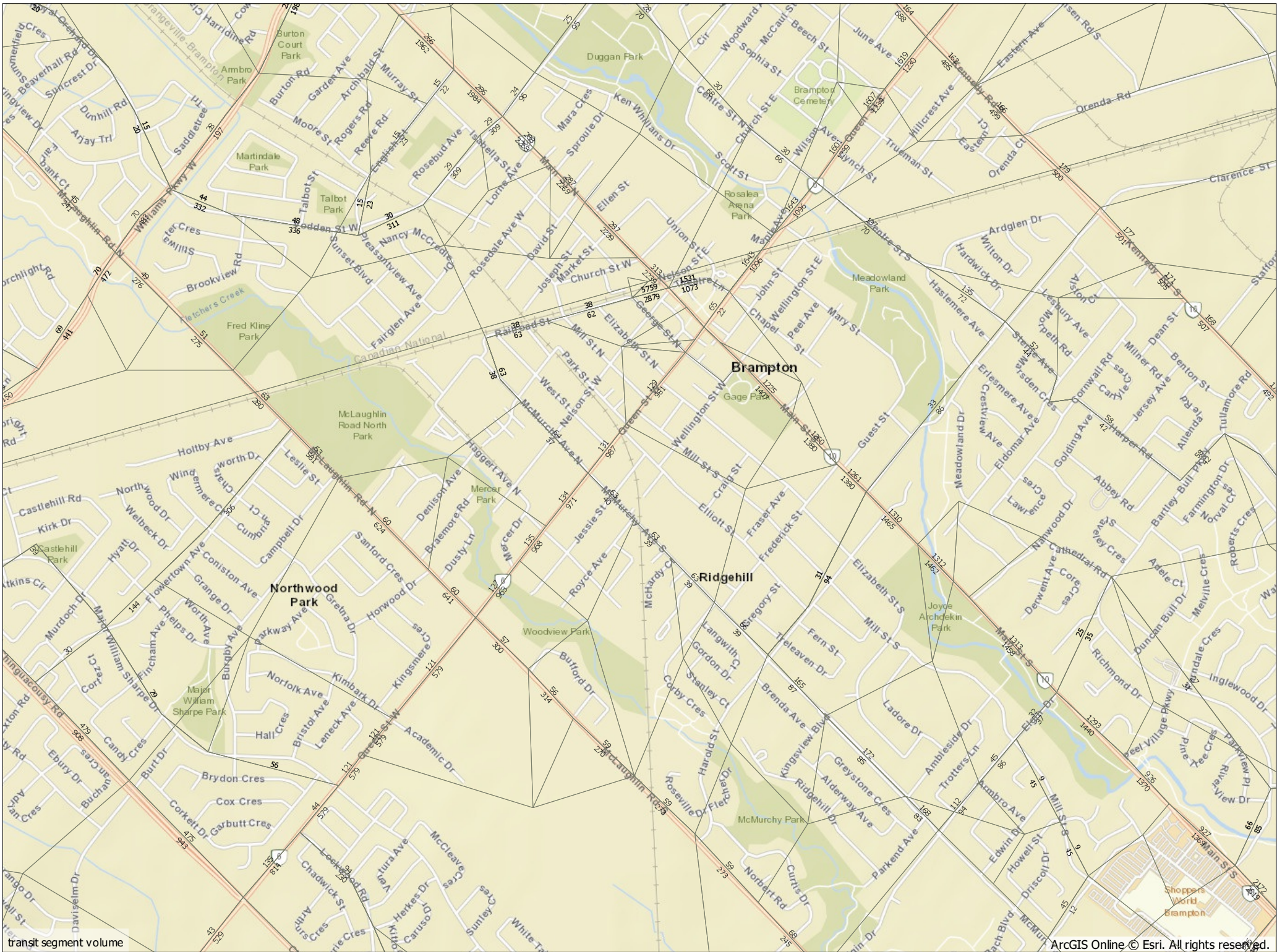
2031 with campus (C:\2031_with_campus\Database\emmetbank)

Scenario: 11: AM - Cleaned Network

2031 AM Peak Period (6:00-9:00) GO Transit Volume



2031 AM Peak Period (6:00-9:00) Local Transit Volume



transit segment volume

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2031 with campus (C:/2031_with_campus/Database/emmebank)

Scenario: 12: AM - Cleaned Network - FBTN

2031 PM Peak Hour Auto Volume



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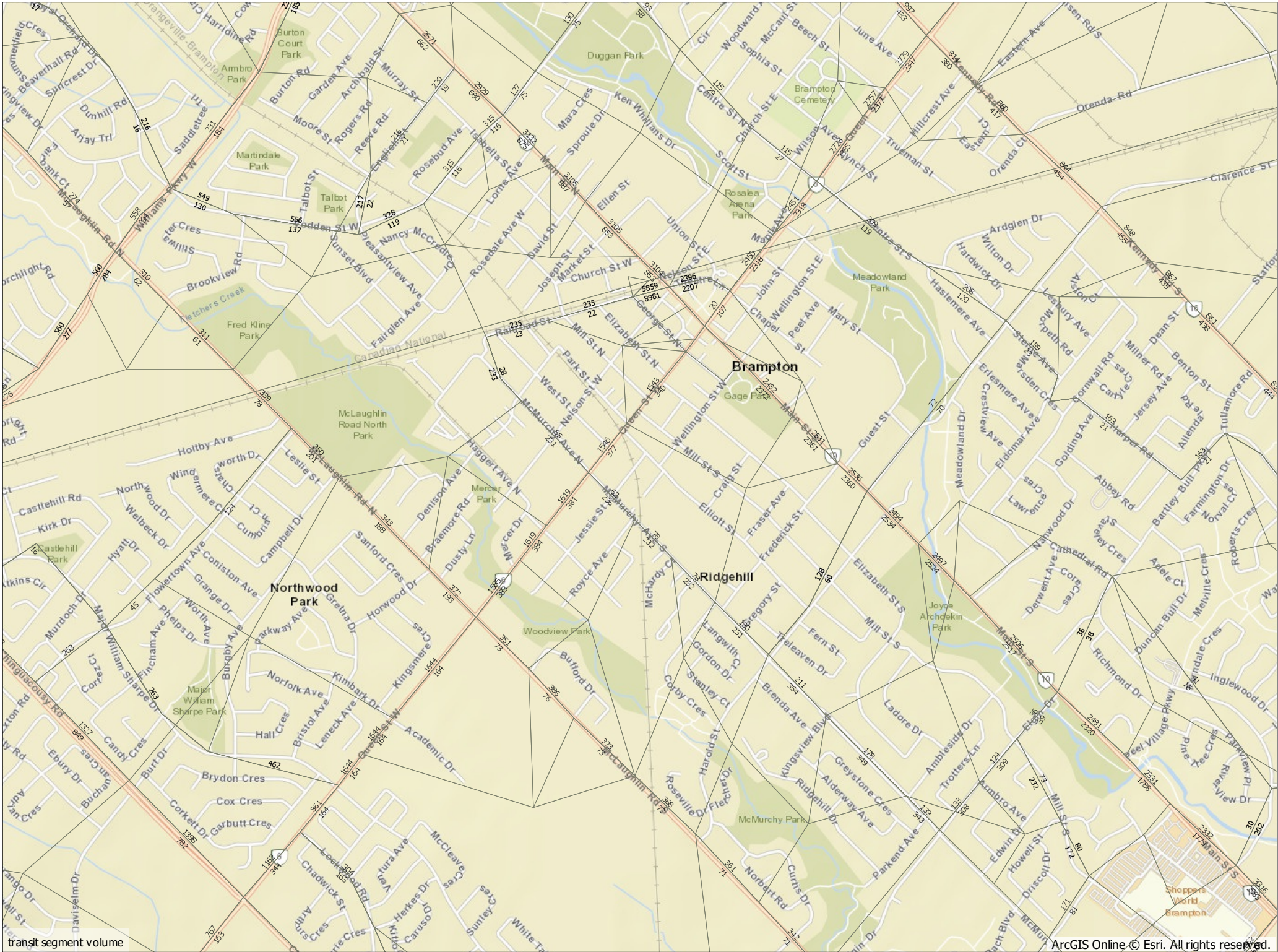
2031 PM Peak Period (15:00-19:00) GO Transit Volume



transit segment volume

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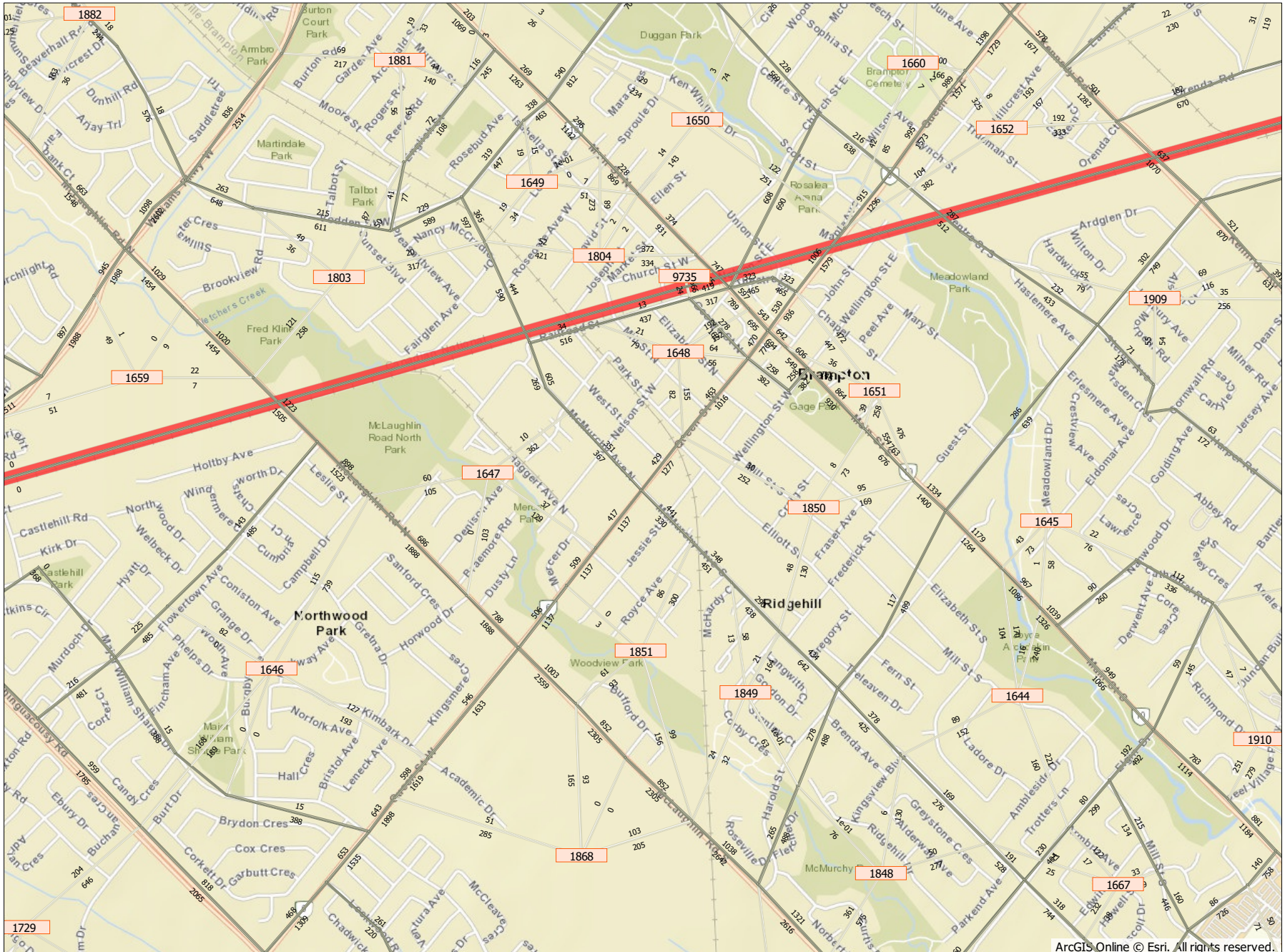
2031 PM Peak Period (15:00:00) Local Transit Volume



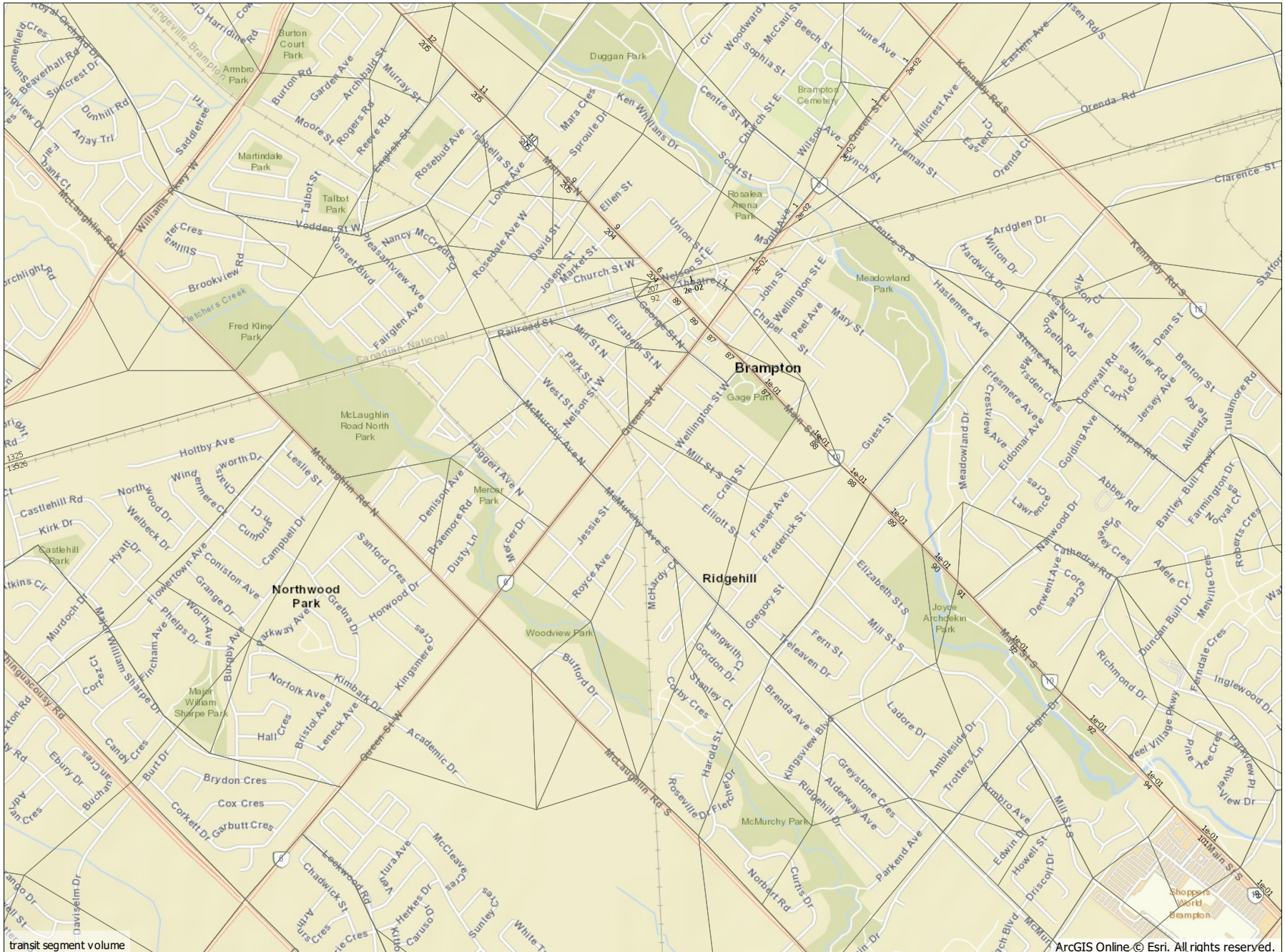
transit segment volume

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2041 AM Peak Hour Auto Volume



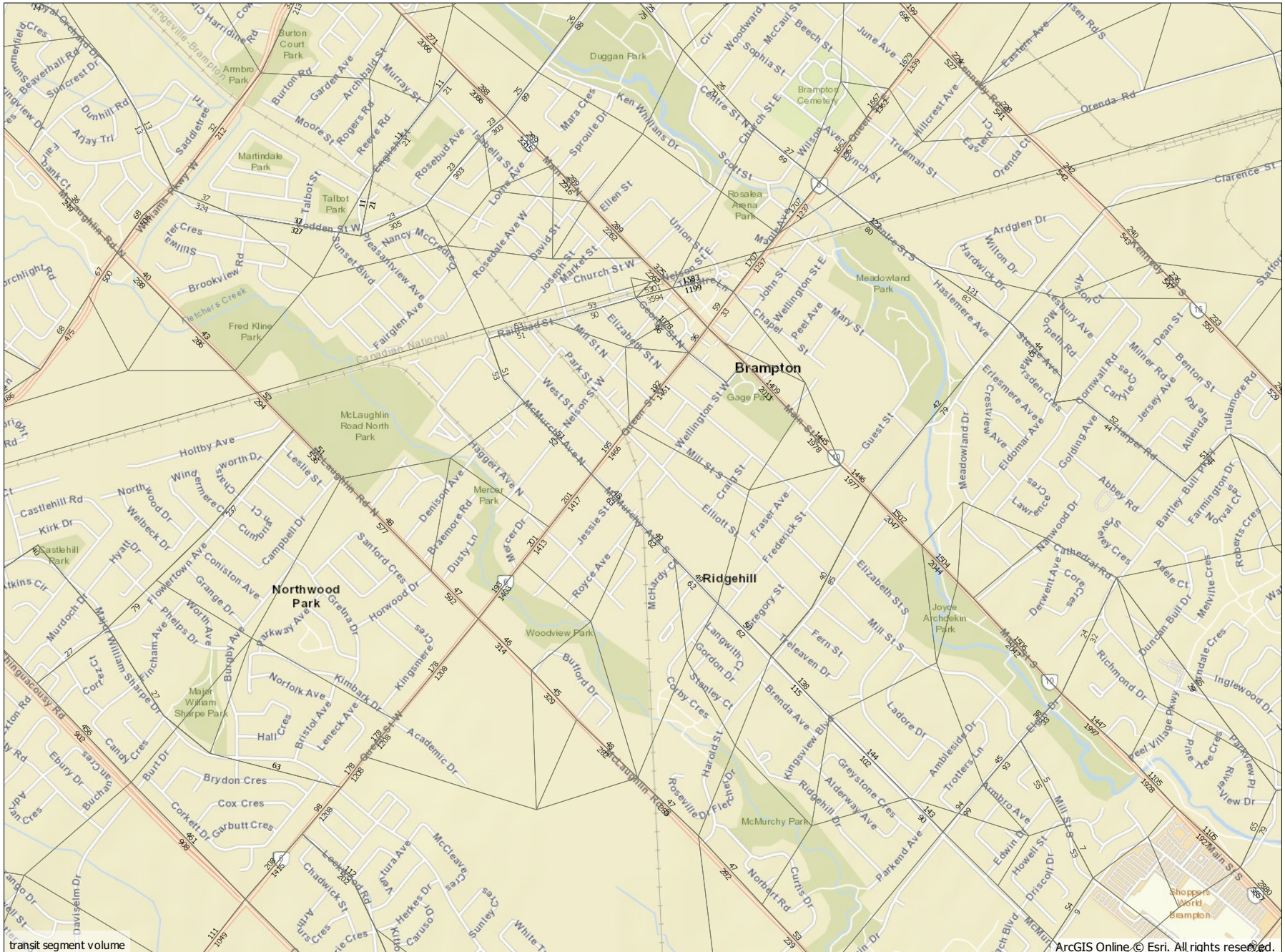
2041 AM Peak Period (6:00-9:00) GO Transit Volume



transit segment volume

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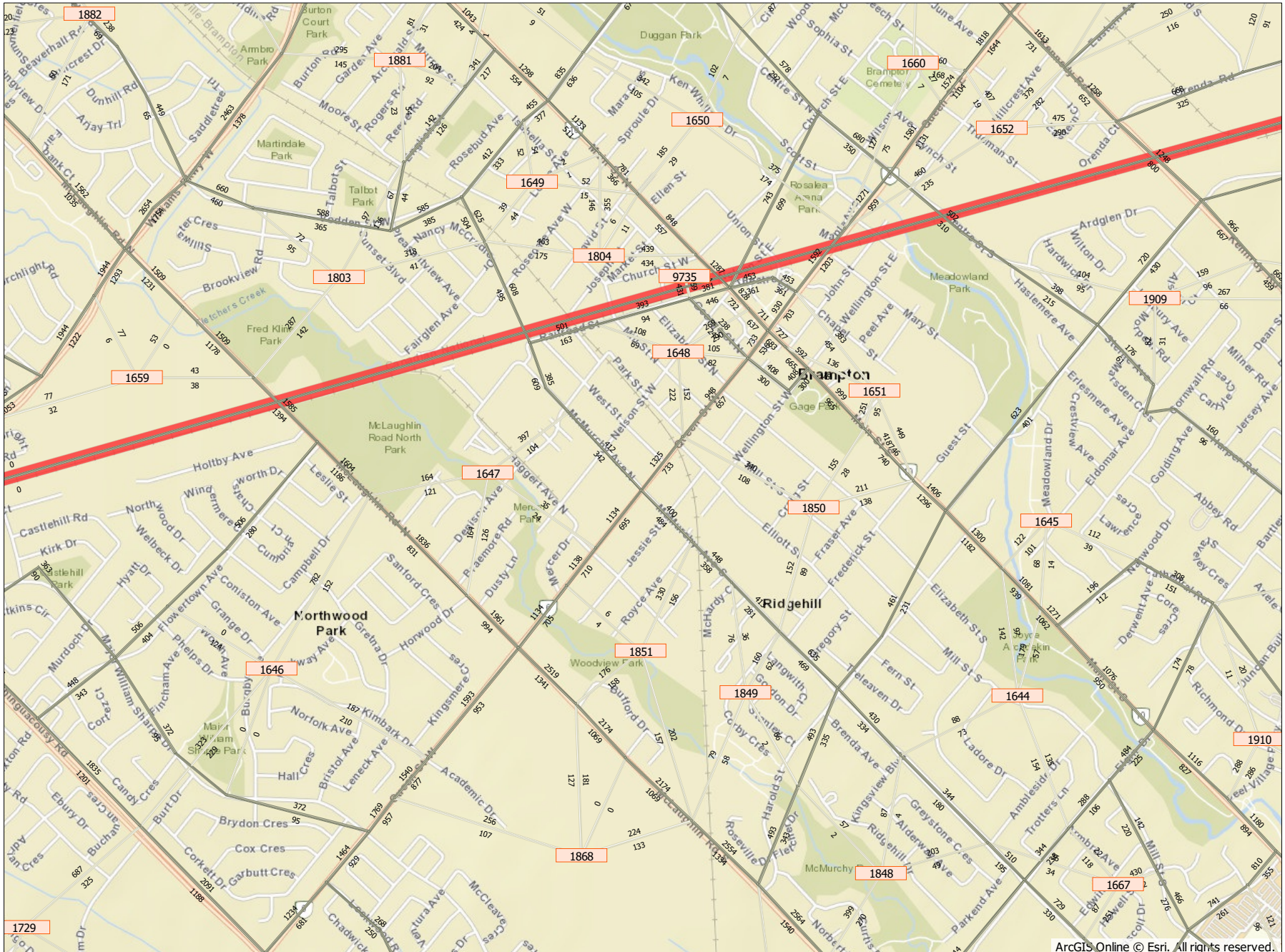
2041 AM Peak Period (6:00-9:00) Local Transit Volume



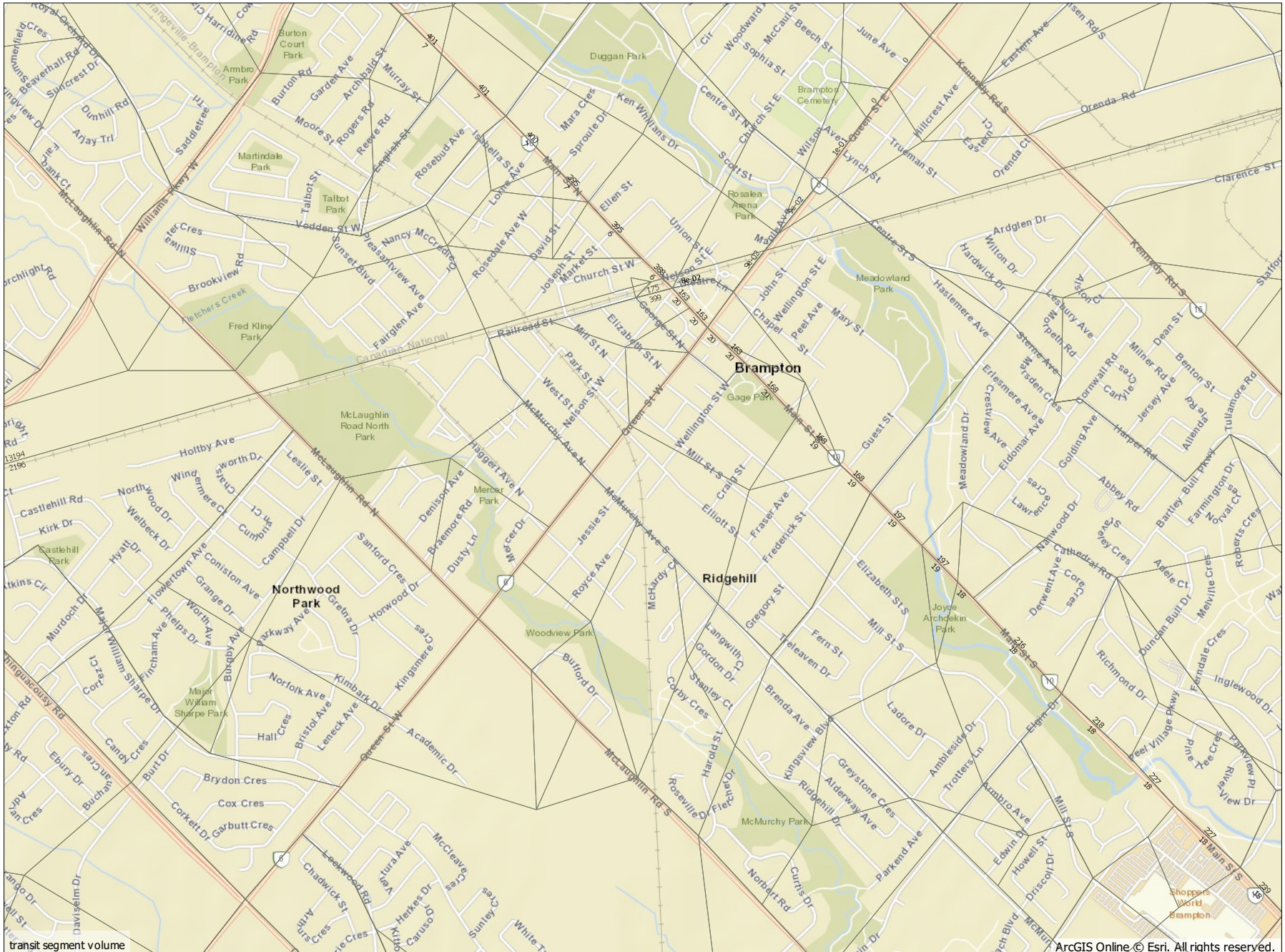
transit segment volume

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2041 PM Peak Hour Auto Volume



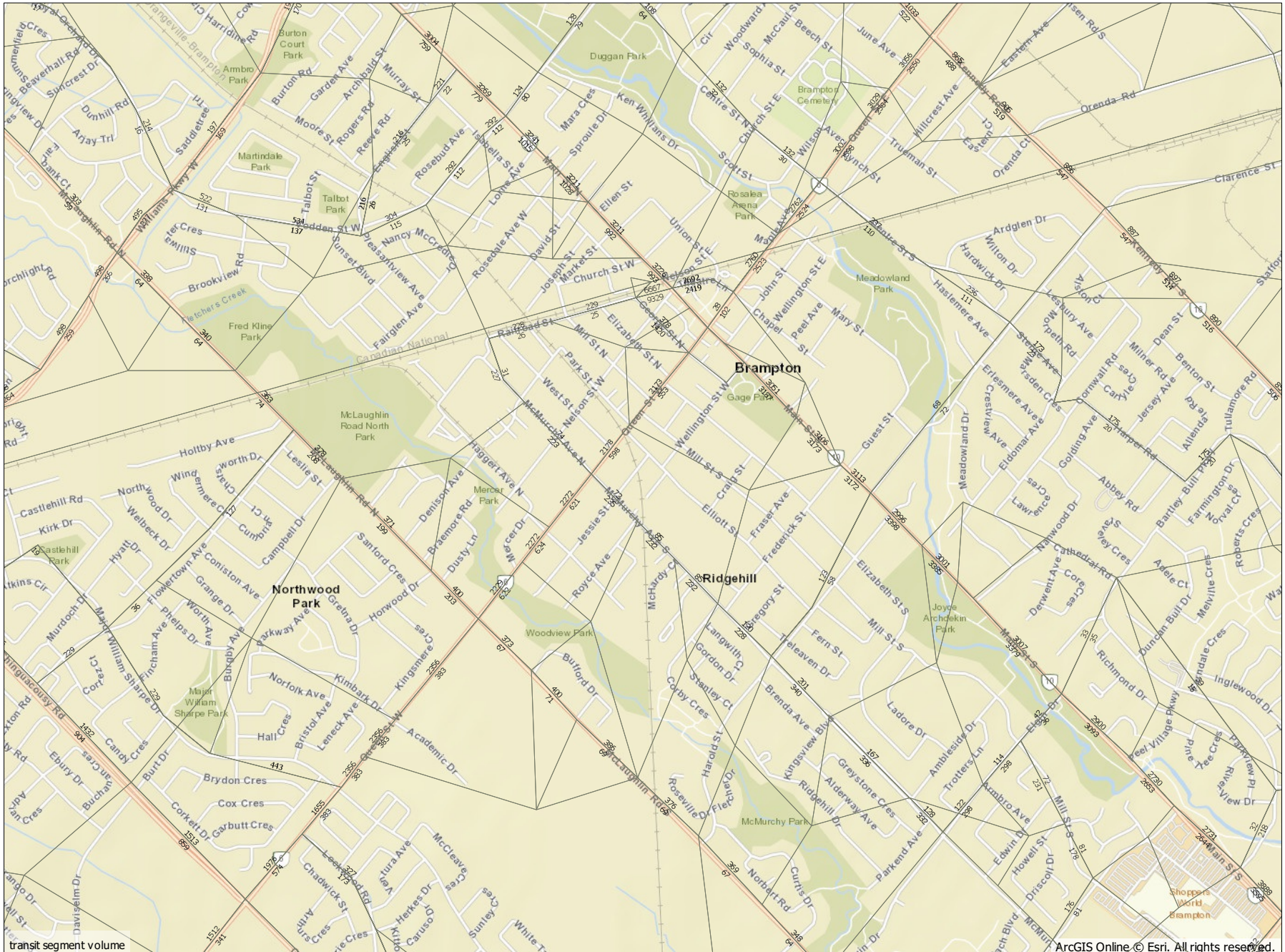
2041 PM Peak Period (15:00-19:00) GO Transit Volume



transit segment volume

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2041 PM Peak Period (15:00-19:00) Local Transit Volume



transit segment volume

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2041_WITH CAMPUS (C:/2041_with_campus/Database/emmebank)
 Scenario 32: PM - Cleaned Network - FBTN
 2019-02-19 16:30 (lwu@COB10W-M003YM3B)

