

**TRAFFIC IMPACT STUDY**  
**HIGHWAY 10 AND KING STREET MIXED-USE  
DEVELOPMENT**

**PREPARED FOR:  
BVD HOLDINGS CALEDON INC.**

**PREPARED BY:  
C.F. CROZIER & ASSOCIATES INC.  
2800 HIGH POINT DRIVE, SUITE 100  
MILTON, ON L9T 6P4**

**NOVEMBER 2019**

**CFCA FILE NO. 1716-5215**

The material in this report reflects best judgment in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. C.F. Crozier & Associates Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



Revision Number	Date	Comments
Rev. 0	November 2019	Submission to MTO, Region and Town

## 1.0 Executive Summary

C.F. Crozier & Associates Inc. (Crozier) was retained by BVD Holdings Caledon Inc. (the client) to complete a Traffic Impact Study as part of the Site Plan Application for the proposed service/commercial development located in the northeast quadrant of the intersection of Highway 10 and King Street in the Town of Caledon, Region of Peel. The site is bounded by Highway 10 to the west, King Street to the south, existing agricultural lands to the north, and existing residential dwellings and agricultural lands to the east.

The elements envisioned for the development include:

- A gas station with eight passenger car fuelling positions and four heavy vehicle fuelling positions
- Building A:
  - A convenience store with a Gross Floor Area (GFA) of 269.3 square metres (2899 ft<sup>2</sup>)
  - Two fast-food restaurants with drive-through, with a total GFA of 279.2 square metres (139.6 square metres each) (3,005 ft<sup>2</sup>)
- Building B:
  - A fast-food restaurant (Burger King) with drive-through, with a GFA of 298 square metres (3,208 ft<sup>2</sup>)
- Building C and D:
  - Two sit-down restaurants with a total GFA of 670 square metres (335 square metres each) (7,212 ft<sup>2</sup>)
- 148 passenger vehicles parking spaces and 5 truck parking spaces

There are two existing accesses to Highway 10 and no accesses to King Street. All accesses will be closed and two new right-in/right-out accesses will be constructed at the northern and eastern limits of the site on Highway 10 and King Street, respectively. The right-in/right-out accesses would be enforced by channelizing triangular islands at the entrances.

These accesses will be designed to meet the applicable Ontario Ministry of Transportation (MTO) and Region of Peel (Region) geometric standards for right-in/right-out entrances. The northbound right-turn lane on Highway 10 has been designed with a width of 3.5 metres, a storage length of 60 metres and taper length of 75 metres. The westbound right-turn lane on King Street has been designed with a width of 3.5 metres, a storage length of 30 metres and taper length of 34 metres. The taper has been designed so it terminates at the neighbouring asphalt driveway to the east.

The analysis contained within this report included the intersection of Highway 10 and King Street, as well as the two proposed site accesses. It is noted that the westbound left-turn and eastbound left-turn movements in the weekday a.m. and p.m. peak hours, respectively, experience volume-to-capacity ratios in excess of 1.0 under future traffic volume conditions. As such, a left-turn reduction was applied to account for left-turns during the intergreen period. The reduction was applied to all scenarios (existing, future background and future total).

The analysis of the study intersection under existing traffic volume conditions indicates the following:

- The intersection of Highway 10 and King Street is operating with a LOS "C" and "B" in the weekday a.m. and p.m. peak hours.
- In the a.m. peak hour, the eastbound and southbound through movements experience volume-to-capacity ratios of 0.91 and 0.98, respectively. In the p.m. peak hour, the northbound through movement experiences a volume-to-capacity ratio of 0.86.
- All 95<sup>th</sup> percentile queues can be contained within the available storage length.

A growth rate of zero percent was calculated based on the MTO's "Provincial Highways Traffic Volumes 1988-2016" document, therefore, a 0.5 percent growth rate was applied to all through movements and turning movements on Highway 10 and between Highway 10 and King Street. A growth rate of 4.5 percent was calculated based on Region of Peel AADT. The 4.5 percent growth rate was applied to all through movements on King Street. The noted growth rates were used to forecast the 2021, 2026 and 2031 future background traffic volumes.

The analysis of the study intersection under future background traffic volume conditions indicates the following:

- The intersection of Highway 10 and King Street is expected to operate with a LOS "D" and "C" in the weekday a.m. and p.m. peak hours, respectively.
- The 95<sup>th</sup> percentile queues are anticipated to be contained within the available storage length.
- In the a.m. peak hour, the eastbound and southbound through movements experience volume-to-capacity ratios of 1.19 and 1.05, respectively.
- In the p.m. peak hour, the northbound through/right, eastbound left and eastbound through/right turn movements experience volume-to-capacity ratios of 0.95, 0.91 and 0.92, respectively.
- These operations are not uncommon during the commuter peak hours at arterial road intersections within the Greater Toronto Area.

The forecasted external trip generation of the proposed development is expected to be 199 and 131 two-way primary trips during the weekday a.m. and p.m. peak hours, respectively, and 211 and 136 two-way pass-by trips during the weekday a.m., and p.m. peak hours, respectively.

These were established using the trip generation rates outlined in the ITE Trip Generation Manual, 10<sup>th</sup> Edition, as well as the internal reduction and pass-by trip information provided in the ITE Trip Generation Handbook, 3<sup>rd</sup> Edition. Trips generated by the proposed development were distributed to and from the boundary road network based on the observed travel patterns at the study intersection, as well as the location of local catchment areas.

The analysis of the study intersections under future total traffic volume conditions indicates the following:

- The intersection of Highway 10 and King Street is anticipated to operate at a LOS "E" and "C" in the weekday a.m. and p.m. peak hours, respectively.
  - While the intersection is expected to change from a LOS "D" to "E" between future background and future total conditions, the increase in delay is only 1.0 seconds in the a.m. peak hour.
  - The addition of the site generated traffic is expected to result in a maximum increase in control delay of 3.7 seconds (p.m.) and a maximum increase in volume-to-capacity ratio of 0.09 (EBL – p.m.)
- The proposed site accesses to King Street and Highway 10 are expected to operate with a LOS "B" or better under weekday a.m. and p.m. peak hour conditions through the 2031 horizon year. The site accesses are expected to experience a maximum control delay of 13.6 seconds (Site Access B – p.m.) and volume-to-capacity ratio of 0.15 (WB – Site Access B – p.m.).
- At the intersection of Highway 10 and King Street, the volume-to-capacity ratios for the eastbound, southbound, and northbound through/right-turn movements are anticipated to be approaching or at capacity. Potential methods to improve the capacity for the through movements would be to implement dedicated right-turn lanes at the approaches (a right-turn lane already exists on the westbound approach).
  - This could be done in conjunction with future development applications for properties in the northwest, southeast and southwest quadrants.

The available stopping and intersection sight distance on Highway 10 and King Street to the south and east of the site accesses exceed the minimum requirements outlined in the TAC GDGCR.

The proposed access to Highway 10 has been designed in conformance with the geometric requirements outlined in the MTO Standard Drawing MTOD 305.030 (far side location commercial service station entrance) and 305.110 (right-in/right-out commercial entrance). The proposed access to King Street has been designed in conformance with the standards set out in the Region of Peel Public Works Standard Drawing 5-1-5 (right-in/right-out access), with a shorter taper to avoid impact to the neighbouring residential dwelling.

It is concluded that the traffic generated by the proposed service/commercial development can be accommodated by the boundary road network.

The analysis undertaken herein was prepared using the most recent Site Plan. Any minor changes to the Plan will not materially affect the conclusions contained within this report.

The proposed development can be supported from a traffic operations and safety perspective.

# TABLE OF CONTENTS

<b>1.0</b>	<b>Executive Summary</b> .....	<b>ii</b>
<b>2.0</b>	<b>Introduction</b> .....	<b>1</b>
2.1	Background .....	1
2.2	Development Proposal .....	1
2.3	Purpose and Scope .....	1
<b>3.0</b>	<b>Existing Conditions</b> .....	<b>2</b>
3.1	Development Lands .....	2
3.2	Boundary Road Network .....	2
3.3	Traffic Data .....	3
3.4	Traffic Modelling .....	3
	3.4.1. Left-turn on Intergreen Adjustment .....	3
3.5	Intersection Operations .....	4
<b>4.0</b>	<b>Future Background Conditions</b> .....	<b>5</b>
4.1	Horizon Year .....	5
4.2	Background Growth Rate .....	5
4.3	Future Roadway Improvements .....	5
4.4	Intersection Operations .....	5
<b>5.0</b>	<b>Site Generated Traffic</b> .....	<b>6</b>
5.1	Internal Trip Synergies .....	6
5.2	Pass-by Trip Generation .....	8
5.3	Trip Distribution and Assignment .....	9
5.4	Intersection Operations .....	9
<b>6.0</b>	<b>Access Safety Analysis</b> .....	<b>12</b>
6.1	Sight Distance Analysis .....	12
	6.1.1. Stopping Sight Distance .....	13
	6.1.2. Intersection Sight Distance .....	13
6.2	Access Geometry .....	14
<b>7.0</b>	<b>Conclusions</b> .....	<b>15</b>

## LIST OF TABLES

Table 1: Region of Peel Synchro Modelling Parameters.....	3
Table 2: 2019 Existing Levels of Service .....	4
Table 3: 2021 Future Background Levels of Service.....	5
Table 4: 2026 Future Background Levels of Service.....	6
Table 5: 2031 Future Background Levels of Service.....	6
Table 6: Unadjusted (Total) Trip Generation .....	7
Table 7: Adjusted (Total) Trip Generation.....	7
Table 8: Average Pass-by Trip Percentage .....	8
Table 9: Trip Generation.....	8
Table 10: 2021 Future Total Levels of Service .....	10
Table 11: 2026 Future Total Levels of Service .....	10
Table 12: 2031 Future Total Levels of Service .....	11
Table 13: 2031 Future Total Levels of Service with Auxiliary Right-turn Lanes.....	12
Table 14: Stopping Sight Distance Requirements .....	13
Table 15: Intersection Sight Distance.....	13
Table 16: MTO Access Geometry Requirements (MTOD 305.030 and MTOD 305.110) .....	14
Table 17: Region of Peel Access Geometry Requirements (SD 5-1-4).....	14

## LIST OF APPENDICES

<b>Appendix A:</b>	Town of Caledon Zoning By-law Excerpts
<b>Appendix B:</b>	Town of Caledon Official Plan Excerpts
<b>Appendix C:</b>	MTO Highway Corridor Management Manual Excerpts
<b>Appendix D:</b>	Region of Peel Road Characterization Study Excerpts
<b>Appendix E:</b>	Traffic Data
<b>Appendix F:</b>	Level of Service Definitions
<b>Appendix G:</b>	Detailed Capacity Analysis Worksheets
<b>Appendix H:</b>	Growth Rate Analysis
<b>Appendix I:</b>	ITE Trip Generation Excerpts
<b>Appendix J:</b>	TAC GDGCR Sight Distance Excerpts
<b>Appendix K:</b>	MTO Standard Drawing MTOD 305.030
<b>Appendix L:</b>	Peel Standard Drawing 5-1-4

## LIST OF FIGURES

- Figure 1:** Site Plan
- Figure 2:** Site Location Plan
- Figure 3:** Boundary Road Network
- Figure 4:** 2019 Existing Traffic Volumes
- Figure 5:** 2021 Future Background Traffic Volumes
- Figure 6:** 2026 Future Background Traffic Volumes
- Figure 7:** 2031 Future Background Traffic Volumes
- Figure 8:** Primary Trip Distribution
- Figure 9:** Pass-By Trip Distribution
- Figure 10:** Primary Trip Assignment
- Figure 11:** Pass-By Trip Assignment
- Figure 12:** 2020 Future Total Traffic Volumes
- Figure 13:** 2025 Future Total Traffic Volumes
- Figure 14:** 2030 Future Total Traffic Volumes

## 2.0 Introduction

### 2.1 Background

CF Crozier & Associates Inc. (Crozier) was retained by BVD Holdings Caledon Inc. (the client) to undertake a Traffic Impact Study (TIS) as part of the Site Plan Application for the proposed service/commercial development located in the northeast quadrant of the intersection of Highway 10 and King Street in the Town of Caledon, Region of Peel.

### 2.2 Development Proposal

The development proposes the construction of a mixed-use development that includes:

- A gas station with eight passenger car fuelling positions and four heavy vehicle fuelling positions
- Building A:
  - A convenience store with a Gross Floor Area (GFA) of 269.3 square metres (2899 ft<sup>2</sup>)
  - Two fast-food restaurants with drive-through, with a total GFA of 279.2 square metres (139.6 square metres each) (3,005 ft<sup>2</sup>)
- Building B:
  - A fast-food restaurant (Burger King) with drive-through, with a GFA of 298 square metres (3,208 ft<sup>2</sup>)
- Building C and D:
  - Two sit-down restaurants with a total GFA of 670 square metres (335 square metres each) (7,212 ft<sup>2</sup>)
- 148 passenger vehicles parking spaces and 5 truck parking spaces

There are two existing accesses to Highway 10 and no entrances to King Street. All entrances will be closed and two new right-in/right-out entrances will be constructed at the northern and eastern limits of the site on Highway 10 and King Street, respectively. The right-in/right-out entrances would be enforced by channelizing triangular islands at the entrances.

These entrances will be designed to meet the applicable Ontario Ministry of Transportation (MTO) and Region of Peel (Region) geometric standards for right-in/right-out entrances. The northbound right-turn lane on Highway 10 has been designed with a width of 3.5 metres, a storage length of 60 metres and taper length of 75 metres. The westbound right-turn lane on King Street has been designed with a width of 3.5 metres, a storage length of 30 metres and taper length of 34 metres. The taper has been designed so it terminates at the neighbouring asphalt driveway to the east.

The Site Plan prepared by Antrix Architects Inc. dated November 14, 2019 has been included as **Figure 1** for reference.

### 2.3 Purpose and Scope

This TIS is being prepared to support the Site Plan Application for the proposed service/commercial development in the northeast quadrant of the intersection of Highway 10 and King Street (the "site"). The purpose of the study is to assess the impacts of the proposed development on the boundary road network and to recommend any required mitigation measures, if warranted.

The study reviews the following main aspects of the proposed development from a transportation engineering perspective:

- Existing, future background, and future total traffic operations at the study intersections
- Forecasted trip generation of the proposed development
- Sight distance, access geometry and site circulation

The proposed scope of work follows the requirements outlined in the MTO's "Traffic Impact Study Guidelines" (September 2014) and the Region's "Traffic Impact Study Guidelines".

### 3.0 Existing Conditions

#### 3.1 Development Lands

The site is 3.3 hectares (7.88 acres) in size, and is located in the northeast quadrant of the intersection of Highway 10 and King Street. It is bounded by Highway 10 to the west, King Street to the south, existing agricultural lands to the north, and existing residential dwellings and agricultural lands to the east. The location of the subject property is illustrated in **Figure 2**.

The site is currently zoned as "A1 – Agricultural", "A1-347 – Agricultural Exception 347" and "CV-267 – Village Commercial Exception 267" per the Town of Caledon Zoning By-law 2006-50. The site is designated "Settlement Area" per the Town of Caledon Official Plan. **Appendix A** and **Appendix B** contain relevant excerpts from the Town of Caledon Zoning By-law and Official Plan, respectively.

#### 3.2 Boundary Road Network

Due to the skewed nature of the roadway, the directional orientation of the boundary road network is ambiguous. Accordingly, to provide clarity throughout the report, Highway 10 has been given a north-south orientation and King Street has been given an east-west orientation.

Highway 10 is a two-way north-south highway that is classified "2B – Arterial" per the MTO Highway Corridor Management Manual (September 2018). The roadway has a posted speed limit of 60 km/h at the site frontage, however it transitions to 80 km/h at the northern limits of the site. The roadway consists of four undivided travel lanes (two per direction) and a two-way centre left-turn lane. Highway 10 has a partially paved shoulder (approximately three-metre granular). Go Transit Route 37 "Orangeville/Brampton" has bus stops in the northwest and southeast corners of Highway 10 and King Street. There are no pedestrian or cycling facilities on Highway 10 in the study area.

King Street is a two-way east-west regional road that is classified "Rural Road" per the Region of Peel Road Characterization Study (May 2013). The roadway has a posted speed limit of 70 km/h at the site frontage and has two undivided travel lanes (one per direction). King Street has an approximate three-metre granular shoulder on the north and south sides of the roadway. There are no transit, pedestrian or cycling facilities on King Street in the study area.

Relevant excerpts from the MTO Highway Corridor Management Manual and Region of Peel Road Characterization Study have been included in **Appendix C** and **Appendix D**, respectively.

The analysis contained within this report assessed the operations of the intersection of Highway 10 and King Street (the "study intersection"), as well as the two proposed entrances to the development. **Figure 3** illustrates the existing traffic controls and lane configurations at the study intersection.

### 3.3 Traffic Data

Turning movement counts at the study intersection were undertaken by Spectrum Traffic Data Inc. staff from 6:00 a.m. to 10:00 a.m. and 3:00 p.m. to 7:00 p.m. on Tuesday March 26, 2019. The traffic count data is summarized in **Appendix E**, and **Figure 4** illustrates the weekday a.m. and p.m. peak hour traffic volumes.

It is noted that turning movement counts were also completed on Highway 10 at the Diamond Trailer Sales property at the central entrance, opposite the proposed Highway 10 site access. While not included in the existing and future background assessment, the volumes were used to establish the through volumes at the proposed Highway 10 site access for the future total traffic volume conditions.

### 3.4 Traffic Modelling

The boundary road network was modelled in Synchro 9.0 using existing roadway geometrics, collected traffic data, and default modelling parameters as described in the Region of Peel "Synchro 9 Guidelines". The default modelling parameters for the Region of Peel are summarized in **Table 1**.

**Table 1: Region of Peel Synchro Modelling Parameters**

Parameter	Value
<b>Ideal (Base) Saturation Flow Rate</b>	1,900 veh/hr/lane
<b>Lost Time</b>	No parameters specified
<b>Peak Hour Factor</b>	1.00 for all intersection movements
<b>Lane Width</b>	3.7 metres for through and shared through/turn lanes 3.5 for exclusive turn lanes
<b>Storage Lengths</b>	As recorded in the field or noted on an as-built drawing.
<b>Heavy Vehicles (%)</b>	As recorded or 2%

#### 3.4.1. Left-turn on Intergreen Adjustment

Modelling adjustments were applied to account for left-turns during the intergreen period.

At intersections with high through volumes, left-turning vehicles waiting for gaps in the opposing traffic stream during a permissive phase may only be able maneuver through the intersection during the intergreen period. This behavior is typically observed at intersections approaching capacity and was confirmed by viewing the camera footage collected during the traffic counts.

In accounting for the increased capacity of left-turning vehicles at the intersections in the boundary road network, the Canadian Capacity Guide recommends that up to two passenger cars can be reasonably discharged during each intergreen period for permissive phases. For the purpose of this assessment, one passenger car per intergreen period was assumed to be discharged.

The number of vehicles that are expected to discharge per intergreen period is determined by the following formula on page 3-20 in the Canadian Capacity Guide:

$$Q_{LTOI} = n * X_{LTOI}$$

Where

$Q_{LTOI}$  = left-turn flow on intergreen (pcu/hr)

$n$  = number of cycles per hour

$X_{LTOI}$  = average number of left-turn passenger car units per intergreen period

Per the existing signal timings, the intersection of Highway 10 and King Street is configured with a cycle length of 84 seconds in the weekday a.m. and p.m. peak hours. Within a one-hour period, the signalized intersection completes 42 cycles. With the assumption of one vehicle discharging per intergreen period, each left-turn movement can be expected to discharge 42 vehicles per hour on each applicable phase.

Accordingly, left-turning volumes were analyzed with a reduction in volume of 42 vehicles per hour when movements were found to experience a volume-to-capacity ratio in excess of 1.00 under existing, future background and future total scenarios. These modifications are in conformance with standard industry practice.

### 3.5 Intersection Operations

The operations of the study intersection were analyzed based on the traffic volumes illustrated in **Figure 4**. Level of service definitions have been included in **Appendix F**, with detailed capacity analysis worksheets included in **Appendix G**.

**Table 2** outlines the existing 2019 traffic operations at the study intersection.

**Table 2: 2019 Existing Levels of Service**

Intersection	Control	Peak Hour	Level of Service <sup>1</sup>	Control Delay	Critical v/c ratio <sup>2</sup>	95 <sup>th</sup> Percentile Queue Length > Storage Length
Highway 10 and King Street	Signal	A.M.	C	32.4 s	0.91 (EBTR) 0.98 (SBTR)	None
		P.M.	B	19.7 s	0.86 (NBTR)	None

Note<sup>1</sup>: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).

Note<sup>2</sup>: The maximum v/c ratio represents the maximum v/c ratio for the minor road approach movements at the intersection. Any movements that experience a v/c ratio in excess of 0.85 are considered critical per the MTO TIS Guidelines.

The metrics summarized above indicate that the study intersection is currently operation at a LOS “C” in the weekday a.m. and p.m. peak hours. Some movements are approaching capacity, and all 95<sup>th</sup> percentile queues can be contained within the available storage length. The traffic operations reflect the high southbound volumes in the a.m. peak hour and the high northbound volumes in the p.m. peak hour, consistent with commuter travel patterns in the Greater Toronto Area (GTA).

## 4.0 Future Background Conditions

### 4.1 Horizon Year

The development is expected to be fully built-out by 2021. Per the MTO's TIS Guidelines, the horizon years of full build-out as well as five and ten years beyond full build-out must be analyzed. Therefore, the horizon years of 2021, 2026 and 2031 have been analyzed.

### 4.2 Background Growth Rate

Background growth rates for Highway 10 were derived from historical Annual Average Daily Traffic (AADT) volumes for the segment of road at Highway 10 and King Street. The most recent AADT data available for this location is from 2016; thus, growth rate trends were derived from 2010-2016 AADT data. The overall average growth rate from 2010 to 2016 is 0.5% annually. An outlier in 2012 was discarded because it resulted in a growth rate of 0%. Accordingly, a growth rate of 0.5 percent will be used to forecast future volumes on Highway 10.

A review of Peel AADT volumes on King Street to the east of Highway 10 resulted in an average growth rate of 4.5 percent between 2010 and 2016. Accordingly, a growth rate of 4.5 percent will be used to forecast future through volumes on King Street. A growth rate of 0.5 percent will be applied to all turning movements between Highway 10 and King Street. **Appendix H** contains the growth rate analysis.

### 4.3 Future Roadway Improvements

No capacity improvements have been identified for the boundary roads within the study horizons.

### 4.4 Intersection Operations

The 2021, 2026 and 2031 future background traffic levels of service are outlined in **Table 3, Table 4 and Table 5**, respectively. These operations are based on the future background traffic volumes illustrated in **Figures 5, 6 and 7**. LOS definitions are included in **Appendix F** and detailed capacity analysis worksheets are included in **Appendix G**.

**Table 3: 2021 Future Background Levels of Service**

Intersection	Control	Peak Hour	Level of Service <sup>1</sup>	Control Delay	Critical v/c ratio <sup>2</sup>	95 <sup>th</sup> Percentile Queue Length > Storage Length
Highway 10 and King Street	Signal	A.M.	C	34.8 s	0.94 (EBTR) 1.00 (SBTR)	None
		P.M.	C	20.8 s	0.87 (NBTR)	None

Note<sup>1</sup>: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).

Note<sup>2</sup>: The maximum v/c ratio represents the maximum v/c ratio for the minor road approach movements at the intersection. Any movements that experience a v/c ratio in excess of 0.85 are considered critical per the MTO TIS Guidelines.

**Table 4: 2026 Future Background Levels of Service**

Intersection	Control	Peak Hour	Level of Service <sup>1</sup>	Control Delay	Critical v/c ratio <sup>2</sup>	95 <sup>th</sup> Percentile Queue Length > Storage Length
Highway 10 and King Street	Signal	A.M.	D	42.7 s	1.06 (EBTR) 1.02 (SBTR)	None
		P.M.	C	24.1 s	0.91 (NBTR)	None

Note<sup>1</sup>: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).

Note<sup>2</sup>: The maximum v/c ratio represents the maximum v/c ratio for the minor road approach movements at the intersection. Any movements that experience a v/c ratio in excess of 0.85 are considered critical per the MTO TIS Guidelines.

**Table 5: 2031 Future Background Levels of Service**

Intersection	Control	Peak Hour	Level of Service <sup>1</sup>	Control Delay	Critical v/c ratio <sup>2</sup>	95 <sup>th</sup> Percentile Queue Length > Storage Length
Highway 10 and King Street	Signal	A.M.	D	54.5 s	1.19 (EBTR) 1.05 (SBTR)	None
		P.M.	C	30.1 s	0.91 (EBL) 0.92 (EBTR) 0.95 (NBTR)	None

Note<sup>1</sup>: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).

Note<sup>2</sup>: The maximum v/c ratio represents the maximum v/c ratio for the minor road approach movements at the intersection. Any movements that experience a v/c ratio in excess of 0.85 are considered critical per the MTO TIS Guidelines.

The metrics summarized above indicate that the intersection is expected to operate at a LOS “D” and “C” in the weekday a.m. and p.m. peak hours, respectively. The 95<sup>th</sup> percentile queues at the intersection are anticipated to be contained within the available storage length.

Some movements at the study intersection are anticipated to be approaching or at capacity. These operations are not uncommon during commuter peak hours at arterial road intersections within the GTA. It is further noted that a conservative growth rate of 4.5 percent was applied to the through volumes on King Street, which is more than the industry standard two percent growth rate. The eastbound and westbound through volumes may be overstated, resulting in higher volume-to-capacity ratios than may be realized in the future.

## 5.0 Site Generated Traffic

The trip generation of the proposed development was forecasted using the average rates provided in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10<sup>th</sup> Edition, under Land Use Categories 945 “Gasoline/Service Station with Convenience Market”, 934 “Fast-Food Restaurant with Drive-Through Window” and 932 “High-Turnover (Sit-Down) Restaurant”.

### 5.1 Internal Trip Synergies

The ITE Trip Generation Handbook, 3<sup>rd</sup> Edition, provides internal trip synergy rates for individual land uses for mixed-use developments. Internal trip synergy is expected between the gas station and fast-food restaurant components of the proposed developments. Accordingly, the internal trip synergy was established between retail and restaurant, with retail representing the gas station and convenience store component of the development.

The unadjusted trip generation as calculated using the ITE Trip Generation Manual, 10<sup>th</sup> Edition is outlined in **Table 6**. Relevant excerpts from the ITE Trip Generation Manual, 10<sup>th</sup> Edition and Handbook, 3<sup>rd</sup> Edition have been included in **Appendix I**, as well as the internal and external trip calculations.

**Table 6: Unadjusted (Total) Trip Generation**

Land Use	Peak Hour	Trips Generated		
		Inbound	Outbound	Total
LUC 945: Gasoline/ Service Station with Convenience Market (12 Fueling Pumps)	Weekday A.M.	76	74	150
	Weekday P.M.	86	82	168
LUC 934: Fast-Food Restaurant with Drive-through Window (6,213 ft <sup>2</sup> )	Weekday A.M.	127	123	250
	Weekday P.M.	106	97	203
LUC 932: High-Turnover (Sit-Down) Restaurant (7,212 ft <sup>2</sup> )	Weekday A.M.	39	33	72
	Weekday P.M.	43	27	70
<b>Total</b>	<b>Weekday A.M.</b>	<b>242</b>	<b>230</b>	<b>472</b>
	<b>Weekday P.M.</b>	<b>235</b>	<b>206</b>	<b>441</b>

The adjusted trip generation is summarized in **Table 7** with the internal trip capture and the external trips tabulated separately.

**Table 7: Adjusted (Total) Trip Generation**

Land Use	Trip Type	Peak Hour	Trips Generated		
			Inbound	Outbound	Total
LUC 934: Fast-Food Restaurant with Drive-through Window (6,213 ft <sup>2</sup> )	Internal	Weekday A.M.	10	6	16
		Weekday P.M.	24	40	64
	External	<b>Weekday A.M.</b>	<b>117</b>	<b>117</b>	<b>234</b>
		<b>Weekday P.M.</b>	<b>82</b>	<b>57</b>	<b>139</b>
LUC 932: High-Turnover (Sit-Down) Restaurant (7,212 ft <sup>2</sup> )	Internal	Weekday A.M.	10	5	15
		Weekday P.M.	12	11	23
	External	<b>Weekday A.M.</b>	<b>29</b>	<b>28</b>	<b>57</b>
		<b>Weekday P.M.</b>	<b>31</b>	<b>16</b>	<b>47</b>
LUC 945: Gasoline/ Service Station with Convenience Market (12 Fueling Pumps)	Internal	Weekday A.M.	11	20	31
		Weekday P.M.	51	36	87
	External	<b>Weekday A.M.</b>	<b>65</b>	<b>54</b>	<b>119</b>
		<b>Weekday P.M.</b>	<b>35</b>	<b>46</b>	<b>81</b>
<b>Total</b>	Internal	Weekday A.M.	31	31	62
		Weekday P.M.	87	87	174
	External	<b>Weekday A.M.</b>	<b>211</b>	<b>199</b>	<b>410</b>
		<b>Weekday P.M.</b>	<b>148</b>	<b>119</b>	<b>267</b>

## 5.2 Pass-by Trip Generation

As defined by the ITE Trip Generation Handbook, 3<sup>rd</sup> Edition, primary trips are made for the specific purpose of visiting the generator. Pass-by trips are made as intermediate stops on the way from an origin to a primary destination without a route diversion. Accordingly, these vehicles do not increase the volume of vehicles on the roadway.

The pass-by percentages for the gas station and restaurant land uses were forecasted using the rates provided in the ITE Trip Generation Handbook, 3<sup>rd</sup> Edition. A morning pass-by percentage was not provided for Land Use Category 932 (High-Turnover (Sit-Down) Restaurant), accordingly the weekday p.m. pass-by rate was applied. The percentages are summarized in **Table 8**.

**Table 8: Average Pass-by Trip Percentage**

Land Use	Peak Hour	Pass-by Percentage	Source
LUC 945: Gasoline/ Service Station with Convenience Market	Weekday A.M.	62%	Table E.37
	Weekday P.M.	56%	Table E.38
LUC 934: Fast-Food Restaurant with Drive-through Window	Weekday A.M.	49%	Table E.31
	Weekday P.M.	50%	Table E.32
LUC 932: High-Turnover (Sit-Down) Restaurant	Weekday A.M.	43%	Table E.30
	Weekday P.M.	43%	Table E.30

The forecasted trips are tabulated in **Table 9**. Relevant excerpts from the ITE Trip Generation Manual, 10<sup>th</sup> Edition and Handbook, 3<sup>rd</sup> Edition have been included in **Appendix I**.

**Table 9: Trip Generation**

Land Use	Peak Hour	Trip Type	Trips Generated		
			Inbound	Outbound	Total
LUC 945: Gasoline/ Service Station with Convenience Market (12 Fueling Pumps)	Weekday A.M.	Primary	25	21	45
		Pass-by	40	33	74
	Weekday P.M.	Primary	15	20	36
		Pass-by	20	26	45
LUC 934: Fast-Food Restaurant with Drive-through Window (6,213 ft <sup>2</sup> )	Weekday A.M.	Primary	60	60	119
		Pass-by	57	57	115
	Weekday P.M.	Primary	41	28	69
		Pass-by	41	29	70
LUC 932: High-Turnover (Sit-Down) Restaurant (7,212 ft <sup>2</sup> )	Weekday A.M.	Primary	17	16	32
		Pass-by	12	12	25
	Weekday P.M.	Primary	18	9	27
		Pass-by	13	7	20
<b>Total</b>	<b>Weekday A.M.</b>	<b>Primary</b>	<b>102</b>	<b>97</b>	<b>199</b>
		<b>Pass-by</b>	<b>109</b>	<b>102</b>	<b>211</b>
	<b>Weekday P.M.</b>	<b>Primary</b>	<b>74</b>	<b>57</b>	<b>131</b>
		<b>Pass-by</b>	<b>74</b>	<b>62</b>	<b>136</b>

The forecasted external trip generation of the proposed development is expected to be 199 and 131 two-way primary trips during the weekday a.m. and p.m. peak hours, respectively, and 211 and 136 two-way pass-by trips during the weekday a.m., and p.m. peak hours, respectively.

While the pass-by rates used are from the ITE Trip Generation Handbook, the location of the site is conducive to having higher rates as it is located in a rural area, with sparse residential dwellings and few employment uses. It is expected that virtually all trips to the site will be pass-by trips drawn from commuters between Brampton and Orangeville.

### 5.3 Trip Distribution and Assignment

Trips generated by the proposed development were distributed to and from the boundary road network based on the observed travel patterns at the study intersection, as well as the location of local catchment areas. The proposed site is located in the Settlement Area of Victoria and is surrounded primarily by industrial uses, service-commercial uses, and some residential dwelling units.

Victoria is approximately 1.4 km west of Campbell's Cross Settlement Area, 6.0 km north of the communities bordering Brampton and Caledon (i.e. Snelgrove, Mayfield West, etc) 4.7 km south of the communities of Claude and Inglewood, and 4.0 km east of the communities of Cheltenham, Ferndale and Boston Mills. Accordingly, 55 percent of trips were assumed to originate from the south and the remaining 45 percent of trips were divided equally between the north, east and west (15 percent each).

As noted, both of the site accesses are restricted to right-in/right-out movements. Accordingly, trips from the north can not access the site from Highway 10. Similarly, trips returning to the east can not do so via King Street. For the purpose of this assessment, the 15 percent of trips arriving from the north were assumed to arrive from the east on King Street. The 15 percent of trips returning to the east were assumed to exit the site to the north.

The pass-by trip distribution was established based on the existing travel patterns observed at the study intersection. In the a.m. peak hour, 75 percent of trips were observed to be travelling north past the site and 25 percent of trips passed the site from the east. In the p.m. peak hour, 90 percent of trips were observed to be travelling north past the site and 10 percent of trips passed the site from the east.

The primary and pass-by trip distributions for the proposed development are illustrated in **Figures 8 and 9**, respectively, with the corresponding trip assignments illustrated in **Figures 10 and 11**, respectively. The trips illustrated in **Figures 10 and 11** were superimposed on the 2021, 2026 and 2031 future background volumes illustrated in **Figures 5, 6 and 7** to establish the future total traffic volumes. The 2021, 2026 and 2031 future total traffic volumes are illustrated in **Figures 12, 13 and 14**, respectively.

### 5.4 Intersection Operations

The 2021, 2026 and 2031 future total intersection operations at the intersection of Highway 10 and King Street, as well as the two site accesses, were analyzed using the future total traffic volumes illustrated in **Figures 12, 13 and 14**. The level of service definitions have been included in **Appendix F**, with detailed capacity analysis worksheets included in **Appendix G. Table 10, Table 11 and Table 12** outline the 2021, 2026 and 2031 future total intersection operations, respectively.

**Table 10: 2021 Future Total Levels of Service**

Intersection	Control	Peak Hour	Level of Service <sup>1</sup>	Control Delay	Critical v/c ratio <sup>2</sup>	95 <sup>th</sup> Percentile Queue Length > Storage Length
Highway 10 and King Street	Signal	A.M.	D	35.3 s	0.94 (EBTR) 1.00 (SBTR)	None
		P.M.	C	22.0 s	0.89 (NBTR)	None
King Street and Site Access A	Stop (Site Access A)	A.M.	B	10.1 s	0.12 (SB)	None
		P.M.	B	10.1 s	0.06 (SB)	None
Highway 10 and Site Access B	Stop (Site Access B)	A.M.	A	9.9 s	0.12 (WB)	None
		P.M.	B	12.3 s	0.13 (WB)	None

Note<sup>1</sup>: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).  
The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM2000).

Note<sup>2</sup>: The maximum v/c ratio represents the maximum v/c ratio for the minor road approach movements at the intersection. Any movements that experience a v/c ratio in excess of 0.85 are considered critical per the MTO TIS Guidelines.

**Table 11: 2026 Future Total Levels of Service**

Intersection	Control	Peak Hour	Level of Service <sup>1</sup>	Control Delay	Critical v/c ratio <sup>2</sup>	95 <sup>th</sup> Percentile Queue Length > Storage Length
Highway 10 and King Street	Signal	A.M.	D	43.7 s	1.06 (EBTR) 0.88 (WBL) 1.02 (SBTR)	None
		P.M.	C	26.0 s	0.93 (NBTR)	None
King Street and Site Access A	Stop (Site Access A)	A.M.	B	10.5 s	0.13 (SB)	None
		P.M.	B	10.4 s	0.07 (SB)	None
Highway 10 and Site Access B	Stop (Site Access B)	A.M.	A	9.9 s	0.12 (WB)	None
		P.M.	B	13.1 s	0.14 (WB)	None

Note<sup>1</sup>: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).  
The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM2000).

Note<sup>2</sup>: The maximum v/c ratio represents the maximum v/c ratio for the minor road approach movements at the intersection. Any movements that experience a v/c ratio in excess of 0.85 are considered critical per the MTO TIS Guidelines.

**Table 12: 2031 Future Total Levels of Service**

Intersection	Control	Peak Hour	Level of Service <sup>1</sup>	Control Delay	Critical v/c ratio <sup>2</sup>	95 <sup>th</sup> Percentile Queue Length > Storage Length
Highway 10 and King Street	Signal	A.M.	E	55.5 s	1.19 (EBTR) 0.89 (WBL) 1.05 (SBTR)	None
		P.M.	C	33.8 s	1.00 (EBL) 0.92 (EBTR) 0.97 (NBTR)	None
King Street and Site Access A	Stop (Site Access A)	A.M.	B	11.1 s	0.14 (SB)	None
		P.M.	B	10.9 s	0.07 (SB)	None
Highway 10 and Site Access B	Stop (Site Access B)	A.M.	A	9.8 s	0.12 (WB)	None
		P.M.	B	13.6 s	0.15 (WB)	None

Note<sup>1</sup>: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).  
 The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM2000).

Note<sup>2</sup>: The maximum v/c ratio represents the maximum v/c ratio for the minor road approach movements at the intersection.  
 Any movements that experience a v/c ratio in excess of 0.85 are considered critical per the MTO TIS Guidelines.

Under 2031 future total traffic conditions, the intersection of Highway 10 and King Street is expected to operate at a LOS “E” in the a.m. peak hour and an unchanged LOS “C” in the p.m. peak hour, when compared to 2031 future background operations. While the intersection is expected to change from a LOS “D” to “E” between future background and future total conditions, the increase in delay is only 1.0 seconds. Furthermore, the addition of the site generated traffic is expected to result in a maximum increase in control delay of 3.7 seconds (p.m.) and a maximum increase in volume-to-capacity ratio of 0.09 (EBL – p.m.). These metrics indicate that the site traffic is expected to have a minimal impact on the operations of the intersection of Highway 10 and King Street.

The proposed site accesses on King Street and Highway 10 are expected to operate with a LOS “B” or better under weekday a.m. and p.m. peak hour conditions through the 2031 horizon year. The site accesses are expected to experience a maximum control delay of 13.6 seconds (Site Access B – p.m.) and volume-to-capacity ratio of 0.15 (WB – Site Access B – p.m.).

These metrics indicate that the proposed site accesses are expected to operate well under future total traffic volume conditions through all horizon years. The development is anticipated to cause minor increases in delay at the intersection of Highway 10 and King Street compared to the future background operations. Thus, the proposed development can be supported from a traffic operations perspective.

It is acknowledged that at the intersection of Highway 10 and King Street, the volume-to-capacity ratios for the eastbound, southbound, and northbound through/right-turn movements are anticipated to be approaching or at capacity. Potential methods to improve the capacity for the through movements would be to implement dedicated right-turn lanes at these approaches (a right-turn lane already exists on the westbound approach). This could be done in conjunction with future development applications for properties in the northwest, southeast and southwest quadrants.

To demonstrate the effect of these improvements, an adjusted Synchro model was created to illustrate the improvements to the eastbound through movement with the implementation of a dedicated eastbound right-turn lane.

**Table 13: 2031 Future Total Levels of Service with Auxiliary Right-turn Lanes**

Intersection	Control	Peak Hour	Level of Service	Control Delay	EB, NB and SB v/c Ratios
Highway 10 and King Street	Signal (Without RT Lanes)	A.M.	E	55.5 s	1.19 (EBTR) 0.89 (WBL) 1.05 (SBTR)
		P.M.	C	33.8 s	1.00 (EBL) 0.92 (EBTR) 0.97 (NBTR)
Highway 10 and King Street	Signal (With RT Lanes)	A.M.	C	25.0 s	0.81 (EBL) 0.65 (EBT) 0.58 (EBR) 0.40 (WBL) 0.91 (SBT) 0.22 (SBR)
		P.M.	C	26.2 s	1.00 (EBL) 0.70 (EBT) 0.22 (EBR) 0.92 (NBT) 0.09 (NBR)

It can be seen that the implementation of a dedicated eastbound right-turn lane reduces the eastbound through volume-to-capacity ratio by 0.54 and 0.22 in the weekday a.m. and p.m. peak hours, respectively. Similarly, the implementation of dedicated northbound and southbound right-turn lanes is expected to improve the volume-to-capacity ratios to 0.91 (AM) and 0.92 (PM), respectively.

While the northbound and southbound through volume-to-capacity ratio still exceed the MTO's critical threshold of 0.85, these conditions are consistent with typical operations in the GTA during commuter travel times. As noted previously, these operations reflect the high southbound and northbound volumes during the a.m. and p.m. peak hours, respectively.

## 6.0 Access Safety Analysis

The following transportation safety components pertaining to the proposed site access were analyzed:

- Sight distance availability
- Access geometry

### 6.1 Sight Distance Analysis

Per the MTO Highway Corridor Management Manual, new and upgraded access connections shall be designed to meet the stopping sight distance requirements specified in Chapter 2 of the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR) and Appendix 2 in the MTO "Design Supplement for TAC GDGCR" (MTO DS), and also designed to meet the minimum intersection sight distance requirements specified in Chapter 9 of the TAC GDGCR and Appendix 9 of the MTO DS.

The design speed of a roadway is typically 20 km/h greater than the posted speed limit on higher speed roads. The posted speed limit on Highway 10 is 60 km/h. Therefore, a design speed of 80 km/h was assumed for the sight distance analysis. The posted speed limit on King Street is 70 km/h, therefore a design speed of 90 km/h was assumed for the sight distance analysis.

### 6.1.1. Stopping Sight Distance

TAC GDGCR Table 2.5.2. outlines stopping sight distance requirements for level roadways. With both entrances being restricted to right-in/right-out movements only, the stopping sight distance applies to vehicles approaching from the south on Highway 10, or from the east on King Street.

**Table 14: Stopping Sight Distance Requirements**

Roadway	Design Speed	Stopping Sight Distance	Available Sight Distance	TAC Reference
Highway 10	80 km/h	130 m	+ 150 m	Table 2.5.2.
King Street	90 km/h	160 m	+ 200 m	Table 2.5.2.

The available sight distance on Highway 10 and King Street approaching the site entrances is in excess of the minimum requirements outlined in the TAC GDGCR, due to the straight horizontal alignment and flat vertical profile of the roadways.

### 6.1.2. Intersection Sight Distance

Section 9.9 of the TAC GDGCR provides intersection sight distance for different intersection control types. The applicable case is "Case B2 – Right turn from the minor road" (Site Access).

Intersection sight distance is calculated using equation 9.9.1 from the TAC GDGCR as outlined below:

$$ISD = 0.278 * V_{major} * t_G$$

Where;

ISD = Intersection Sight Distance

$V_{major}$  = design speed of roadway (km/h)

$t_G$  = assumed time gap for vehicles to turn from stop onto roadway (s)

The calculated and design sight distances are further summarized in the TAC GDGCR Table 9.9.6 for vehicles turning right from stop and the time gap was obtained from Table 9.9.5 in the TAC GDGCR. Relevant excerpts from TAC GDGCR are included in **Appendix J. Table 15** contains a summary of the intersection sight distance requirements for Case B2.

**Table 15: Intersection Sight Distance**

Case	Time Gap	Required Intersection Sight Distance	Available Sight Distance	TAC Reference
<b>Highway 10 Design Speed = 80 km/h</b>				
B2: Vehicles turning right from stop	6.5 s	145 m	+150 m (south)	Table 9.9.6
<b>King Street Design Speed = 90 km/h</b>				
B2: Vehicles turning right from stop	6.5 s	165 m	+200 m (east)	Table 9.9.6

As the available sight distance is in excess of the minimum intersection sight distance requirements per the TAC GDGCR guidelines, sufficient sight distance is available for vehicles exiting to the north and west from the proposed site accesses on Highway 10 and King Street, respectively. The proposed site accesses can be supported from a sight distance perspective.

## 6.2 Access Geometry

Two new right-in/right-out entrances will be constructed at the northern and eastern limits of the site on Highway 10 and King Street, respectively. The right-in/right-out entrances would be enforced by channelizing triangular islands at the entrances. The proposed site accesses will be designed to meet the applicable Ontario Ministry of Transportation (MTO) and Region of Peel (Region) geometric standards for right-in/right-out entrances.

The access geometry of the Highway 10 site access conforms to the standards set out in the MTO Standard Drawing MTOD 305.030 for "Commercial Entrance Service Station, 2&4 Lane Highway Far Side Location, Raised Island." To establish the design parameters for the right-in/right-out entrance, the standards detailed in the MTOD 305.110 were referenced. **Appendix K** contains the MTO standard drawing MTOD 305.030 and MTOD 305.110. **Table 16** outlines the MTO right-in/out access requirements.

**Table 16: MTO Access Geometry Requirements (MTOD 305.030 and MTOD 305.110)**

Feature	MTO Requirement	Proposed
Desirable Offset	185 m	183 m
Minimum Offset	80 m	183 m
Right-turn Lane Width	3.5 m	3.5 m
Right-turn Lane Parallel Length	60 m	60 m
Right-turn Lane Taper Length	75 m	75 m
Curb Radii	15 m	15 m
Ingress and Egress Lane Width	5.5 m	5.5 m

The access geometry of the King Street site access conforms to the standards set out in the Region of Peel Public Works Standard Drawing 5-1-4 "Typical Design for a Right In/Out Access with Directional Island (Roads Without Divided Centre Median Island)", with the exception that the proposed taper length is 34 metres, which is less than the minimum requirement described in TAC. The length of the proposed taper was designed such that it terminates at the neighbouring asphalt driveway to the east. **Appendix L** contains the Region of Peel standard drawing. **Table 17** outlines the Region of Peel right-in/out access requirements.

**Table 17: Region of Peel Access Geometry Requirements (SD 5-1-4)**

Feature	Region of Peel Requirement	Proposed
Right-turn Lane Width	3.5 m	3.5 m
Minimum Right-turn Lane Parallel Length	30 m	30 m
Minimum Right-turn Lane Taper Length	80 m (Per TAC GDGCR Table 10.6.2)	34 m
Curb Radii	15 m	15 m
Ingress and Egress Lane Width	4.0 m	4.0 m

## 7.0 Conclusions

The analysis contained within this report has resulted in the following key findings:

- The intersection of Highway 10 and King Street is operating with a LOS “C” and “B” in the weekday a.m. and p.m. peak hours.
  - In the a.m. peak hour, the eastbound and southbound through movements experience volume-to-capacity ratios of 0.91 and 0.98, respectively. In the p.m. peak hour, the northbound through movement experiences a volume-to-capacity ratio of 0.86.
- Examination of the 2021, 2026 and 2031 future background conditions at the intersection of Highway 10 and King Street indicates that the intersection is expected to operate with a LOS “D” and “C” in the weekday a.m. and p.m. peak hours, respectively.
  - The 95<sup>th</sup> percentile queues are anticipated to be contained within the available storage length.
  - In the a.m. peak hour, the eastbound and southbound through movements will experience volume-to-capacity ratios of 1.19 and 1.05, respectively.
  - In the p.m. peak hour, the northbound through/right, eastbound left and eastbound through/right turn movements will experience volume-to-capacity ratios of 0.95, 0.91 and 0.92, respectively.
  - These operations are not uncommon during the commuter peak hours at arterial road intersections within the GTA.
- The proposed service/commercial development is expected to generate 199 and 131 two-way primary trips and 211 and 136 two-way pass-by trips in the weekday a.m. and p.m. peak hours, respectively.
- Under 2031 future total traffic volume conditions, the intersection of Highway 10 and King Street is expected to operate at a LOS “E” and “C” in the weekday a.m. and p.m. peak hours, respectively.
  - While the intersection is expected to change from a LOS “D” to “E” between future background and future total conditions, the increase in delay is only 1.0 seconds in the a.m. peak hour.
  - The addition of the site generated traffic is expected to result in a maximum increase in control delay of 3.7 seconds (p.m.) and a maximum increase in volume-to-capacity ratio of 0.09 (EBL – p.m.).
  - The volume-to-capacity ratios for the eastbound, southbound, and northbound through/right-turn movements are anticipated to be approaching or at capacity. The implementation of dedicated right-turn lanes improves the operations of the study intersection (a westbound right-turn lane already exists).
    - This could be done in conjunction with future development applications for properties in the northwest, southeast and southwest quadrants.
- The proposed site accesses on King Street and Highway 10 are expected to operate with a LOS “B” or better under weekday a.m. and p.m. peak hour conditions through the 2031 horizon year. The site accesses are expected to experience a maximum control delay of 13.6 seconds (Site Access B – p.m.) and volume-to-capacity ratio of 0.15 (WB – Site Access B – p.m.).
- The available stopping and intersection sight distance on Highway 10 and King Street to the south and east of the site accesses exceed the minimum requirements outlined in the TAC GDGCR.

- The right-in/right-out accesses would be enforced by channelizing triangular islands at the entrances.
  - The proposed access to Highway 10 has been designed in conformance with the geometric requirements outlined in the MTO Standard Drawing MTOD 305.030 (far side location commercial service station entrance) and 305.110 (right-in/right-out commercial entrance).
  - The proposed access to King Street has been designed in conformance with the standards set out in the Region of Peel Public Works Standard Drawing 5-1-5 (right-in/right-out access).

It is concluded that the traffic generated by the proposed development can be accommodated by the boundary road network.

The analysis undertaken herein was prepared using the most recent Site Plan. Any minor changes to the Plan will not materially affect the conclusions contained within this report.

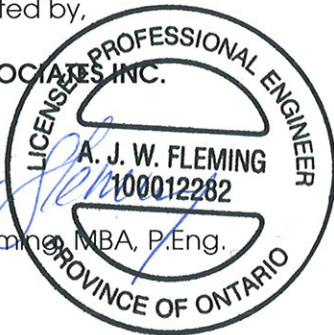
The proposed development can be supported from a traffic operations and safety perspective.

Respectfully submitted by,

C.F. CROZIER & ASSOCIATES INC.



Alexander J. W. Fleming, MBA, P.Eng.  
Associate



C.F. CROZIER & ASSOCIATES INC.



Madeleine Ferguson, EIT  
Transportation

/mf

J:\1700\1716-BVD Holdings Caledon Inc\5215-Hurontario St & King St\Reports\5215\_TIS\5215\_TIS (November 2019).docx

# APPENDIX A

## Town of Caledon Zoning By-law Excerpts



		<ul style="list-style-type: none"> <li>- Place of Assembly</li> <li>- Restaurant</li> <li>- Retail Store</li> <li>-Sales, Service &amp; Repair Shop</li> </ul>	
<b>CV</b>	<b>266</b>	<ul style="list-style-type: none"> <li>- Business Office</li> <li>- Dwelling Unit, Accessory</li> <li>- Financial Institution</li> <li>- Merchandise Service Shop</li> <li>- Motor Vehicle Rental Establishment</li> <li>- Motor Vehicle Repair Facility</li> <li>- Motor Vehicle Sales Establishment</li> <li>- Motor Vehicle Service Centre</li> <li>- Motor Vehicle Used Sales Establishment</li> <li>- Parking Lot, Commercial</li> <li>- Personal Service Shop</li> <li>- Place of Assembly</li> <li>- Retail Store</li> <li>-Sales, Service &amp; Repair Shop</li> <li>- Take-out Restaurant</li> </ul>	<p><b>Dwelling Units</b> (maximum) 1 only</p> <p><b>Yard, Front</b> (minimum)</p> <p>(a) existing lots nil</p> <p>(b) other lots 21m</p> <p><b>Parking Spaces</b> (minimum) 10</p>
<b>CV</b>	<b>267</b>	<ul style="list-style-type: none"> <li>- Drive-Through Service Facility Accessory to a Restaurant</li> <li>- Motor Vehicle Gas Bar</li> <li>- Motor Vehicle Repair Facility</li> <li>- Motor Vehicle Service Centre</li> <li>- Motor Vehicle Washing Establishment</li> <li>- Restaurant</li> <li>- Retail Store</li> </ul>	<p><b>Lot Area</b> (minimum) 1,390 m2</p> <p><b>Lot Frontage</b> (minimum) 21m</p> <p><b>Building Area</b> (maximum) 50%</p> <p><b>Yard, Front</b> (minimum) 7.5m</p> <p><b>Yard, Exterior Side</b> (minimum)</p> <p>(a) from any other side lot line 7.5m</p> <p><b>Yard, Interior Side</b> (minimum)</p> <p>(a) from an interior side lot line abutting a Residential zone 10.5m</p> <p><b>Restaurant Capacity</b> (maximum) 110 seats</p> <p><b>Planting Strip Location</b></p> <p>A planting strip shall be required along any portion of a front lot line and exterior side lot line which abuts a Provincial Highway and along any portion of an interior side lot line which abuts a Residential zone or which abuts a lot containing a Residential use.</p> <p><b>Planting Strip Widths</b> (minimum)</p> <p>(a) along a front lot line or exterior side lot line 1.5m</p> <p>(b) along an interior side lot line 3m</p>
<b>CV</b>	<b>268</b>	<ul style="list-style-type: none"> <li>- Business Office</li> <li>- Dwelling Unit, Accessory</li> </ul>	<p><b>Lot Area</b> (minimum) 1,390 m2</p> <p><b>Lot Frontage</b> (minimum) 21m</p>

1. Unless amended by the above provisions, all applicable standards of Sections 4 & Section 5 as well as the parent zone shall apply.

2. All uses listed in this Section which are subject to a footnote in Sections 6 through 12 will also be subject to the associated footnote.

<b>A1</b>	<b>347</b>	- <i>Parking Area</i> accessory to a permitted CV-267 use - <i>Water Recycling System</i> accessory to a permitted CV-267 use	
<b>A1</b>	<b>348</b>	- <i>Parking Area</i> accessory to an <i>Existing Sales Area</i> on an abutting <i>lot</i>	
<b>A1</b>	<b>349</b>	- <i>Dwelling Unit, Accessory</i> - <i>Gasoline Pump Island, Accessory</i> - <i>Motor Vehicle Body Shop</i> - <i>Motor Vehicle Repair Facility</i> - <i>Motor Vehicle Sales Establishment</i> - <i>Restaurant, Take-out</i> - <i>Retail Store</i>	In any A1-349 zone, no person shall use any <i>lot</i> , or construct, alter or use any <i>building</i> or <i>structure</i> except in accordance with the CH standards in Table 7.2
<b>A1</b>	<b>350</b> <b>(By-law 89-116, 89-83, 2012-160)</b>	- <i>Business Office</i> accessory to a topsoil manufacturing business - <i>Dwelling, Detached</i> - <i>Equipment Storage Building</i> related to a topsoil business - <i>Farm</i> - <i>Farm Equipment Storage Building</i> - <i>Farm Produce Outlet</i> - <i>Gasoline Pump Island, Accessory</i> - <i>Home Occupation</i> - <i>Livestock Facility</i> - <i>Nursery, Horticultural</i> - <i>Produce Storage Building</i> - <i>Topsoil Manufacturing Business</i>	<b>Yard, Rear</b> (minimum) 15m <b>Building Separation</b> (minimum) 3m <b>Driveway Setbacks</b> (minimum) (a) from a <i>lot line</i> abutting a Residential zone or abutting a <i>lot</i> containing a Residential use 4.5m (b) from any other <i>lot line</i> 1.5m <b>Parking Spaces</b> (minimum) (a) Residential uses 2 for each dwelling unit (b) <i>farm produce outlet, home occupation</i> the greater of: 2 per <i>lot</i> ; or 1 for each 20 m2 of net floor area or portion thereof (c) other Non-Residential Uses the greater of: 5 per <i>lot</i> ; or 1 for each 45 m2 of gross floor area or portion thereof <b>Parking Space Setback</b> (minimum) (a) from any <i>street line</i> 1.5m (b) from any <i>lot line</i> which abuts a Residential zone or abuts a <i>lot</i> containing a Residential use 4.5m <b>Accessory Open Storage Regulations:</b> No <i>accessory open storage area</i> shall be located:

1. Unless amended by the above provisions, all applicable standards of Sections 4 & Section 5 as well as the parent zone shall apply.  
2. All uses listed in this Section which are subject to a footnote in Sections 6 through 12 will also be subject to the associated footnote.

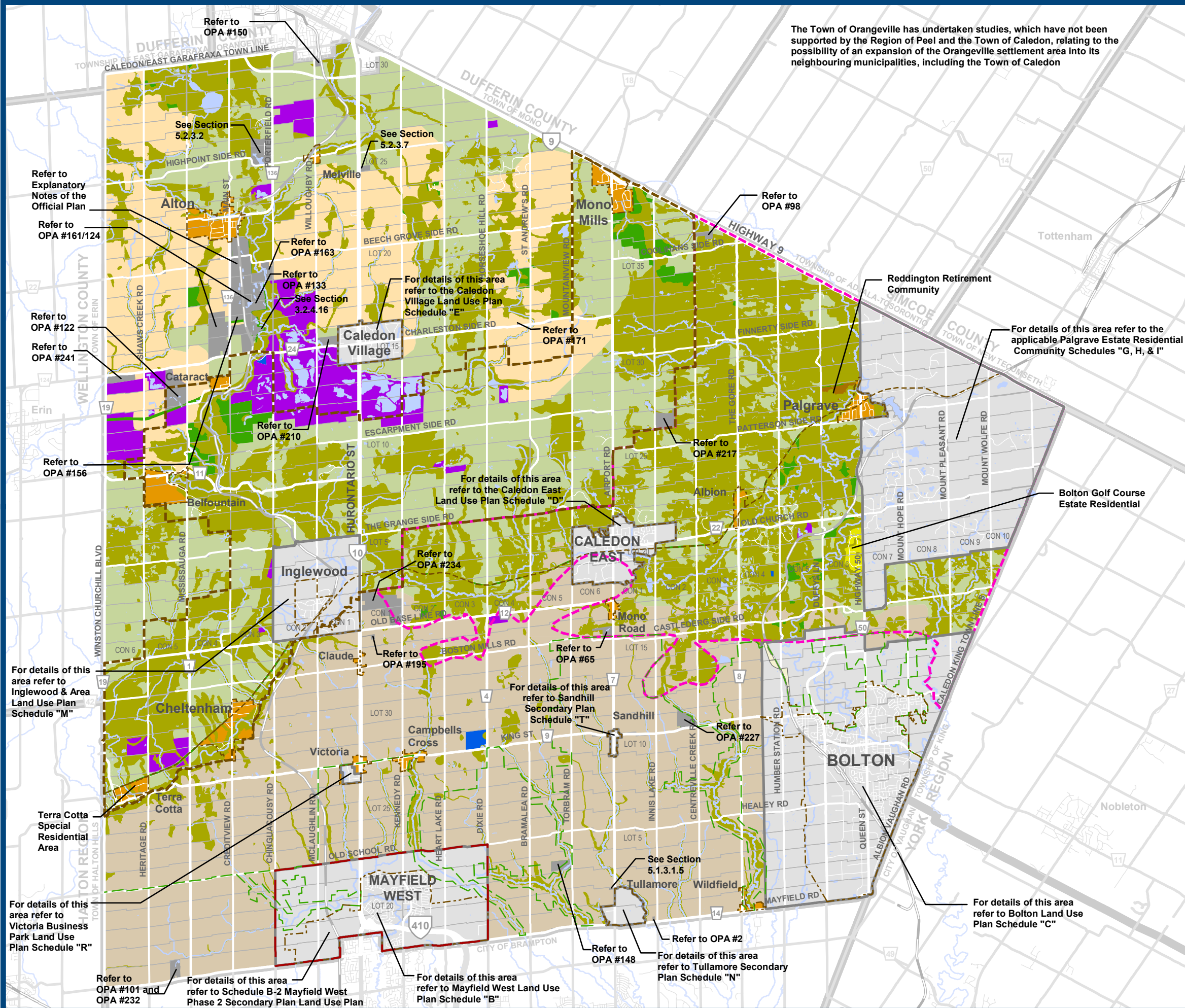
# APPENDIX B

Town of Caledon Official Plan Excerpts



# Schedule A TOWN OF CALEDON LAND USE PLAN

The Town of Orangeville has undertaken studies, which have not been supported by the Region of Peel and the Town of Caledon, relating to the possibility of an expansion of the Orangeville settlement area into its neighbouring municipalities, including the Town of Caledon



- General Agricultural Area
- Prime Agricultural Area
- Rural Lands
- Extractive Industrial Area
- Waste Management Area
- Open Space Policy Area
- Environmental Policy Area
- Estate Residential Area
- Retirement Community Area
- Settlement Area
- Mayfield West Study Area Boundary
- Boundary of Greenbelt Plan Area
- Oak Ridges Moraine Conservation Plan Area
- Niagara Escarpment Plan Area
- Provincial Road
- Regional Road
- Local Road
- Railway
- Caledon Trailway

Base Data Source: Town of Caledon



Refer to Explanatory Notes of the Official Plan

Refer to OPA #161/124

Refer to OPA #122

Refer to OPA #241

Refer to OPA #156

For details of this area refer to Inglewood & Area Land Use Plan Schedule "M"

Terra Cotta Special Residential Area

For details of this area refer to Victoria Business Park Land Use Plan Schedule "R"

Refer to OPA #101 and OPA #232

For details of this area refer to Schedule B-2 Mayfield West Phase 2 Secondary Plan Land Use Plan

For details of this area refer to Mayfield West Land Use Plan Schedule "B"

Refer to OPA #150

See Section 5.2.3.2

See Section 5.2.3.7

Refer to OPA #163

Refer to OPA #133

See Section 3.2.4.16

Refer to OPA #210

For details of this area refer to the Caledon East Land Use Plan Schedule "D"

Refer to OPA #234

Refer to OPA #195

Refer to OPA #65

For details of this area refer to Sandhill Secondary Plan Schedule "T"

See Section 5.1.3.1.5

Refer to OPA #148

Refer to OPA #2  
For details of this area refer to Tullamore Secondary Plan Schedule "N"

Refer to OPA #98

Reddington Retirement Community

For details of this area refer to the applicable Palgrave Estate Residential Community Schedules "G, H, & I"

Refer to OPA #217

Bolton Golf Course Estate Residential

Refer to OPA #227

For details of this area refer to Bolton Land Use Plan Schedule "C"

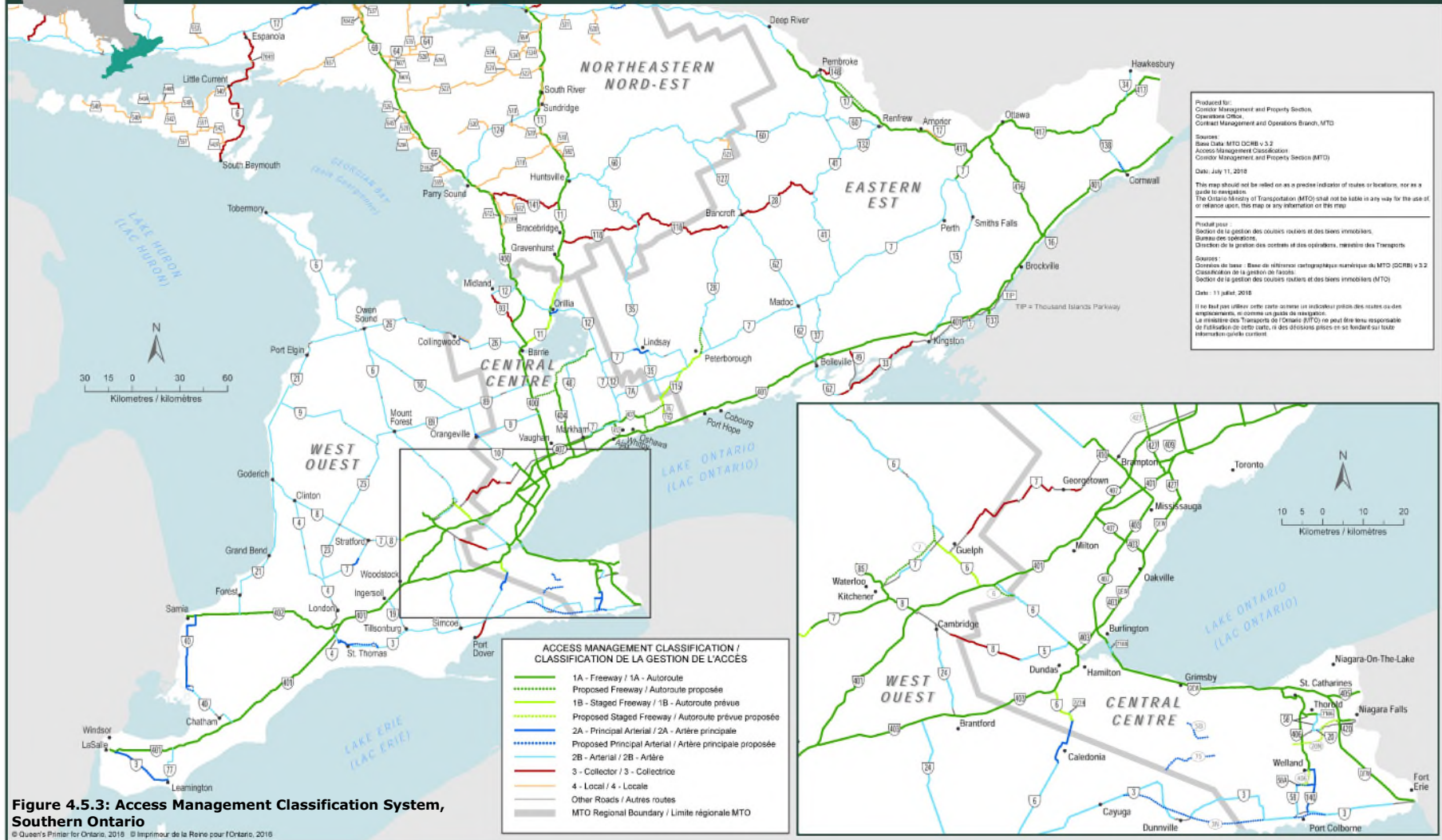
# APPENDIX C

MTO Highway Corridor Management Manual Excerpts

**Access Management Classification - Southern Ontario** **Classification de la gestion de l'accès - Sud de l'Ontario**

July 2018

Juillet 2018



Produced for:  
 Contract Management and Property Section,  
 Operations Office,  
 Contract Management and Operations Branch, MTO

Sources:  
 Base Data: MTO DCRB v 3.2  
 Access Management Classification:  
 Contract Management and Property Section (MTO)

Date: July 11, 2018

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation.  
 The Ontario Ministry of Transportation (MTO) shall not be liable in any way for the use of or reliance upon, this map or any information on this map.

Produit pour:  
 Section de la gestion des routes routières et des biens immobiliers,  
 Bureau des opérations,  
 Direction de la gestion des contrats et des opérations, ministère des Transports

Sources:  
 Données de base : Base de données cartographiques numérique du MTO (DCRB) v 3.2  
 Classification de la gestion de l'accès:  
 Section de la gestion des routes routières et des biens immobiliers (MTO)

Date : 11 juillet 2018

Il ne faut pas utiliser cette carte comme un indicateur précis des routes ou des emplacements, ni comme un guide de navigation.  
 Le ministère des Transports de l'Ontario (MTO) ne peut être tenu responsable de l'utilisation de cette carte, ni des décisions prises en se basant sur toute information qu'elle contient.

**Figure 4.5.3: Access Management Classification System, Southern Ontario**

© Queen's Printer for Ontario, 2018. © Imprimeur de la Reine pour l'Ontario, 2018

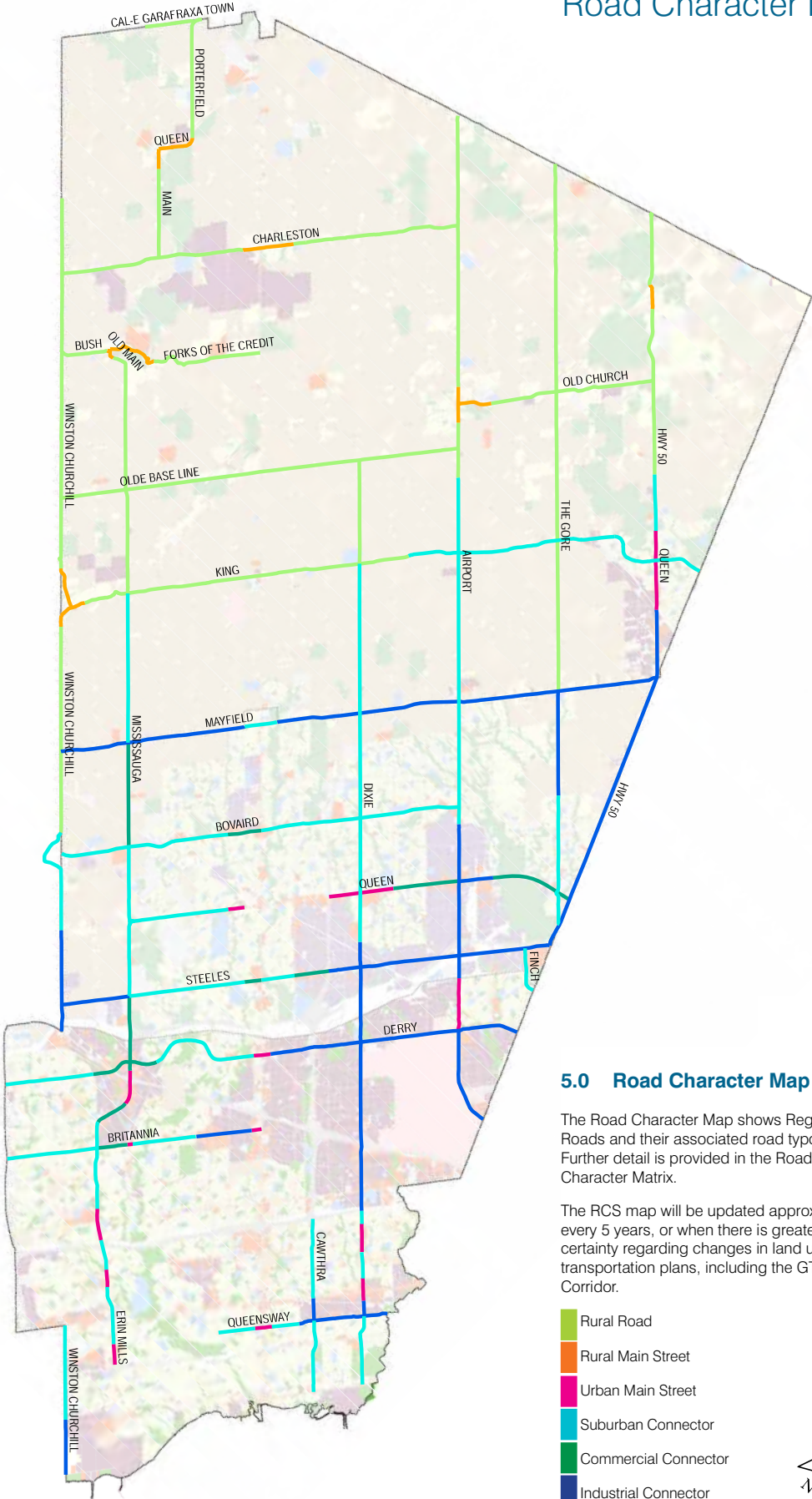
# APPENDIX D

## Region of Peel Road Characterization Study Excerpts

# Road Character Matrix

Street Type	Area Context	Through Lanes	Desired Operating Speed	Transit Role	Area for Pedestrian and Other Facilities	Bicycle Facilities*	Drainage Conditions	Freight Role
<b>Rural Road</b>	Rural Agricultural, Scenic and Greenlands	2 to 4	40* to 80 km/h	Very Limited and Site Specific	Shoulder	Shoulder	Rural Swale	Primarily Local Deliveries, Aggregates and Agricultural Material Transport with Restrictions Through Village Centres
<b>Rural Main Street</b>	Rural Village Centre	2 to 4	40* to 50 km/h Community Safety Zone/School Zone	Limited to Designated Stops or Stations	Village Specific - 1.5 Minimum Sidewalk (Wider where appropriate) + Furnishing/Planting Zone + Splash Strip + Utility Zone	Behind the Curb Where Design Speeds Exceed 50km/h Otherwise Sharing the Road	Curb and Gutter	Local Deliveries
<b>Urban Main Street</b>	Urban Village Centre Mixed Use	4 to 6	40* to 50 km/h	Major	Location Specific - 1.5 Minimum Sidewalk (Wider where appropriate) + Furnishing/Planting Zone + Splash Strip + Utility Zone	Behind the Curb	Curb and Gutter	Local Deliveries
<b>Suburban Connector</b>	Includes some existing Residential Areas with Reverse Frontages and Associated Intersections that have Neighbourhood Service Retail	4 to 6	50 to 70km/h	Moderate to Major	Desired 1.5m Minimum Sidewalk + Furnishing/Planting Zone + Splash Strip + Utility Zone	1) For New Construction or Reconstruction accommodated in a 3m Off-Street Multi-Use Trail 2) In Transitional Situations provide a 1.5m Striped On-Street Bicycle Lane	Curb and Gutter	Yes
<b>Commercial Connector</b>	Commercial Uses Including Employment Lands/Office Campus and Regional Serving Retail	4 to 6	50 to 70 km	Moderate to Major	Desired 1.5m Minimum Sidewalk + Planting Zone + Splash Strip + Utility Zone	On-Street when using ≤ 50km/h Posted Speed or Behind the Curb Where Posted Speeds Exceed 50km/h Otherwise Sharing the Road	Curb and Gutter	Yes
<b>Industrial Connector</b>	Industrial and Warehousing Areas and Routes from those Areas to 400 Series Highways	4 to 6 (Professional Judgement to be Used if Climbing Lanes are Necessary on Steep Grades)	60 to 80 km	Moderate to Major	Location Specific - Desired 1.5m Minimum Sidewalk + Planting Zone + Splash Strip + Utility Zone	Recommend the Use of Professional Judgement in High Truck Volume Traffic Areas Where Access Points to Adjacent Uses or Intersections are < 300m Apart	Curb and Gutter or Rural Swale Depending on Adjacent Uses	Yes

\* The Region is committed to designing for active transportation. All future designs will reference the Region's Active Transportation Plan.



**5.0 Road Character Map**

The Road Character Map shows Regional Roads and their associated road typologies. Further detail is provided in the Road Character Matrix.

The RCS map will be updated approximately every 5 years, or when there is greater certainty regarding changes in land use or transportation plans, including the GTA West Corridor.

- Rural Road
- Rural Main Street
- Urban Main Street
- Suburban Connector
- Commercial Connector
- Industrial Connector



Note: Existing land use data for the base map was sourced from Area Municipal Official Plans. This map will be amended periodically in response to approved secondary plans, block plans, or council endorsed development applications.

# APPENDIX E

## Traffic Data



Turning Movement Count (1 . HURONTARIO ST & KING ST) CustID: 00919057 MioID: 634772

Start Time	N Approach HURONTARIO ST						E Approach KING ST						S Approach HURONTARIO ST						W Approach KING ST						Int. Total (15 min)	Int. Total (1 hr)	
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total			
06:00:00	20	447	7	0	0	474	2	7	5	0	0	14	4	78	5	0	0	87	41	27	7	0	0	75	650		
06:15:00	49	468	14	0	0	531	2	19	7	0	0	28	9	112	5	0	0	126	47	22	15	0	0	84	769		
06:30:00	44	437	11	0	0	492	0	31	15	0	0	46	5	108	8	0	0	121	51	32	16	0	0	99	758		
06:45:00	50	387	8	0	0	445	2	38	9	0	0	49	5	87	15	0	0	107	39	28	14	0	0	81	682	2859	
07:00:00	58	463	14	0	0	535	2	42	10	0	0	54	5	135	12	0	0	152	65	34	15	0	0	114	855	3064	
07:15:00	49	448	9	0	0	506	3	42	9	0	0	54	6	182	16	0	0	204	41	39	28	0	0	108	872	3167	
07:30:00	42	450	12	0	0	504	5	47	21	0	0	73	15	163	15	0	0	193	59	51	31	0	0	141	911	3320	
07:45:00	53	410	16	0	0	479	4	54	14	0	0	72	13	154	15	0	0	182	62	41	26	0	0	129	862	3500	
08:00:00	52	369	14	0	0	435	6	56	14	0	0	76	18	149	15	0	0	182	58	41	27	0	0	126	819	3464	
08:15:00	56	347	13	0	0	416	3	39	16	0	0	58	10	153	17	0	0	180	48	36	28	0	0	112	766	3358	
08:30:00	60	377	7	0	0	444	5	30	23	0	0	58	16	185	15	0	0	216	48	32	29	0	0	109	827	3274	
08:45:00	33	316	13	0	0	362	6	38	13	0	0	57	22	144	7	0	0	173	36	30	30	0	0	96	688	3100	
09:00:00	25	267	13	0	0	305	5	27	21	0	0	53	20	149	13	0	0	182	34	23	30	0	0	87	627	2908	
09:15:00	21	284	5	0	0	310	7	25	12	0	0	44	10	160	9	0	0	179	39	20	21	0	0	80	613	2755	
09:30:00	22	268	5	0	0	295	4	28	9	0	0	41	8	144	20	0	0	172	43	21	23	0	0	87	595	2523	
09:45:00	19	229	3	0	0	251	7	20	11	0	0	38	6	143	17	0	0	166	33	12	24	0	0	69	524	2359	
***BREAK***																											
15:00:00	22	180	6	0	0	208	7	35	9	0	0	51	16	321	45	0	0	382	15	24	34	0	0	73	714		
15:15:00	20	203	7	0	0	230	7	36	8	0	0	51	16	391	39	0	0	446	16	42	40	0	0	98	825		
15:30:00	19	174	3	0	0	196	15	32	17	0	0	64	25	383	25	0	0	433	18	32	39	0	0	89	782		
15:45:00	18	190	4	0	0	212	8	47	21	0	0	76	14	440	36	0	0	490	15	44	40	0	0	99	877	3198	
16:00:00	17	180	9	0	0	206	18	39	10	0	0	67	16	451	35	0	0	502	19	38	47	0	0	104	879	3363	
16:15:00	24	195	6	0	0	225	10	47	12	0	0	69	14	437	41	0	0	492	28	47	47	0	0	122	908	3446	
16:30:00	32	206	4	0	0	242	8	33	14	0	0	55	25	452	39	0	0	516	20	45	62	0	0	127	940	3604	
16:45:00	31	184	4	0	0	219	12	59	12	0	0	83	16	395	45	0	0	456	25	55	49	0	0	129	887	3614	
17:00:00	30	145	6	0	0	181	10	68	12	0	0	90	17	406	42	0	0	465	19	49	36	0	1	104	840	3575	
17:15:00	26	204	7	0	0	237	11	55	13	0	1	79	15	419	50	0	1	484	34	39	51	0	0	124	924	3591	
17:30:00	21	177	5	0	1	203	13	52	14	0	1	79	15	358	34	0	1	407	28	46	50	0	1	124	813	3464	
17:45:00	14	150	5	0	0	169	5	48	10	0	0	63	7	372	45	0	0	424	30	41	59	0	0	130	786	3363	
18:00:00	20	142	7	0	0	169	10	35	13	0	0	58	16	309	33	0	0	358	17	40	35	0	0	92	677	3200	
18:15:00	12	132	4	0	0	148	10	38	14	0	0	62	7	295	39	0	0	341	18	37	34	0	0	89	640	2916	



18:30:00	13	126	8	0	0	147	12	17	7	0	0	36	8	259	48	0	0	315	18	29	29	0	0	76	574	2677
18:45:00	9	119	2	0	0	130	3	21	8	0	0	32	9	245	36	0	0	290	12	15	29	0	0	56	508	2399
<b>Grand Total</b>	<b>981</b>	<b>8674</b>	<b>251</b>	<b>0</b>	<b>1</b>	<b>9906</b>	<b>222</b>	<b>1205</b>	<b>403</b>	<b>0</b>	<b>2</b>	<b>1830</b>	<b>408</b>	<b>8179</b>	<b>836</b>	<b>0</b>	<b>2</b>	<b>9423</b>	<b>1076</b>	<b>1112</b>	<b>1045</b>	<b>0</b>	<b>2</b>	<b>3233</b>	<b>24392</b>	<b>-</b>
<b>Approach%</b>	9.9%	87.6%	2.5%	0%	-	12.1%	65.8%	22%	0%	-	4.3%	86.8%	8.9%	0%	-	33.3%	34.4%	32.3%	0%	-	-	-	-	-	-	-
<b>Totals %</b>	4%	35.6%	1%	0%	40.6%	0.9%	4.9%	1.7%	0%	7.5%	1.7%	33.5%	3.4%	0%	38.6%	4.4%	4.6%	4.3%	0%	13.3%	-	-	-	-	-	-
<b>Heavy</b>	24	446	16	0	-	27	55	58	0	-	38	546	42	0	-	42	60	40	0	-	-	-	-	-	-	-
<b>Heavy %</b>	2.4%	5.1%	6.4%	0%	-	12.2%	4.6%	14.4%	0%	-	9.3%	6.7%	5%	0%	-	3.9%	5.4%	3.8%	0%	-	-	-	-	-	-	-
<b>Bicycles</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Bicycle %</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



**Peak Hour: 07:00 AM - 08:00 AM Weather: Clear Sky (-4.49 °C)**

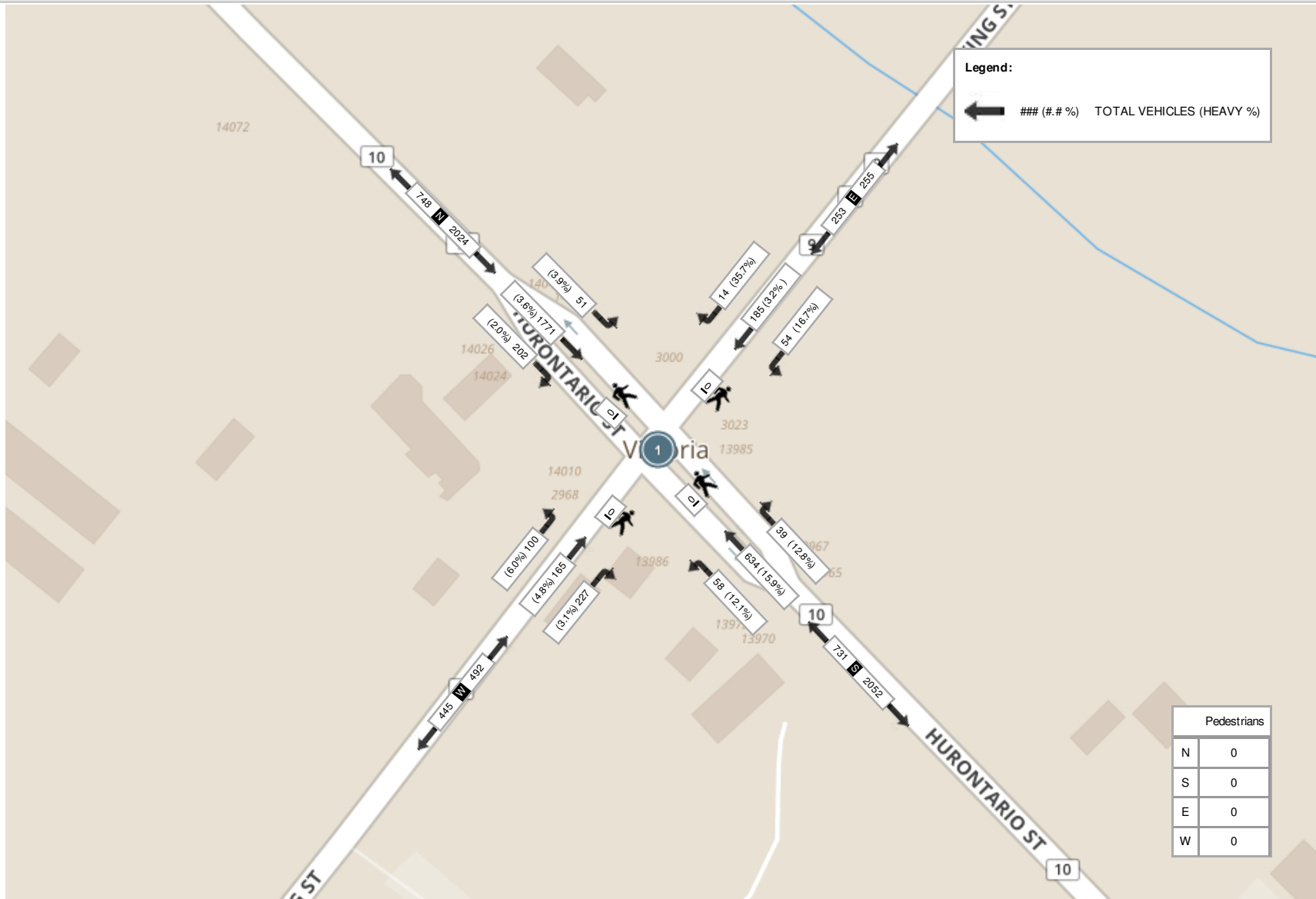
Start Time	N Approach HURONTARIO ST						E Approach KING ST						S Approach HURONTARIO ST						W Approach KING ST						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
07:00:00	58	463	14	0	0	535	2	42	10	0	0	54	5	135	12	0	0	152	65	34	15	0	0	114	855
07:15:00	49	448	9	0	0	506	3	42	9	0	0	54	6	182	16	0	0	204	41	39	28	0	0	108	872
07:30:00	42	450	12	0	0	504	5	47	21	0	0	73	15	163	15	0	0	193	59	51	31	0	0	141	911
07:45:00	53	410	16	0	0	479	4	54	14	0	0	72	13	154	15	0	0	182	62	41	26	0	0	129	862
<b>Grand Total</b>	<b>202</b>	<b>1771</b>	<b>51</b>	<b>0</b>	<b>0</b>	<b>2024</b>	<b>14</b>	<b>185</b>	<b>54</b>	<b>0</b>	<b>0</b>	<b>253</b>	<b>39</b>	<b>634</b>	<b>58</b>	<b>0</b>	<b>0</b>	<b>731</b>	<b>227</b>	<b>165</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>492</b>	<b>3500</b>
<b>Approach%</b>	10%	87.5%	2.5%	0%	-	-	5.5%	73.1%	21.3%	0%	-	5.3%	86.7%	7.9%	0%	-	46.1%	33.5%	20.3%	0%	-	-	-	-	
<b>Totals %</b>	5.8%	50.6%	1.5%	0%	57.8%	0.4%	5.3%	1.5%	0%	7.2%	1.1%	18.1%	1.7%	0%	20.9%	6.5%	4.7%	2.9%	0%	14.1%	-	-	-	-	
<b>PHF</b>	0.87	0.96	0.8	0	0.95	0.7	0.86	0.64	0	0.87	0.65	0.87	0.91	0	0.9	0.87	0.81	0.81	0	0.87	-	-	-	-	
<b>Heavy</b>	4	63	2	0	69	5	6	9	0	20	5	101	7	0	113	7	8	6	0	21	-	-	-	-	
<b>Heavy %</b>	2%	3.6%	3.9%	0%	3.4%	35.7%	3.2%	16.7%	0%	7.9%	12.8%	15.9%	12.1%	0%	15.5%	3.1%	4.8%	6%	0%	4.3%	-	-	-	-	
<b>Lights</b>	198	1708	49	0	1955	9	179	45	0	233	34	533	51	0	618	220	157	94	0	471	-	-	-	-	
<b>Lights %</b>	98%	96.4%	96.1%	0%	96.6%	64.3%	96.8%	83.3%	0%	92.1%	87.2%	84.1%	87.9%	0%	84.5%	96.9%	95.2%	94%	0%	95.7%	-	-	-	-	
<b>Single-Unit Trucks</b>	2	20	0	0	22	0	2	1	0	3	0	34	2	0	36	4	3	3	0	10	-	-	-	-	
<b>Single-Unit Trucks %</b>	1%	1.1%	0%	0%	1.1%	0%	1.1%	1.9%	0%	1.2%	0%	5.4%	3.4%	0%	4.9%	1.8%	1.8%	3%	0%	2%	-	-	-	-	
<b>Buses</b>	2	6	1	0	9	0	3	5	0	8	2	6	1	0	9	0	4	2	0	6	-	-	-	-	
<b>Buses %</b>	1%	0.3%	2%	0%	0.4%	0%	1.6%	9.3%	0%	3.2%	5.1%	0.9%	1.7%	0%	1.2%	0%	2.4%	2%	0%	1.2%	-	-	-	-	
<b>Articulated Trucks</b>	0	37	1	0	38	5	1	3	0	9	3	61	4	0	68	3	1	1	0	5	-	-	-	-	
<b>Articulated Trucks %</b>	0%	2.1%	2%	0%	1.9%	35.7%	0.5%	5.6%	0%	3.6%	7.7%	9.6%	6.9%	0%	9.3%	1.3%	0.6%	1%	0%	1%	-	-	-	-	
<b>Pedestrians</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	
<b>Pedestrians%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	



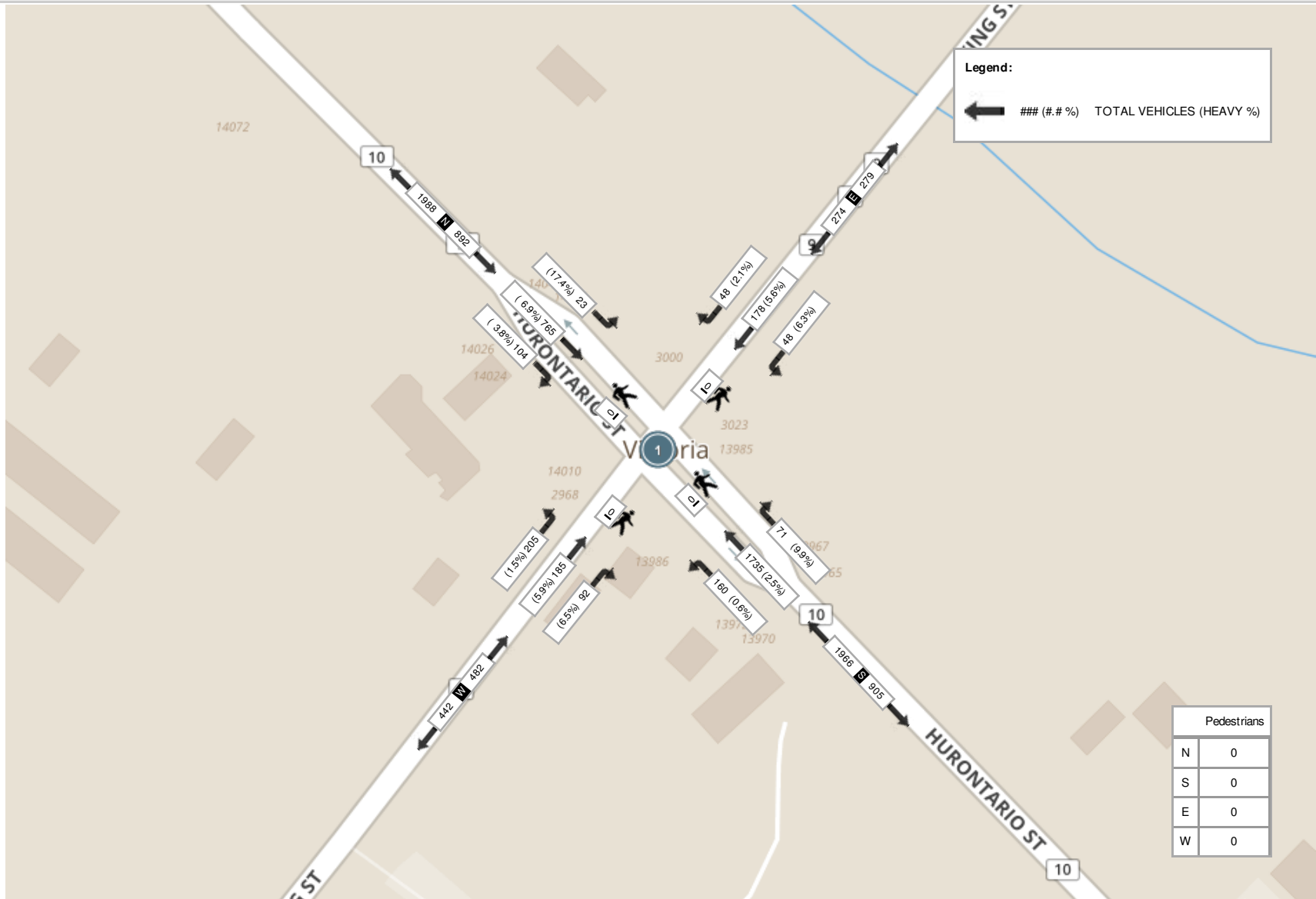
**Peak Hour: 04:00 PM - 05:00 PM Weather: Clear Sky (3.35 °C)**

Start Time	N Approach HURONTARIO ST						E Approach KING ST						S Approach HURONTARIO ST						W Approach KING ST						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:00:00	17	180	9	0	0	206	18	39	10	0	0	67	16	451	35	0	0	502	19	38	47	0	0	104	879
16:15:00	24	195	6	0	0	225	10	47	12	0	0	69	14	437	41	0	0	492	28	47	47	0	0	122	908
16:30:00	32	206	4	0	0	242	8	33	14	0	0	55	25	452	39	0	0	516	20	45	62	0	0	127	940
16:45:00	31	184	4	0	0	219	12	59	12	0	0	83	16	395	45	0	0	456	25	55	49	0	0	129	887
<b>Grand Total</b>	<b>104</b>	<b>765</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>892</b>	<b>48</b>	<b>178</b>	<b>48</b>	<b>0</b>	<b>0</b>	<b>274</b>	<b>71</b>	<b>1735</b>	<b>160</b>	<b>0</b>	<b>0</b>	<b>1966</b>	<b>92</b>	<b>185</b>	<b>205</b>	<b>0</b>	<b>0</b>	<b>482</b>	<b>3614</b>
<b>Approach%</b>	11.7%	85.8%	2.6%	0%	-	-	17.5%	65%	17.5%	0%	-	-	3.6%	88.3%	8.1%	0%	-	-	19.1%	38.4%	42.5%	0%	-	-	-
<b>Totals %</b>	2.9%	21.2%	0.6%	0%	24.7%	1.3%	4.9%	1.3%	0%	7.6%	2%	48%	4.4%	0%	54.4%	2.5%	5.1%	5.7%	0%	13.3%	-	-	-	-	-
<b>PHF</b>	0.81	0.93	0.64	0	0.92	0.67	0.75	0.86	0	0.83	0.71	0.96	0.89	0	0.95	0.82	0.84	0.83	0	0.93	-	-	-	-	-
<b>Heavy</b>	4	53	4	0	61	1	10	3	0	14	7	44	1	0	52	6	11	3	0	20	-	-	-	-	-
<b>Heavy %</b>	3.8%	6.9%	17.4%	0%	6.8%	2.1%	5.6%	6.3%	0%	5.1%	9.9%	2.5%	0.6%	0%	2.6%	6.5%	5.9%	1.5%	0%	4.1%	-	-	-	-	-
<b>Lights</b>	100	712	19	0	831	47	168	45	0	260	64	1691	159	0	1914	86	174	202	0	462	-	-	-	-	-
<b>Lights %</b>	96.2%	93.1%	82.6%	0%	93.2%	97.9%	94.4%	93.8%	0%	94.9%	90.1%	97.5%	99.4%	0%	97.4%	93.5%	94.1%	98.5%	0%	95.9%	-	-	-	-	-
<b>Single-Unit Trucks</b>	1	18	2	0	21	0	6	3	0	9	4	18	1	0	23	2	2	2	0	6	-	-	-	-	-
<b>Single-Unit Trucks %</b>	1%	2.4%	8.7%	0%	2.4%	0%	3.4%	6.3%	0%	3.3%	5.6%	1%	0.6%	0%	1.2%	2.2%	1.1%	1%	0%	1.2%	-	-	-	-	-
<b>Buses</b>	1	10	1	0	12	0	2	0	0	2	3	4	0	0	7	3	3	0	0	6	-	-	-	-	-
<b>Buses %</b>	1%	1.3%	4.3%	0%	1.3%	0%	1.1%	0%	0%	0.7%	4.2%	0.2%	0%	0%	0.4%	3.3%	1.6%	0%	0%	1.2%	-	-	-	-	-
<b>Articulated Trucks</b>	2	25	1	0	28	1	2	0	0	3	0	22	0	0	22	1	6	1	0	8	-	-	-	-	-
<b>Articulated Trucks %</b>	1.9%	3.3%	4.3%	0%	3.1%	2.1%	1.1%	0%	0%	1.1%	0%	1.3%	0%	0%	1.1%	1.1%	3.2%	0.5%	0%	1.7%	-	-	-	-	-
<b>Pedestrians</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-
<b>Pedestrians %</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-

Peak Hour: 07:00 AM - 08:00 AM Weather: Clear Sky (-4.49 °C)



Peak Hour: 04:00 PM - 05:00 PM Weather: Clear Sky (3.35 °C)





**Turning Movement Count (2 . HURONTARIO ST & DIAMOND TRAILER SITE ACCESS)**

Start Time	N Approach HURONTARIO ST					S Approach HURONTARIO ST					W Approach DIAMOND TRAILER SITE ACCESS					Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	U-Turn N:N	Peds N:	Approach Total	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Left W:N	U-Turn W:W	Peds W:	Approach Total		
06:00:00	0	473	0	0	473	86	0	0	0	86	0	0	0	0	0	559	
06:15:00	0	538	0	0	538	128	0	0	0	128	0	0	0	0	0	666	
06:30:00	0	494	0	0	494	122	0	0	0	122	0	0	0	0	0	616	
06:45:00	0	469	0	0	469	105	0	0	0	105	0	0	0	0	0	574	2415
07:00:00	0	535	0	0	535	152	0	0	0	152	0	0	0	0	0	687	2543
07:15:00	0	524	0	0	524	210	0	0	0	210	0	0	0	1	0	734	2611
07:30:00	0	525	0	0	525	203	0	0	0	203	0	0	0	0	0	728	2723
07:45:00	0	479	0	0	479	185	0	0	0	185	0	0	0	0	0	664	2813
08:00:00	0	419	0	0	419	187	0	0	0	187	0	0	0	0	0	606	2732
08:15:00	0	441	0	0	441	185	0	0	0	185	0	0	0	0	0	626	2624
08:30:00	0	422	0	0	422	221	0	0	0	221	0	0	0	0	0	643	2539
08:45:00	0	367	0	0	367	182	0	0	0	182	0	0	0	0	0	549	2424
09:00:00	0	309	0	0	309	184	0	0	0	184	0	0	0	0	0	493	2311
09:15:00	0	303	0	0	303	184	0	0	0	184	0	0	0	0	0	487	2172
09:30:00	0	302	0	0	302	175	0	0	0	175	0	0	0	0	0	477	2006
09:45:00	0	262	0	0	262	171	0	0	0	171	0	0	0	0	0	433	1890
***BREAK***																	
15:00:00	0	214	0	0	214	363	0	0	0	363	0	0	0	0	0	577	
15:15:00	0	232	0	0	232	446	0	0	0	446	0	0	0	0	0	678	
15:30:00	0	196	0	0	196	440	0	0	0	440	0	0	0	0	0	636	
15:45:00	0	219	0	0	219	490	0	0	0	490	0	0	0	0	0	709	2600
16:00:00	0	206	0	0	206	512	0	0	0	512	0	0	0	0	0	718	2741
16:15:00	0	221	0	0	221	497	0	0	0	497	0	0	0	0	0	718	2781
16:30:00	0	239	0	0	239	522	0	0	0	522	0	0	0	0	0	761	2906



16:45:00	0	216	0	0	216	454	0	0	0	454	0	0	0	1	0	670	2867
17:00:00	0	188	0	0	188	460	0	0	0	460	0	0	0	1	0	648	2797
17:15:00	0	242	0	0	242	487	0	0	0	487	0	0	0	0	0	729	2808
17:30:00	0	198	0	0	198	426	0	0	0	426	0	0	0	1	0	624	2671
17:45:00	0	168	0	0	168	439	0	0	0	439	0	0	0	0	0	607	2608
18:00:00	0	165	0	0	165	359	0	0	0	359	0	0	0	0	0	524	2484
18:15:00	0	151	0	0	151	347	0	0	0	347	0	0	0	0	0	498	2253
18:30:00	0	147	0	0	147	309	0	0	0	309	0	0	0	0	0	456	2085
18:45:00	0	130	0	0	130	281	0	0	0	281	0	0	0	0	0	411	1889
<b>Grand Total</b>	0	9994	0	0	9994	9512	0	0	0	9512	0	0	0	4	0	<b>19506</b>	-
<b>Approach%</b>	0%	100%	0%		-	100%	0%	0%		-	0%	0%	0%		-	-	-
<b>Totals %</b>	0%	51.2%	0%		51.2%	48.8%	0%	0%		48.8%	0%	0%	0%		0%	-	-
<b>Heavy</b>	0	491	0		-	607	0	0		-	0	0	0		-	-	-
<b>Heavy %</b>	0%	4.9%	0%		-	6.4%	0%	0%		-	0%	0%	0%		-	-	-
<b>Bicycles</b>	-	-	-		-	-	-	-		-	-	-	-		-	-	-
<b>Bicycle %</b>	-	-	-		-	-	-	-		-	-	-	-		-	-	-



**Peak Hour: 07:00 AM - 08:00 AM Weather: Clear Sky (-4.49 °C)**

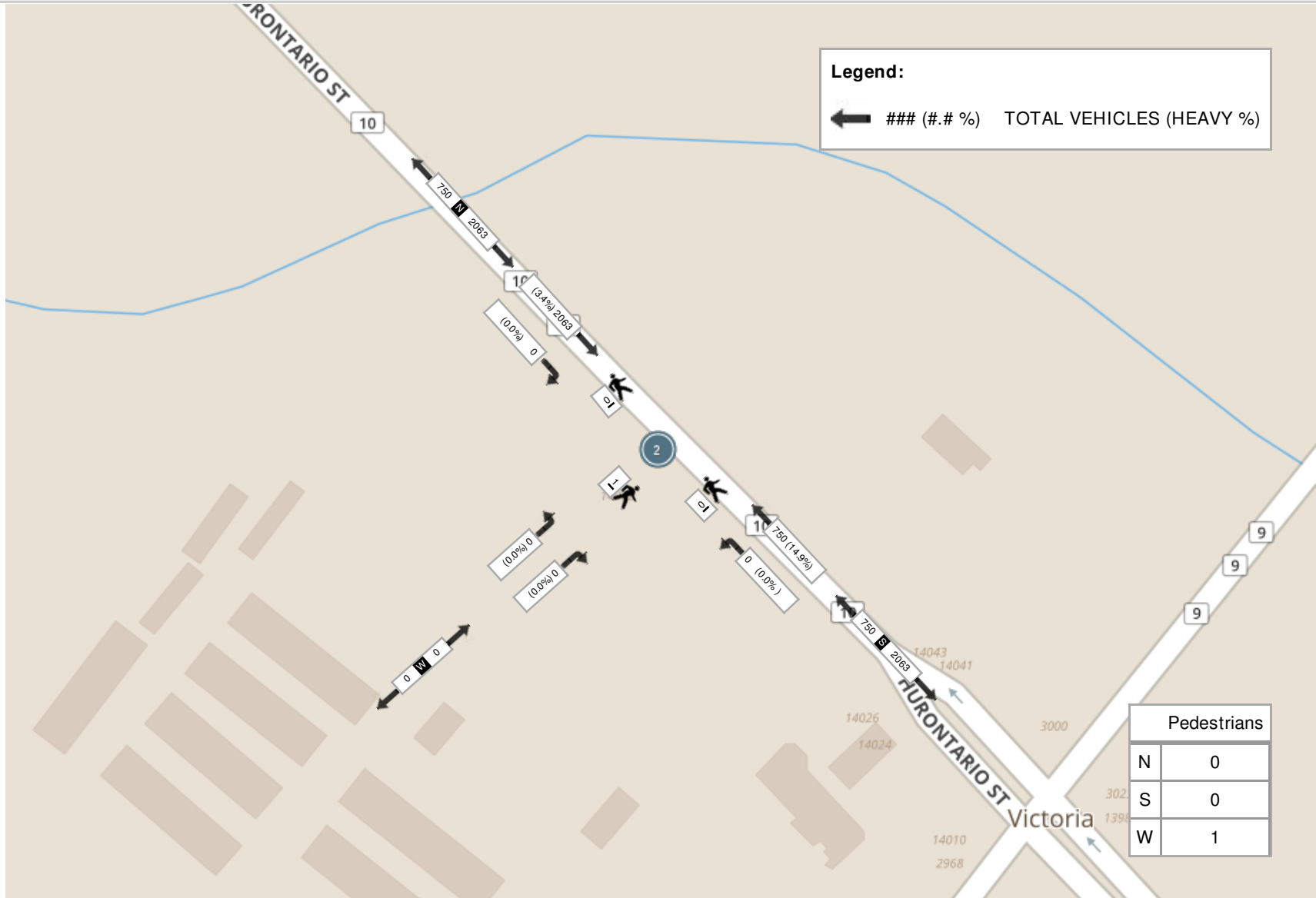
Start Time	N Approach HURONTARIO ST					S Approach HURONTARIO ST					W Approach DIAMOND TRAILER SITE ACCESS					Int. Total (15 min)
	Right	Thru	U-Turn	Peds	Approach Total	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	
07:00:00	0	535	0	0	535	152	0	0	0	152	0	0	0	0	0	687
07:15:00	0	524	0	0	524	210	0	0	0	210	0	0	0	1	0	734
07:30:00	0	525	0	0	525	203	0	0	0	203	0	0	0	0	0	728
07:45:00	0	479	0	0	479	185	0	0	0	185	0	0	0	0	0	664
<b>Grand Total</b>	0	2063	0	0	2063	750	0	0	0	750	0	0	0	1	0	<b>2813</b>
<b>Approach%</b>	0%	100%	0%		-	100%	0%	0%		-	0%	0%	0%		-	-
<b>Totals %</b>	0%	73.3%	0%		73.3%	26.7%	0%	0%		26.7%	0%	0%	0%		0%	-
<b>PHF</b>	0	0.96	0		0.96	0.89	0	0		0.89	0	0	0		0	-
<b>Heavy</b>	0	71	0		71	112	0	0		112	0	0	0		0	-
<b>Heavy %</b>	0%	3.4%	0%		3.4%	14.9%	0%	0%		14.9%	0%	0%	0%		0%	-
<b>Lights</b>	0	1992	0		1992	638	0	0		638	0	0	0		0	-
<b>Lights %</b>	0%	96.6%	0%		96.6%	85.1%	0%	0%		85.1%	0%	0%	0%		0%	-
<b>Single-Unit Trucks</b>	0	24	0		24	39	0	0		39	0	0	0		0	-
<b>Single-Unit Trucks %</b>	0%	1.2%	0%		1.2%	5.2%	0%	0%		5.2%	0%	0%	0%		0%	-
<b>Buses</b>	0	9	0		9	7	0	0		7	0	0	0		0	-
<b>Buses %</b>	0%	0.4%	0%		0.4%	0.9%	0%	0%		0.9%	0%	0%	0%		0%	-
<b>Articulated Trucks</b>	0	38	0		38	66	0	0		66	0	0	0		0	-
<b>Articulated Trucks %</b>	0%	1.8%	0%		1.8%	8.8%	0%	0%		8.8%	0%	0%	0%		0%	-
<b>Pedestrians</b>	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
<b>Pedestrians%</b>	-	-	-	0%	-	-	-	-	0%	-	-	-	-	100%	-	-



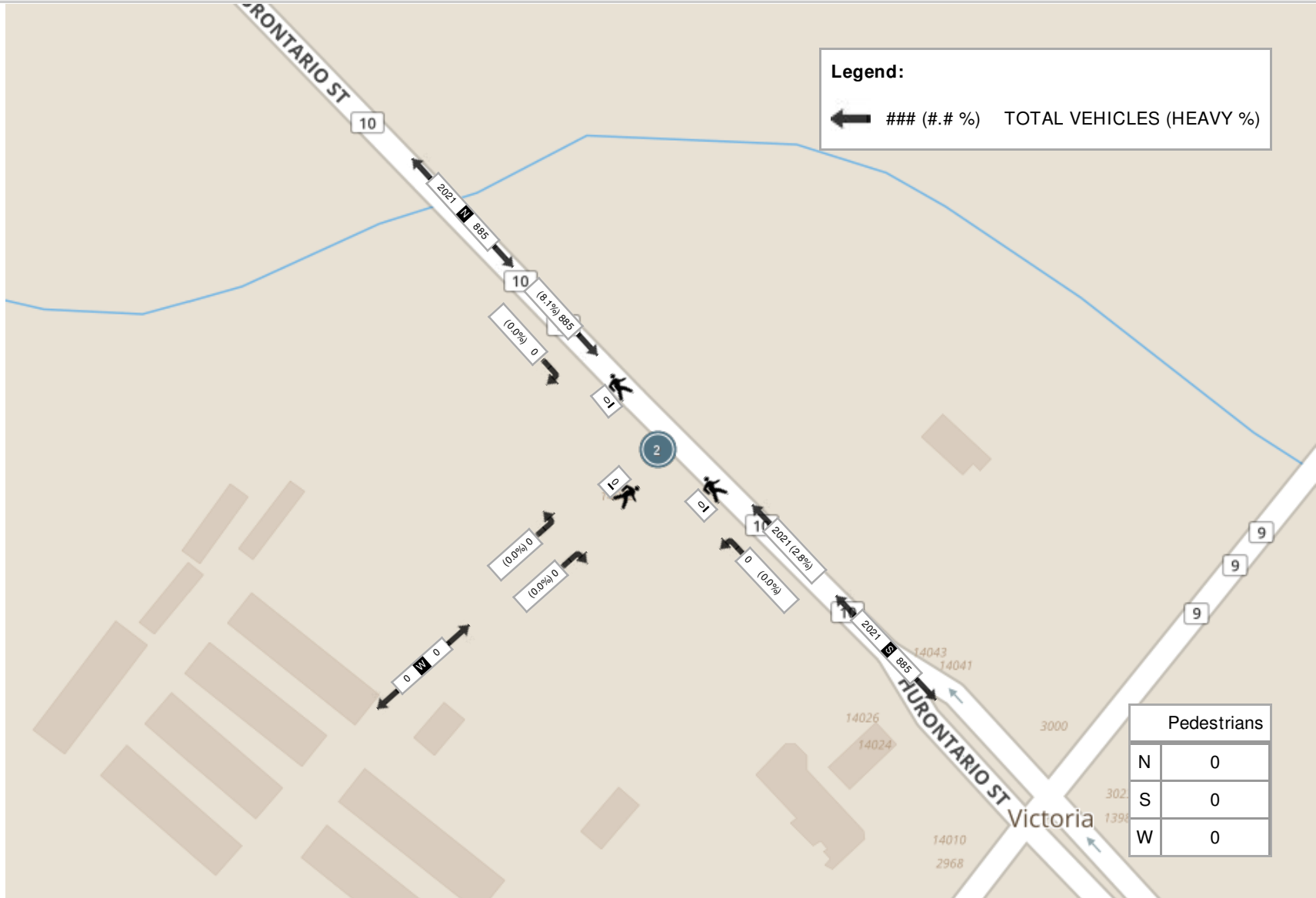
**Peak Hour: 03:45 PM - 04:45 PM Weather: Clear Sky (3.35 °C)**

Start Time	N Approach HURONTARIO ST					S Approach HURONTARIO ST					W Approach DIAMOND TRAILER SITE ACCESS					Int. Total (15 min)
	Right	Thru	U-Turn	Peds	Approach Total	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	
15:45:00	0	219	0	0	219	490	0	0	0	490	0	0	0	0	0	709
16:00:00	0	206	0	0	206	512	0	0	0	512	0	0	0	0	0	718
16:15:00	0	221	0	0	221	497	0	0	0	497	0	0	0	0	0	718
16:30:00	0	239	0	0	239	522	0	0	0	522	0	0	0	0	0	761
<b>Grand Total</b>	0	885	0	0	885	2021	0	0	0	2021	0	0	0	0	0	<b>2906</b>
<b>Approach%</b>	0%	100%	0%		-	100%	0%	0%		-	0%	0%	0%		-	-
<b>Totals %</b>	0%	30.5%	0%		30.5%	69.5%	0%	0%		69.5%	0%	0%	0%		0%	-
<b>PHF</b>	0	0.93	0		0.93	0.97	0	0		0.97	0	0	0		0	-
<b>Heavy</b>	0	72	0		72	56	0	0		56	0	0	0		0	-
<b>Heavy %</b>	0%	8.1%	0%		8.1%	2.8%	0%	0%		2.8%	0%	0%	0%		0%	-
<b>Lights</b>	0	813	0		813	1965	0	0		1965	0	0	0		0	-
<b>Lights %</b>	0%	91.9%	0%		91.9%	97.2%	0%	0%		97.2%	0%	0%	0%		0%	-
<b>Single-Unit Trucks</b>	0	25	0		25	30	0	0		30	0	0	0		0	-
<b>Single-Unit Trucks %</b>	0%	2.8%	0%		2.8%	1.5%	0%	0%		1.5%	0%	0%	0%		0%	-
<b>Buses</b>	0	12	0		12	3	0	0		3	0	0	0		0	-
<b>Buses %</b>	0%	1.4%	0%		1.4%	0.1%	0%	0%		0.1%	0%	0%	0%		0%	-
<b>Articulated Trucks</b>	0	35	0		35	23	0	0		23	0	0	0		0	-
<b>Articulated Trucks %</b>	0%	4%	0%		4%	1.1%	0%	0%		1.1%	0%	0%	0%		0%	-
<b>Pedestrians</b>	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
<b>Pedestrians%</b>	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-

Peak Hour: 07:00 AM - 08:00 AM Weather: Clear Sky (-4.49 °C)



Peak Hour: 03:45 PM - 04:45 PM Weather: Clear Sky (3.35 °C)



# APPENDIX F

## Level of Service Definitions

## Level of Service Definitions

### Two-Way Stop Controlled Intersections

<b>Level of Service</b>	<b>Control Delay per Vehicle (seconds)</b>	<b>Interpretation</b>
A	$\leq 10$	EXCELLENT. Large and frequent gaps in traffic on the main roadway. Queuing on the minor street is rare.
B	$> 10$ and $\leq 15$	VERY GOOD. Many gaps exist in traffic on the main roadway. Queuing on the minor street is minimal.
C	$> 15$ and $\leq 25$	GOOD. Fewer gaps exist in traffic on the main roadway. Delay on minor approach becomes more noticeable.
D	$> 25$ and $\leq 35$	FAIR. Infrequent and shorter gaps in traffic on the main roadway. Queue lengths develop on the minor street.
E	$> 35$ and $\leq 50$	POOR. Very infrequent gaps in traffic on the main roadway. Queue lengths become noticeable.
F	$> 50$	UNSATISFACTORY. Very few gaps in traffic on the main roadway. Excessive delay with significant queue lengths on the minor street.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

## Signalized Intersections

<b>Level of Service</b>	<b>Control Delay per Vehicle (seconds)</b>	<b>Interpretation</b>
A	$\leq 10$	EXCELLENT. Extremely favourable progression with most vehicles arriving during the green phase. Most vehicles do not stop and short cycle lengths may contribute to low delay.
B	$> 10$ and $\leq 20$	VERY GOOD. Very good progression and/or short cycle lengths with slightly more vehicles stopping than LOS "A" causing slightly higher levels of average delay.
C	$> 20$ and $\leq 35$	GOOD. Fair progression and longer cycle lengths lead to a greater number of vehicles stopping than LOS "B".
D	$> 35$ and $\leq 55$	FAIR. Congestion becomes noticeable with higher average delays resulting from a combination of long cycle lengths, high volume-to-capacity ratios and unfavourable progression.
E	$> 55$ and $\leq 80$	POOR. Lengthy delays values are indicative of poor progression, long cycle lengths and high volume-to-capacity ratios. Individual cycle failures are common with individual movement failures also common.
F	$> 80$	UNSATISFACTORY. Indicative of oversaturated conditions with vehicular demand greater than the capacity of the intersection.

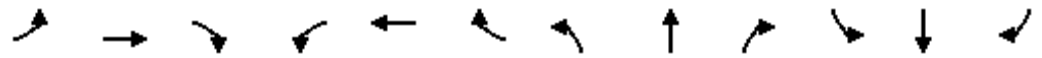
Adapted from Highway Capacity Manual 2000, Transportation Research Board

# APPENDIX G

## Detailed Capacity Analysis Worksheets

Lanes, Volumes, Timings  
1: Highway 10 & King Street

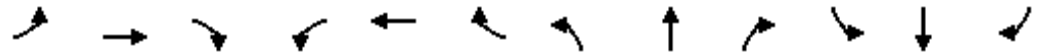
2019 Existing - AM  
11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	165	227	12	185	14	58	634	39	51	1771	202
Future Volume (vph)	100	165	227	12	185	14	58	634	39	51	1771	202
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr <sub>t</sub>		0.913				0.850		0.991			0.985	
Fl <sub>t</sub> Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1689	0	1526	1865	1174	1594	3123	0	1716	3464	0
Fl <sub>t</sub> Permitted	0.637			0.262			0.083			0.388		
Satd. Flow (perm)	1129	1689	0	421	1865	1174	139	3123	0	701	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				61		12			24	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	100	165	227	12	185	14	58	634	39	51	1771	202
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	392	0	12	185	14	58	673	0	51	1973	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2019 Existing - AM  
11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	20.7	20.7		20.7	20.7	20.7	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.36	0.91		0.12	0.40	0.04	0.73	0.37		0.13	0.98	
Control Delay	30.5	57.7		27.9	29.5	0.2	67.9	10.2		9.2	35.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	30.5	57.7		27.9	29.5	0.2	67.9	10.2		9.2	35.1	
LOS	C	E		C	C	A	E	B		A	D	
Approach Delay		52.1			27.4			14.8			34.4	
Approach LOS		D			C			B			C	

Intersection Summary

Area Type: Other  
 Cycle Length: 84  
 Actuated Cycle Length: 83.8  
 Natural Cycle: 90  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.98  
 Intersection Signal Delay: 32.4  
 Intersection LOS: C  
 Intersection Capacity Utilization 104.6%  
 ICU Level of Service G  
 Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2019 Existing - AM  
11/11/2019



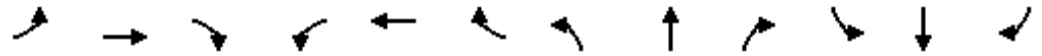
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	100	392	12	185	14	58	673	51	1973
v/c Ratio	0.36	0.91	0.12	0.40	0.04	0.73	0.37	0.13	0.98
Control Delay	30.5	57.7	27.9	29.5	0.2	67.9	10.2	9.2	35.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	57.7	27.9	29.5	0.2	67.9	10.2	9.2	35.1
Queue Length 50th (m)	13.2	58.8	1.5	24.7	0.0	6.3	27.7	3.5	149.3
Queue Length 95th (m)	27.0	#110.0	5.9	42.7	0.0	#29.1	38.4	8.6	#214.3
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	281	433	104	465	338	79	1804	404	2006
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.91	0.12	0.40	0.04	0.73	0.37	0.13	0.98

Intersection Summary

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

Lanes, Volumes, Timings  
1: Highway 10 & King Street

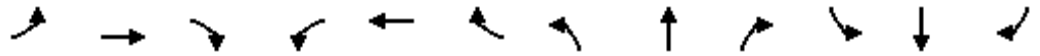
2019 Existing - PM  
11/12/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	185	92	48	178	48	160	1735	71	23	765	104
Future Volume (vph)	163	185	92	48	178	48	160	1735	71	23	765	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.950				0.850		0.994			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1716	0	1684	1812	1566	1767	3513	0	1526	3361	0
Flt Permitted	0.645			0.442			0.304			0.083		
Satd. Flow (perm)	1200	1716	0	783	1812	1566	566	3513	0	133	3361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28				61		8			30	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	163	185	92	48	178	48	160	1735	71	23	765	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	163	277	0	48	178	48	160	1806	0	23	869	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2019 Existing - PM  
11/12/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	17.6	17.6		17.6	17.6	17.6	48.4	48.4		48.4	48.4	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.22	0.60	0.60		0.60	0.60	
v/c Ratio	0.62	0.70		0.28	0.45	0.12	0.47	0.86		0.29	0.43	
Control Delay	39.8	36.3		30.7	31.2	6.1	15.8	19.5		20.9	9.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.8	36.3		30.7	31.2	6.1	15.8	19.5		20.9	9.6	
LOS	D	D		C	C	A	B	B		C	A	
Approach Delay		37.6			26.7			19.2			9.9	
Approach LOS		D			C			B			A	

Intersection Summary

Area Type: Other  
 Cycle Length: 84  
 Actuated Cycle Length: 80.8  
 Natural Cycle: 90  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.86  
 Intersection Signal Delay: 19.7  
 Intersection LOS: B  
 Intersection Capacity Utilization 115.2%  
 ICU Level of Service H  
 Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2019 Existing - PM  
11/12/2019



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	163	277	48	178	48	160	1806	23	869
v/c Ratio	0.62	0.70	0.28	0.45	0.12	0.47	0.86	0.29	0.43
Control Delay	39.8	36.3	30.7	31.2	6.1	15.8	19.5	20.9	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.8	36.3	30.7	31.2	6.1	15.8	19.5	20.9	9.6
Queue Length 50th (m)	22.8	35.4	6.2	23.8	0.0	13.0	113.3	1.6	34.4
Queue Length 95th (m)	42.0	60.0	15.6	41.7	6.2	31.5	#163.0	8.7	50.0
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	310	465	202	469	451	339	2107	79	2024
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.60	0.24	0.38	0.11	0.47	0.86	0.29	0.43

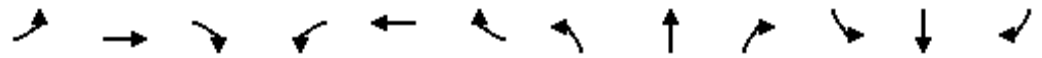
Intersection Summary

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

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2021 Future Background - AM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	180	229	13	202	14	59	640	39	52	1789	204
Future Volume (vph)	101	180	229	13	202	14	59	640	39	52	1789	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.916				0.850		0.991			0.985	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1694	0	1526	1865	1174	1594	3123	0	1716	3464	0
Flt Permitted	0.605			0.236			0.083			0.384		
Satd. Flow (perm)	1072	1694	0	379	1865	1174	139	3123	0	694	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				61		12			24	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	101	180	229	13	202	14	59	640	39	52	1789	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	101	409	0	13	202	14	59	679	0	52	1993	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2021 Future Background - AM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.38	0.94		0.14	0.44	0.04	0.75	0.38		0.13	1.00	
Control Delay	31.2	63.4		29.0	30.1	0.2	70.4	10.3		9.3	37.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	31.2	63.4		29.0	30.1	0.2	70.4	10.3		9.3	37.9	
LOS	C	E		C	C	A	E	B		A	D	
Approach Delay		57.0			28.2			15.1			37.2	
Approach LOS		E			C			B			D	

Intersection Summary

Area Type: Other

Cycle Length: 84

Actuated Cycle Length: 84

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 34.8

Intersection LOS: C

Intersection Capacity Utilization 106.0%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	101	409	13	202	14	59	679	52	1993
v/c Ratio	0.38	0.94	0.14	0.44	0.04	0.75	0.38	0.13	1.00
Control Delay	31.2	63.4	29.0	30.1	0.2	70.4	10.3	9.3	37.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.2	63.4	29.0	30.1	0.2	70.4	10.3	9.3	37.9
Queue Length 50th (m)	13.4	62.2	1.6	27.3	0.0	6.4	28.1	3.5	152.6
Queue Length 95th (m)	27.5	#116.3	6.5	46.6	0.0	#29.8	38.8	8.8	#218.1
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	266	433	94	464	337	79	1800	399	2002
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.94	0.14	0.44	0.04	0.75	0.38	0.13	1.00

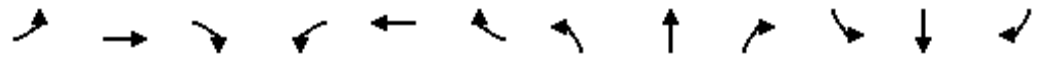
Intersection Summary

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

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2021 Future Background - PM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	202	93	48	194	48	162	1752	72	23	773	105
Future Volume (vph)	165	202	93	48	194	48	162	1752	72	23	773	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.953				0.850		0.994			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1722	0	1684	1812	1566	1767	3513	0	1526	3361	0
Flt Permitted	0.617			0.412			0.299			0.083		
Satd. Flow (perm)	1148	1722	0	730	1812	1566	556	3513	0	133	3361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26				61		8			30	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	165	202	93	48	194	48	162	1752	72	23	773	105
Shared Lane Traffic (%)												
Lane Group Flow (vph)	165	295	0	48	194	48	162	1824	0	23	878	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	18.3	18.3		18.3	18.3	18.3	48.4	48.4		48.4	48.4	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.22	0.59	0.59		0.59	0.59	
v/c Ratio	0.64	0.73		0.29	0.48	0.12	0.49	0.87		0.29	0.44	
Control Delay	40.8	37.7		31.2	31.5	6.1	16.8	20.8		21.3	10.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	40.8	37.7		31.2	31.5	6.1	16.8	20.8		21.3	10.0	
LOS	D	D		C	C	A	B	C		C	A	
Approach Delay		38.8			27.3			20.5			10.3	
Approach LOS		D			C			C			B	

Intersection Summary

Area Type: Other

Cycle Length: 84

Actuated Cycle Length: 81.5

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 20.8

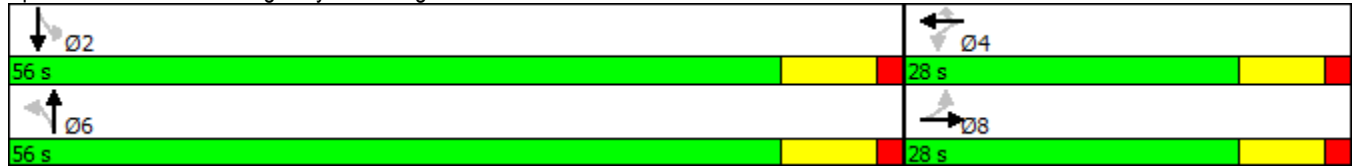
Intersection LOS: C

Intersection Capacity Utilization 116.7%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	165	295	48	194	48	162	1824	23	878
v/c Ratio	0.64	0.73	0.29	0.48	0.12	0.49	0.87	0.29	0.44
Control Delay	40.8	37.7	31.2	31.5	6.1	16.8	20.8	21.3	10.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.8	37.7	31.2	31.5	6.1	16.8	20.8	21.3	10.0
Queue Length 50th (m)	23.2	38.7	6.2	26.2	0.0	14.3	124.2	1.7	37.5
Queue Length 95th (m)	43.2	64.9	15.8	45.1	6.2	32.7	#170.5	8.7	50.5
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	294	461	187	465	447	330	2088	78	2007
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.64	0.26	0.42	0.11	0.49	0.87	0.29	0.44

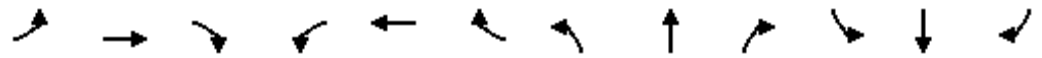
Intersection Summary

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

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Background - AM

11/11/2019

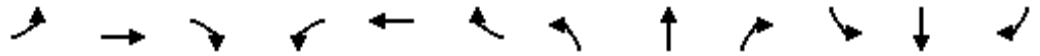


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	104	225	235	14	252	14	60	657	40	53	1834	209
Future Volume (vph)	104	225	235	14	252	14	60	657	40	53	1834	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr <sub>t</sub>		0.923				0.850		0.991			0.985	
Fl <sub>t</sub> Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1705	0	1526	1865	1174	1594	3123	0	1716	3464	0
Fl <sub>t</sub> Permitted	0.511			0.191			0.083			0.375		
Satd. Flow (perm)	906	1705	0	307	1865	1174	139	3123	0	677	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14				61		12			24	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	104	225	235	14	252	14	60	657	40	53	1834	209
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	460	0	14	252	14	60	697	0	53	2043	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Background - AM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.46	1.06		0.18	0.54	0.04	0.76	0.39		0.14	1.02	
Control Delay	34.7	92.1		31.9	32.6	0.2	72.8	10.3		9.4	44.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	34.7	92.1		31.9	32.6	0.2	72.8	10.3		9.4	44.6	
LOS	C	F		C	C	A	E	B		A	D	
Approach Delay		81.5			30.9			15.3			43.7	
Approach LOS		F			C			B			D	

Intersection Summary

Area Type: Other

Cycle Length: 84

Actuated Cycle Length: 84

Natural Cycle: 120

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 42.7

Intersection LOS: D

Intersection Capacity Utilization 110.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	104	460	14	252	14	60	697	53	2043
v/c Ratio	0.46	1.06	0.18	0.54	0.04	0.76	0.39	0.14	1.02
Control Delay	34.7	92.1	31.9	32.6	0.2	72.8	10.3	9.4	44.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	92.1	31.9	32.6	0.2	72.8	10.3	9.4	44.6
Queue Length 50th (m)	14.2	~80.4	1.8	35.2	0.0	6.6	29.0	3.6	~171.6
Queue Length 95th (m)	29.6	#136.5	7.0	57.8	0.0	#30.1	40.0	9.0	#227.2
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	225	434	76	464	337	79	1800	389	2002
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	1.06	0.18	0.54	0.04	0.76	0.39	0.14	1.02

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

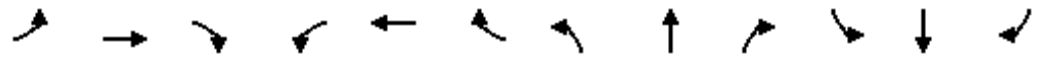
# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Background - PM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	252	95	50	242	50	166	1797	74	24	792	108
Future Volume (vph)	170	252	95	50	242	50	166	1797	74	24	792	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.959				0.850		0.994			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1734	0	1684	1812	1566	1767	3513	0	1526	3361	0
Flt Permitted	0.525			0.328			0.286			0.083		
Satd. Flow (perm)	977	1734	0	581	1812	1566	532	3513	0	133	3361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22				61		8			30	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	170	252	95	50	242	50	166	1797	74	24	792	108
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	347	0	50	242	50	166	1871	0	24	900	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Background - PM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	19.6	19.6		19.6	19.6	19.6	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.24	0.24		0.24	0.24	0.24	0.58	0.58		0.58	0.58	
v/c Ratio	0.74	0.81		0.36	0.57	0.12	0.54	0.91		0.31	0.46	
Control Delay	49.6	44.5		34.9	33.5	6.3	18.9	24.0		22.5	10.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	49.6	44.5		34.9	33.5	6.3	18.9	24.0		22.5	10.5	
LOS	D	D		C	C	A	B	C		C	B	
Approach Delay		46.2			29.7			23.6			10.8	
Approach LOS		D			C			C			B	

Intersection Summary

Area Type: Other  
 Cycle Length: 84  
 Actuated Cycle Length: 82.7  
 Natural Cycle: 90  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.91  
 Intersection Signal Delay: 24.1  
 Intersection LOS: C  
 Intersection Capacity Utilization 120.7%  
 ICU Level of Service H  
 Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	170	347	50	242	50	166	1871	24	900
v/c Ratio	0.74	0.81	0.36	0.57	0.12	0.54	0.91	0.31	0.46
Control Delay	49.6	44.5	34.9	33.5	6.3	18.9	24.0	22.5	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.6	44.5	34.9	33.5	6.3	18.9	24.0	22.5	10.5
Queue Length 50th (m)	24.8	48.6	6.6	33.7	0.0	15.1	131.5	1.8	38.9
Queue Length 95th (m)	#53.2	#88.4	16.9	55.9	6.5	35.7	#194.1	9.0	52.3
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	247	454	146	457	441	310	2055	77	1975
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.76	0.34	0.53	0.11	0.54	0.91	0.31	0.46

Intersection Summary

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

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Background - AM

11/11/2019

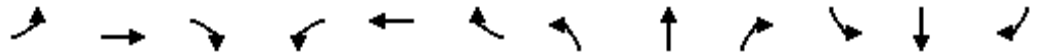


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	280	241	15	314	15	62	673	41	54	1880	214
Future Volume (vph)	106	280	241	15	314	15	62	673	41	54	1880	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.931				0.850		0.991			0.985	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1719	0	1526	1865	1174	1594	3123	0	1716	3464	0
Flt Permitted	0.400			0.191			0.083			0.367		
Satd. Flow (perm)	709	1719	0	307	1865	1174	139	3123	0	663	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12				61		12			24	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	106	280	241	15	314	15	62	673	41	54	1880	214
Shared Lane Traffic (%)												
Lane Group Flow (vph)	106	521	0	15	314	15	62	714	0	54	2094	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Background - AM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.60	1.19		0.20	0.68	0.04	0.78	0.40		0.14	1.05	
Control Delay	44.5	138.6		32.6	36.9	0.3	77.5	10.5		9.5	52.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	44.5	138.6		32.6	36.9	0.3	77.5	10.5		9.5	52.8	
LOS	D	F		C	D	A	E	B		A	D	
Approach Delay		122.7			35.1			15.8			51.7	
Approach LOS		F			D			B			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 84  
 Actuated Cycle Length: 84  
 Natural Cycle: 130  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 1.19  
 Intersection Signal Delay: 54.5  
 Intersection LOS: D  
 Intersection Capacity Utilization 114.8%  
 ICU Level of Service H  
 Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	106	521	15	314	15	62	714	54	2094
v/c Ratio	0.60	1.19	0.20	0.68	0.04	0.78	0.40	0.14	1.05
Control Delay	44.5	138.6	32.6	36.9	0.3	77.5	10.5	9.5	52.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.5	138.6	32.6	36.9	0.3	77.5	10.5	9.5	52.8
Queue Length 50th (m)	15.0	~101.4	1.9	45.5	0.0	7.0	29.9	3.7	~193.8
Queue Length 95th (m)	#36.1	#159.9	7.4	72.6	0.0	#31.1	41.2	9.2	#236.5
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	176	436	76	464	337	79	1800	381	2002
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	1.19	0.20	0.68	0.04	0.78	0.40	0.14	1.05

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

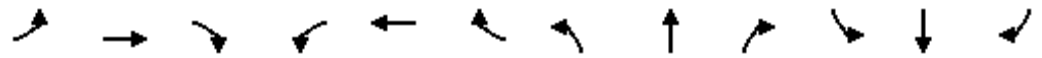
# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Background - PM

11/11/2019

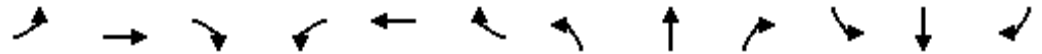


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	314	98	51	302	51	170	1842	75	24	812	110
Future Volume (vph)	176	314	98	51	302	51	170	1842	75	24	812	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr <sub>t</sub>		0.964				0.850		0.994			0.982	
Fl <sub>t</sub> Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1743	0	1684	1812	1566	1767	3513	0	1526	3361	0
Fl <sub>t</sub> Permitted	0.421			0.231			0.275			0.083		
Satd. Flow (perm)	783	1743	0	409	1812	1566	512	3513	0	133	3361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18				61		8			30	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			389.8			391.2			396.8	
Travel Time (s)		18.3			20.0			23.5			23.8	
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	176	314	98	51	302	51	170	1842	75	24	812	110
Shared Lane Traffic (%)												
Lane Group Flow (vph)	176	412	0	51	302	51	170	1917	0	24	922	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Background - PM

11/11/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.91	0.92		0.50	0.67	0.12	0.58	0.95		0.32	0.47	
Control Delay	78.4	58.4		47.3	36.9	6.5	21.2	28.7		22.9	11.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	78.4	58.4		47.3	36.9	6.5	21.2	28.7		22.9	11.0	
LOS	E	E		D	D	A	C	C		C	B	
Approach Delay		64.4			34.4			28.1			11.3	
Approach LOS		E			C			C			B	

Intersection Summary

Area Type: Other

Cycle Length: 84

Actuated Cycle Length: 84

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 30.1

Intersection LOS: C

Intersection Capacity Utilization 125.5%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street


























Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	176	412	51	302	51	170	1917	24	922
v/c Ratio	0.91	0.92	0.50	0.67	0.12	0.58	0.95	0.32	0.47
Control Delay	78.4	58.4	47.3	36.9	6.5	21.2	28.7	22.9	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.4	58.4	47.3	36.9	6.5	21.2	28.7	22.9	11.0
Queue Length 50th (m)	27.4	61.9	7.0	43.7	0.0	16.0	138.6	1.8	40.2
Queue Length 95th (m)	#64.1	#115.0	#21.7	70.1	6.8	38.5	#202.7	9.0	53.9
Internal Link Dist (m)		332.8		365.8			367.2		372.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	194	447	101	450	435	294	2023	76	1945
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.92	0.50	0.67	0.12	0.58	0.95	0.32	0.47

Intersection Summary

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

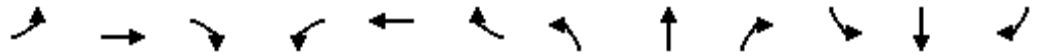
Lanes, Volumes, Timings  
1: Highway 10 & King Street

2021 Future Total - AM  
11/18/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	180	229	66	217	14	59	696	39	52	1789	204
Future Volume (vph)	116	180	229	66	217	14	59	696	39	52	1789	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Fr <sub>t</sub>		0.916				0.850		0.992			0.985	
Fl <sub>t</sub> Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1694	0	1526	1865	1174	1594	3126	0	1716	3464	0
Fl <sub>t</sub> Permitted	0.576			0.236			0.083			0.356		
Satd. Flow (perm)	1021	1694	0	379	1865	1174	139	3126	0	643	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				61		11			24	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			81.4			391.2			160.2	
Travel Time (s)		18.3			4.2			23.5			9.6	
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	116	180	229	66	217	14	59	696	39	52	1789	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	116	409	0	66	217	14	59	735	0	52	1993	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2021 Future Total - AM  
11/18/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.46	0.94		0.70	0.47	0.04	0.75	0.41		0.14	1.00	
Control Delay	33.6	63.4		69.4	30.8	0.2	70.4	10.6		9.5	37.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	33.6	63.4		69.4	30.8	0.2	70.4	10.6		9.5	37.9	
LOS	C	E		E	C	A	E	B		A	D	
Approach Delay		56.8			37.9			15.0			37.2	
Approach LOS		E			D			B			D	

Intersection Summary

Area Type:	Other
Cycle Length:	84
Actuated Cycle Length:	84
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	1.00
Intersection Signal Delay:	35.3
Intersection LOS:	D
Intersection Capacity Utilization:	106.0%
ICU Level of Service:	G
Analysis Period (min):	15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2021 Future Total - AM  
11/18/2019



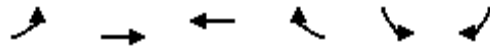
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	116	409	66	217	14	59	735	52	1993
v/c Ratio	0.46	0.94	0.70	0.47	0.04	0.75	0.41	0.14	1.00
Control Delay	33.6	63.4	69.4	30.8	0.2	70.4	10.6	9.5	37.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	63.4	69.4	30.8	0.2	70.4	10.6	9.5	37.9
Queue Length 50th (m)	15.8	62.2	9.6	29.6	0.0	6.4	31.2	3.6	152.6
Queue Length 95th (m)	31.7	#116.3	#30.7	49.8	0.0	#29.8	42.7	9.0	#218.1
Internal Link Dist (m)		332.8		57.4			367.2		136.2
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	254	433	94	464	337	79	1802	369	2002
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.94	0.70	0.47	0.04	0.75	0.41	0.14	1.00

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis  
 2: King Street & Site Access A

2021 Future Total - AM  
 11/18/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Volume (veh/h)	0	271	244	58	0	94
Future Volume (Veh/h)	0	271	244	58	0	94
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	271	244	58	0	94
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		81				
pX, platoon unblocked						
vC, conflicting volume	302				515	244
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	302				515	244
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	88
cM capacity (veh/h)	1259				520	795
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	271	244	58	94		
Volume Left	0	0	0	0		
Volume Right	0	0	58	94		
cSH	1700	1700	1700	795		
Volume to Capacity	0.16	0.14	0.03	0.12		
Queue Length 95th (m)	0.0	0.0	0.0	3.0		
Control Delay (s)	0.0	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			1.4			
Intersection Capacity Utilization			25.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 3: Highway 10 & Site Access B

2021 Future Total - AM  
 11/18/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Volume (veh/h)	0	105	676	153	0	2084
Future Volume (Veh/h)	0	105	676	153	0	2084
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	105	676	153	0	2084
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (m)			160			
pX, platoon unblocked	0.92	0.92			0.92	
vC, conflicting volume	1718	338			829	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1612	118			650	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	88			100	
cM capacity (veh/h)	88	842			861	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	105	338	338	153	1042	1042
Volume Left	0	0	0	0	0	0
Volume Right	105	0	0	153	0	0
cSH	842	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.20	0.20	0.09	0.61	0.61
Queue Length 95th (m)	3.2	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.9	0.0			0.0	
Approach LOS	A					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			60.9%		ICU Level of Service	B
Analysis Period (min)			15			

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2021 Future Total - PM  
11/19/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	202	93	79	203	48	162	1793	72	23	773	105
Future Volume (vph)	176	202	93	79	203	48	162	1793	72	23	773	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.953				0.850		0.994			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1722	0	1684	1812	1566	1767	3513	0	1526	3361	0
Flt Permitted	0.598			0.412			0.299			0.083		
Satd. Flow (perm)	1112	1722	0	730	1812	1566	556	3513	0	133	3361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26				61		8			30	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			91.7			391.2			156.8	
Travel Time (s)		18.3			4.7			23.5			9.4	
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	176	202	93	79	203	48	162	1793	72	23	773	105
Shared Lane Traffic (%)												
Lane Group Flow (vph)	176	295	0	79	203	48	162	1865	0	23	878	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2021 Future Total - PM  
11/19/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	18.3	18.3		18.3	18.3	18.3	48.4	48.4		48.4	48.4	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.22	0.59	0.59		0.59	0.59	
v/c Ratio	0.71	0.73		0.48	0.50	0.12	0.49	0.89		0.29	0.44	
Control Delay	45.6	37.7		38.2	32.1	6.1	16.8	22.1		21.3	10.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	45.6	37.7		38.2	32.1	6.1	16.8	22.1		21.3	10.0	
LOS	D	D		D	C	A	B	C		C	A	
Approach Delay		40.6			29.8			21.7			10.3	
Approach LOS		D			C			C			B	

Intersection Summary

Area Type: Other  
 Cycle Length: 84  
 Actuated Cycle Length: 81.5  
 Natural Cycle: 90  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.89  
 Intersection Signal Delay: 22.0  
 Intersection LOS: C  
 Intersection Capacity Utilization 117.8%  
 ICU Level of Service H  
 Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2021 Future Total - PM  
11/19/2019



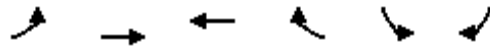
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	176	295	79	203	48	162	1865	23	878
v/c Ratio	0.71	0.73	0.48	0.50	0.12	0.49	0.89	0.29	0.44
Control Delay	45.6	37.7	38.2	32.1	6.1	16.8	22.1	21.3	10.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.6	37.7	38.2	32.1	6.1	16.8	22.1	21.3	10.0
Queue Length 50th (m)	25.2	38.7	10.7	27.6	0.0	14.3	130.3	1.7	37.5
Queue Length 95th (m)	#50.3	64.9	24.3	46.8	6.2	32.7	#193.0	8.7	50.5
Internal Link Dist (m)		332.8		67.7			367.2		132.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	285	461	187	465	447	330	2088	78	2007
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.64	0.42	0.44	0.11	0.49	0.89	0.29	0.44

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis  
 2: King Street & Site Access A

2021 Future Total - PM  
 11/19/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Volume (veh/h)	0	297	283	29	0	46
Future Volume (Veh/h)	0	297	283	29	0	46
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	297	283	29	0	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		92				
pX, platoon unblocked				0.88		
vC, conflicting volume	312			580	283	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	312			451	283	
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	94	
cM capacity (veh/h)	1248			497	756	
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>WB 2</b>	<b>SB 1</b>		
Volume Total	297	283	29	46		
Volume Left	0	0	0	0		
Volume Right	0	0	29	46		
cSH	1700	1700	1700	756		
Volume to Capacity	0.17	0.17	0.02	0.06		
Queue Length 95th (m)	0.0	0.0	0.0	1.5		
Control Delay (s)	0.0	0.0	0.0	10.1		
Lane LOS				B		
Approach Delay (s)	0.0	0.0		10.1		
Approach LOS				B		
<b>Intersection Summary</b>						
Average Delay			0.7			
Intersection Capacity Utilization			24.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 3: Highway 10 & Site Access B
























2021 Future Total - PM  
 11/19/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕↕	↗		↕↕
Traffic Volume (veh/h)	0	73	1974	119	0	894
Future Volume (Veh/h)	0	73	1974	119	0	894
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	73	1974	119	0	894
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			157			
pX, platoon unblocked	0.52	0.52			0.52	
vC, conflicting volume	2421	987			2093	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1885	0			1254	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	87			100	
cM capacity (veh/h)	32	563			286	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	73	987	987	119	447	447
Volume Left	0	0	0	0	0	0
Volume Right	73	0	0	119	0	0
cSH	563	1700	1700	1700	1700	1700
Volume to Capacity	0.13	0.58	0.58	0.07	0.26	0.26
Queue Length 95th (m)	3.4	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	B					
Approach Delay (s)	12.3	0.0			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			65.8%		ICU Level of Service	C
Analysis Period (min)			15			

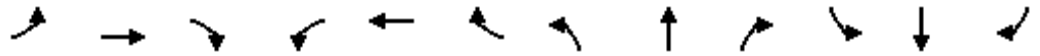
Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Total - AM  
11/18/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	225	235	67	267	14	60	713	40	53	1834	209
Future Volume (vph)	119	225	235	67	267	14	60	713	40	53	1834	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.923				0.850		0.992			0.985	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1705	0	1526	1865	1174	1594	3126	0	1716	3464	0
Flt Permitted	0.484			0.191			0.083			0.348		
Satd. Flow (perm)	858	1705	0	307	1865	1174	139	3126	0	629	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14				61		11			24	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			81.4			391.2			160.2	
Travel Time (s)		18.3			4.2			23.5			9.6	
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	119	225	235	67	267	14	60	713	40	53	1834	209
Shared Lane Traffic (%)												
Lane Group Flow (vph)	119	460	0	67	267	14	60	753	0	53	2043	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Total - AM  
11/18/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.56	1.06		0.88	0.58	0.04	0.76	0.42		0.15	1.02	
Control Delay	39.1	92.1		111.3	33.4	0.2	72.8	10.7		9.6	44.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.1	92.1		111.3	33.4	0.2	72.8	10.7		9.6	44.6	
LOS	D	F		F	C	A	E	B		A	D	
Approach Delay		81.2			47.1			15.3			43.7	
Approach LOS		F			D			B			D	

Intersection Summary

Area Type:	Other
Cycle Length:	84
Actuated Cycle Length:	84
Natural Cycle:	110
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	1.06
Intersection Signal Delay:	43.7
Intersection LOS:	D
Intersection Capacity Utilization:	110.2%
ICU Level of Service:	H
Analysis Period (min):	15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2026 Future Total - AM  
11/18/2019



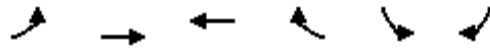
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	119	460	67	267	14	60	753	53	2043
v/c Ratio	0.56	1.06	0.88	0.58	0.04	0.76	0.42	0.15	1.02
Control Delay	39.1	92.1	111.3	33.4	0.2	72.8	10.7	9.6	44.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.1	92.1	111.3	33.4	0.2	72.8	10.7	9.6	44.6
Queue Length 50th (m)	16.7	~80.4	10.3	37.6	0.0	6.6	32.1	3.6	~171.6
Queue Length 95th (m)	34.0	#136.5	#34.4	61.2	0.0	#30.1	44.0	9.1	#227.2
Internal Link Dist (m)		332.8		57.4			367.2		136.2
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	213	434	76	464	337	79	1802	361	2002
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	1.06	0.88	0.58	0.04	0.76	0.42	0.15	1.02

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

HCM Unsignalized Intersection Capacity Analysis  
 2: King Street & Site Access A

2026 Future Total - AM  
 11/18/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Volume (veh/h)	0	318	295	58	0	94
Future Volume (Veh/h)	0	318	295	58	0	94
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	318	295	58	0	94
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		81				
pX, platoon unblocked						
vC, conflicting volume	353				613	295
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	353				613	295
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	87
cM capacity (veh/h)	1206				456	744
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	318	295	58	94		
Volume Left	0	0	0	0		
Volume Right	0	0	58	94		
cSH	1700	1700	1700	744		
Volume to Capacity	0.19	0.17	0.03	0.13		
Queue Length 95th (m)	0.0	0.0	0.0	3.3		
Control Delay (s)	0.0	0.0	0.0	10.5		
Lane LOS				B		
Approach Delay (s)	0.0	0.0		10.5		
Approach LOS				B		
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			28.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 3: Highway 10 & Site Access B
























2026 Future Total - AM  
 11/18/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Volume (veh/h)	0	105	695	153	0	2136
Future Volume (Veh/h)	0	105	695	153	0	2136
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	105	695	153	0	2136
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			160			
pX, platoon unblocked	0.92	0.92			0.92	
vC, conflicting volume	1763	348			848	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1653	111			656	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	88			100	
cM capacity (veh/h)	82	845			851	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	105	348	348	153	1068	1068
Volume Left	0	0	0	0	0	0
Volume Right	105	0	0	153	0	0
cSH	845	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.20	0.20	0.09	0.63	0.63
Queue Length 95th (m)	3.2	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.9	0.0			0.0	
Approach LOS	A					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			62.4%		ICU Level of Service	B
Analysis Period (min)			15			

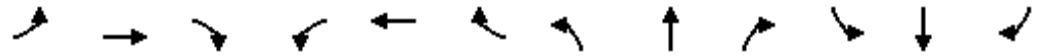
Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Total - PM  
11/19/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	181	252	95	81	251	50	166	1838	74	24	792	108
Future Volume (vph)	181	252	95	81	251	50	166	1838	74	24	792	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.959				0.850		0.994			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1734	0	1684	1812	1566	1767	3513	0	1526	3361	0
Flt Permitted	0.507			0.328			0.286			0.083		
Satd. Flow (perm)	943	1734	0	581	1812	1566	532	3513	0	133	3361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22				61		8			30	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			91.7			391.2			156.8	
Travel Time (s)		18.3			4.7			23.5			9.4	
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	181	252	95	81	251	50	166	1838	74	24	792	108
Shared Lane Traffic (%)												
Lane Group Flow (vph)	181	347	0	81	251	50	166	1912	0	24	900	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2026 Future Total - PM  
11/19/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	19.6	19.6		19.6	19.6	19.6	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.24	0.24		0.24	0.24	0.24	0.58	0.58		0.58	0.58	
v/c Ratio	0.81	0.81		0.59	0.59	0.12	0.54	0.93		0.31	0.46	
Control Delay	58.7	44.5		47.7	34.1	6.3	18.9	26.1		22.5	10.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	58.7	44.5		47.7	34.1	6.3	18.9	26.1		22.5	10.5	
LOS	E	D		D	C	A	B	C		C	B	
Approach Delay		49.4			33.4			25.5			10.8	
Approach LOS		D			C			C			B	

Intersection Summary

Area Type: Other  
 Cycle Length: 84  
 Actuated Cycle Length: 82.7  
 Natural Cycle: 90  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.93  
 Intersection Signal Delay: 26.0  
 Intersection LOS: C  
 Intersection Capacity Utilization 121.9%  
 ICU Level of Service H  
 Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2026 Future Total - PM  
11/19/2019



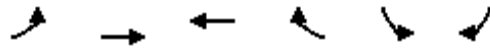
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	181	347	81	251	50	166	1912	24	900
v/c Ratio	0.81	0.81	0.59	0.59	0.12	0.54	0.93	0.31	0.46
Control Delay	58.7	44.5	47.7	34.1	6.3	18.9	26.1	22.5	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.7	44.5	47.7	34.1	6.3	18.9	26.1	22.5	10.5
Queue Length 50th (m)	27.0	48.6	11.4	35.2	0.0	15.1	137.8	1.8	38.9
Queue Length 95th (m)	#59.4	#88.4	#29.7	58.0	6.5	35.7	#201.8	9.0	52.3
Internal Link Dist (m)		332.8		67.7			367.2		132.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	238	454	146	457	441	310	2055	77	1975
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.76	0.55	0.55	0.11	0.54	0.93	0.31	0.46

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis  
 2: King Street & Site Access A

2026 Future Total - PM  
 11/19/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Volume (veh/h)	0	350	335	29	0	46
Future Volume (Veh/h)	0	350	335	29	0	46
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	350	335	29	0	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		92				
pX, platoon unblocked				0.84		
vC, conflicting volume	364			685	335	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	364			526	335	
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	93	
cM capacity (veh/h)	1195			429	707	
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	350	335	29	46		
Volume Left	0	0	0	0		
Volume Right	0	0	29	46		
cSH	1700	1700	1700	707		
Volume to Capacity	0.21	0.20	0.02	0.07		
Queue Length 95th (m)	0.0	0.0	0.0	1.6		
Control Delay (s)	0.0	0.0	0.0	10.4		
Lane LOS				B		
Approach Delay (s)	0.0	0.0		10.4		
Approach LOS				B		
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			27.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
3: Highway 10 & Site Access B
























2026 Future Total - PM  
11/19/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Volume (veh/h)	0	73	2026	119	0	916
Future Volume (Veh/h)	0	73	2026	119	0	916
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	73	2026	119	0	916
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			157			
pX, platoon unblocked	0.48	0.48			0.48	
vC, conflicting volume	2484	1013			2145	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1920	0			1211	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	86			100	
cM capacity (veh/h)	28	518			273	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	73	1013	1013	119	458	458
Volume Left	0	0	0	0	0	0
Volume Right	73	0	0	119	0	0
cSH	518	1700	1700	1700	1700	1700
Volume to Capacity	0.14	0.60	0.60	0.07	0.27	0.27
Queue Length 95th (m)	3.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	13.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	B					
Approach Delay (s)	13.1	0.0			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			67.2%		ICU Level of Service	C
Analysis Period (min)			15			

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Total - AM  
11/18/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
Future Volume (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.931				0.850		0.992			0.985	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1719	0	1526	1865	1174	1594	3126	0	1716	3464	0
Flt Permitted	0.373			0.191			0.083			0.340		
Satd. Flow (perm)	661	1719	0	307	1865	1174	139	3126	0	614	3464	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12				61		11				24
Link Speed (k/h)		70			70			60				60
Link Distance (m)		356.8			81.4			391.2				160.2
Travel Time (s)		18.3			4.2			23.5				9.6
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	521	0	68	329	15	62	770	0	54	2094	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Total - AM  
11/18/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	0.74	1.19		0.89	0.71	0.04	0.78	0.43		0.15	1.05	
Control Delay	57.7	138.6		114.3	38.5	0.3	77.5	10.8		9.7	52.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	57.7	138.6		114.3	38.5	0.3	77.5	10.8		9.7	52.8	
LOS	E	F		F	D	A	E	B		A	D	
Approach Delay		123.4			49.7			15.8			51.7	
Approach LOS		F			D			B			D	

Intersection Summary

Area Type: Other

Cycle Length: 84

Actuated Cycle Length: 84

Natural Cycle: 100

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.19

Intersection Signal Delay: 55.5

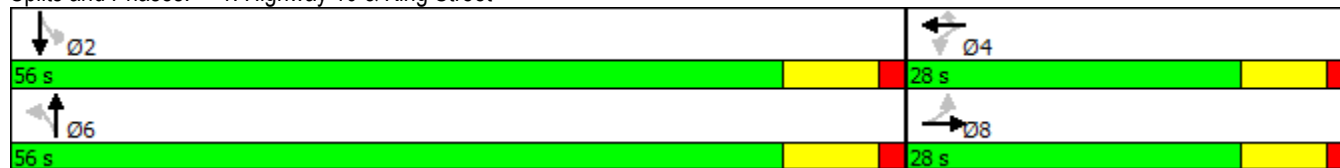
Intersection LOS: E

Intersection Capacity Utilization 114.8%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2031 Future Total - AM  
11/18/2019



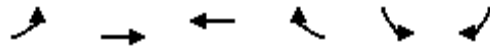
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	121	521	68	329	15	62	770	54	2094
v/c Ratio	0.74	1.19	0.89	0.71	0.04	0.78	0.43	0.15	1.05
Control Delay	57.7	138.6	114.3	38.5	0.3	77.5	10.8	9.7	52.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.7	138.6	114.3	38.5	0.3	77.5	10.8	9.7	52.8
Queue Length 50th (m)	17.9	~101.4	10.5	48.2	0.0	7.0	33.2	3.7	~193.8
Queue Length 95th (m)	#44.9	#159.9	#34.7	#78.0	0.0	#31.1	45.2	9.4	#236.5
Internal Link Dist (m)		332.8		57.4			367.2		136.2
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	164	436	76	464	337	79	1802	353	2002
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	1.19	0.89	0.71	0.04	0.78	0.43	0.15	1.05

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

HCM Unsignalized Intersection Capacity Analysis  
 2: King Street & Site Access A

2031 Future Total - AM  
 11/18/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Volume (veh/h)	0	375	359	58	0	94
Future Volume (Veh/h)	0	375	359	58	0	94
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	375	359	58	0	94
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		81				
pX, platoon unblocked				0.79		
vC, conflicting volume	417			734	359	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	417			533	359	
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	86	
cM capacity (veh/h)	1142			402	685	
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	375	359	58	94		
Volume Left	0	0	0	0		
Volume Right	0	0	58	94		
cSH	1700	1700	1700	685		
Volume to Capacity	0.22	0.21	0.03	0.14		
Queue Length 95th (m)	0.0	0.0	0.0	3.6		
Control Delay (s)	0.0	0.0	0.0	11.1		
Lane LOS				B		
Approach Delay (s)	0.0	0.0		11.1		
Approach LOS				B		
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			31.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 3: Highway 10 & Site Access B

2031 Future Total - AM  
 11/18/2019



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Volume (veh/h)	0	105	714	153	0	2190
Future Volume (Veh/h)	0	105	714	153	0	2190
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	105	714	153	0	2190
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			160			
pX, platoon unblocked	0.91	0.91			0.91	
vC, conflicting volume	1809	357			867	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1696	105			664	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	88			100	
cM capacity (veh/h)	76	848			841	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	105	357	357	153	1095	1095
Volume Left	0	0	0	0	0	0
Volume Right	105	0	0	153	0	0
cSH	848	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.21	0.21	0.09	0.64	0.64
Queue Length 95th (m)	3.2	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.8	0.0			0.0	
Approach LOS	A					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			63.9%		ICU Level of Service	B
Analysis Period (min)			15			

Lanes, Volumes, Timings  
1: Highway 10 & King Street

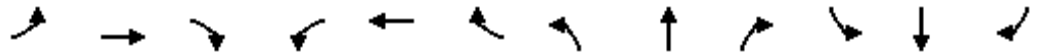
2031 Future Total - PM  
11/19/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
Future Volume (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		0.0	110.0		65.0	55.0		0.0	35.0		0.0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.964				0.850		0.994			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1743	0	1684	1812	1566	1767	3513	0	1526	3361	0
Flt Permitted	0.405			0.231			0.275			0.083		
Satd. Flow (perm)	753	1743	0	409	1812	1566	512	3513	0	133	3361	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18				61		8			30	
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		356.8			91.7			391.2			156.8	
Travel Time (s)		18.3			4.7			23.5			9.4	
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
Shared Lane Traffic (%)												
Lane Group Flow (vph)	187	412	0	82	311	51	170	1958	0	24	922	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1		1	1	1	1	1		1	1	
Detector Template	Left			Left		Right	Left			Left		
Leading Detector (m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6				2
Permitted Phases	8			4		4	6			2		
Detector Phase	8	8		4	4	4	6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Total - PM  
11/19/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1		32.1	32.1	32.1	34.7	34.7		34.7	34.7	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	56.0	56.0		56.0	56.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%	33.3%	66.7%	66.7%		66.7%	66.7%	
Maximum Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Yellow Time (s)	5.4	5.4		5.4	5.4	5.4	5.9	5.9		5.9	5.9	
All-Red Time (s)	1.7	1.7		1.7	1.7	1.7	1.8	1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.1	7.1		7.1	7.1	7.1	7.7	7.7		7.7	7.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	15.0	15.0		15.0	15.0	15.0	16.0	16.0		16.0	16.0	
Flash Dont Walk (s)	10.0	10.0		10.0	10.0	10.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effect Green (s)	20.9	20.9		20.9	20.9	20.9	48.3	48.3		48.3	48.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.25	0.58	0.58		0.58	0.58	
v/c Ratio	1.00	0.92		0.81	0.69	0.12	0.58	0.97		0.32	0.47	
Control Delay	101.5	58.4		84.0	37.9	6.5	21.2	32.0		22.9	11.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	101.5	58.4		84.0	37.9	6.5	21.2	32.0		22.9	11.0	
LOS	F	E		F	D	A	C	C		C	B	
Approach Delay		71.8			42.8			31.1			11.3	
Approach LOS		E			D			C			B	

Intersection Summary

Area Type:	Other
Cycle Length:	84
Actuated Cycle Length:	84
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	1.00
Intersection Signal Delay:	33.8
Intersection LOS:	C
Intersection Capacity Utilization:	126.6%
ICU Level of Service:	H
Analysis Period (min):	15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2031 Future Total - PM  
11/19/2019



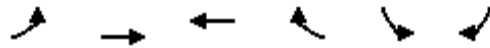
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	187	412	82	311	51	170	1958	24	922
v/c Ratio	1.00	0.92	0.81	0.69	0.12	0.58	0.97	0.32	0.47
Control Delay	101.5	58.4	84.0	37.9	6.5	21.2	32.0	22.9	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	101.5	58.4	84.0	37.9	6.5	21.2	32.0	22.9	11.0
Queue Length 50th (m)	30.0	61.9	12.4	45.3	0.0	16.0	145.3	1.8	40.2
Queue Length 95th (m)	#70.1	#115.0	#37.6	#72.5	6.8	38.5	#210.4	9.0	53.9
Internal Link Dist (m)		332.8		67.7			367.2		132.8
Turn Bay Length (m)	110.0		110.0		65.0	55.0		35.0	
Base Capacity (vph)	187	447	101	450	435	294	2023	76	1945
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.92	0.81	0.69	0.12	0.58	0.97	0.32	0.47

Intersection Summary

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

HCM Unsignalized Intersection Capacity Analysis  
 2: King Street & Site Access A

2031 Future Total - PM  
 11/19/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↗		↗
Traffic Volume (veh/h)	0	413	397	29	0	46
Future Volume (Veh/h)	0	413	397	29	0	46
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	413	397	29	0	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		92				
pX, platoon unblocked				0.79		
vC, conflicting volume	426			810	397	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	426			625	397	
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	93	
cM capacity (veh/h)	1133			354	652	
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	413	397	29	46		
Volume Left	0	0	0	0		
Volume Right	0	0	29	46		
cSH	1700	1700	1700	652		
Volume to Capacity	0.24	0.23	0.02	0.07		
Queue Length 95th (m)	0.0	0.0	0.0	1.7		
Control Delay (s)	0.0	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			0.6			
Intersection Capacity Utilization			30.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 3: Highway 10 & Site Access B

2031 Future Total - PM  
 11/19/2019



























Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Volume (veh/h)	0	73	2079	119	0	940
Future Volume (Veh/h)	0	73	2079	119	0	940
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	73	2079	119	0	940
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
			None			
			None			
Median storage veh						
Upstream signal (m)						
			157			
pX, platoon unblocked	0.46	0.46			0.46	
vC, conflicting volume	2549	1040			2198	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2009	0			1239	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	85			100	
cM capacity (veh/h)	23	494			254	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	73	1040	1040	119	470	470
Volume Left	0	0	0	0	0	0
Volume Right	73	0	0	119	0	0
cSH	494	1700	1700	1700	1700	1700
Volume to Capacity	0.15	0.61	0.61	0.07	0.28	0.28
Queue Length 95th (m)	3.9	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	13.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	B					
Approach Delay (s)	13.6	0.0			0.0	
Approach LOS	B					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			68.7%		ICU Level of Service	C
Analysis Period (min)			15			

Lanes, Volumes, Timings  
1: Highway 10 & King Street

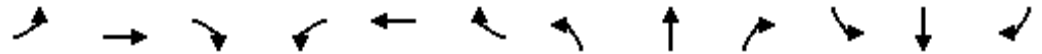
2031 Future Total - AM - Adjusted

11/18/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
Future Volume (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		65.0	110.0		65.0	55.0		25.0	35.0		25.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1684	1830	1585	1526	1865	1174	1594	3147	1445	1716	3510	1601
Flt Permitted	0.359			0.451			0.083			0.363		
Satd. Flow (perm)	636	1830	1585	724	1865	1174	139	3147	1445	656	3510	1601
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			61			61			53			94
Link Speed (k/h)		70			70			60				60
Link Distance (m)		356.8			81.4			391.2				160.2
Travel Time (s)		18.3			4.2			23.5				9.6
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
Heavy Vehicles (%)	6%	5%	3%	17%	3%	36%	12%	16%	13%	4%	4%	2%
Adj. Flow (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left		Right	Left		Right	Left		Right	Left		Right
Leading Detector (m)	10.0	10.0	6.1	10.0	10.0	10.0	10.0	10.0	6.1	10.0	10.0	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	10.0	10.0	6.1	10.0	10.0	10.0	10.0	10.0	6.1	10.0	10.0	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8			4			6				2
Permitted Phases	8		8	4		4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	20.0	20.0	20.0	20.0	20.0	20.0

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Total - AM - Adjusted  
11/18/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1	32.1	32.1	32.1	32.1	34.7	34.7	34.7	34.7	34.7	34.7
Total Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	56.0	56.0	56.0	56.0	56.0	56.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
Maximum Green (s)	20.9	20.9	20.9	20.9	20.9	20.9	48.3	48.3	48.3	48.3	48.3	48.3
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4	5.4	5.9	5.9	5.9	5.9	5.9	5.9
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.1	7.1	7.1	7.1	7.1	7.1	7.7	7.7	7.7	7.7	7.7	7.7
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Walk Time (s)	15.0	15.0	15.0	15.0	15.0	15.0	16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	10.0	10.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	19.4	19.4	19.4	19.4	19.4	19.4	48.3	48.3	48.3	48.3	48.3	48.3
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.24	0.24	0.59	0.59	0.59	0.59	0.59	0.59
v/c Ratio	0.81	0.65	0.58	0.40	0.75	0.05	0.77	0.40	0.05	0.14	0.91	0.22
Control Delay	69.4	36.4	26.6	34.5	41.3	0.3	74.1	10.3	2.0	9.4	24.4	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.4	36.4	26.6	34.5	41.3	0.3	74.1	10.3	2.0	9.4	24.4	5.4
LOS	E	D	C	C	D	A	E	B	A	A	C	A
Approach Delay	38.9			38.7			14.6			22.2		
Approach LOS	D			D			B			C		

Intersection Summary

Area Type: Other

Cycle Length: 84

Actuated Cycle Length: 82.5

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 25.0

Intersection LOS: C

Intersection Capacity Utilization 95.9%

ICU Level of Service F













Analysis Period (min) 15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2031 Future Total - AM - Adjusted  
11/18/2019

























												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	121	280	241	68	329	15	62	729	41	54	1880	214
v/c Ratio	0.81	0.65	0.58	0.40	0.75	0.05	0.77	0.40	0.05	0.14	0.91	0.22
Control Delay	69.4	36.4	26.6	34.5	41.3	0.3	74.1	10.3	2.0	9.4	24.4	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.4	36.4	26.6	34.5	41.3	0.3	74.1	10.3	2.0	9.4	24.4	5.4
Queue Length 50th (m)	18.0	39.8	24.7	9.1	48.2	0.0	7.0	31.3	0.0	3.7	133.7	8.1
Queue Length 95th (m)	#45.9	64.6	47.0	21.1	#78.0	0.0	#31.1	42.8	3.0	9.2	#196.2	17.8
Internal Link Dist (m)		332.8			57.4			367.2			136.2	
Turn Bay Length (m)	110.0		65.0	110.0		65.0	55.0		25.0	35.0		25.0
Base Capacity (vph)	161	463	447	183	473	342	81	1843	868	384	2056	976
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.60	0.54	0.37	0.70	0.04	0.77	0.40	0.05	0.14	0.91	0.22

Intersection Summary

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

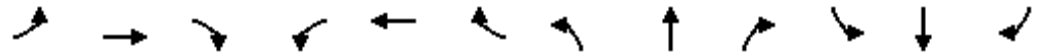
Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Total - PM - Adjusted  
11/19/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
Future Volume (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.7
Storage Length (m)	110.0		65.0	110.0		65.0	55.0		25.0	35.0		25.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	100.0			100.0			15.0			95.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1767	1812	1526	1684	1812	1566	1767	3544	1484	1526	3411	1570
Flt Permitted	0.405			0.400			0.321			0.083		
Satd. Flow (perm)	753	1812	1526	709	1812	1566	597	3544	1484	133	3411	1570
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			98			61			53			110
Link Speed (k/h)		70			70			60				60
Link Distance (m)		356.8			91.7			391.2				156.8
Travel Time (s)		18.3			4.7			23.5				9.4
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
Heavy Vehicles (%)	1%	6%	7%	6%	6%	2%	1%	3%	10%	17%	7%	4%
Adj. Flow (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
Shared Lane Traffic (%)												
Lane Group Flow (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.01	0.99	0.99	1.01	0.99	1.01	1.01	0.99	0.99	1.01	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	1
Detector Template	Left		Right	Left		Right	Left		Right	Left		Right
Leading Detector (m)	10.0	10.0	6.1	10.0	10.0	10.0	10.0	10.0	6.1	10.0	10.0	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	10.0	10.0	6.1	10.0	10.0	10.0	10.0	10.0	6.1	10.0	10.0	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8			4			6				2
Permitted Phases	8		8	4		4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	20.0	20.0	20.0	20.0	20.0	20.0

Lanes, Volumes, Timings  
1: Highway 10 & King Street

2031 Future Total - PM - Adjusted  
11/19/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	32.1	32.1	32.1	32.1	32.1	32.1	34.7	34.7	34.7	34.7	34.7	34.7
Total Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	56.0	56.0	56.0	56.0	56.0	56.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
Maximum Green (s)	20.9	20.9	20.9	20.9	20.9	20.9	48.3	48.3	48.3	48.3	48.3	48.3
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4	5.4	5.9	5.9	5.9	5.9	5.9	5.9
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.1	7.1	7.1	7.1	7.1	7.1	7.7	7.7	7.7	7.7	7.7	7.7
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Walk Time (s)	15.0	15.0	15.0	15.0	15.0	15.0	16.0	16.0	16.0	16.0	16.0	16.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	10.0	10.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	20.9	20.9	20.9	20.9	20.9	20.9	48.3	48.3	48.3	48.3	48.3	48.3
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25	0.25	0.58	0.58	0.58	0.58	0.58	0.58
v/c Ratio	1.00	0.70	0.22	0.47	0.69	0.12	0.50	0.92	0.09	0.32	0.41	0.12
Control Delay	101.5	38.2	7.0	37.0	37.9	6.5	16.8	25.8	3.8	22.9	10.8	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	101.5	38.2	7.0	37.0	37.9	6.5	16.8	25.8	3.8	22.9	10.8	2.0
LOS	F	D	A	D	D	A	B	C	A	C	B	A
Approach Delay	52.9			34.1			24.3			10.1		
Approach LOS	D			C			C			B		

Intersection Summary

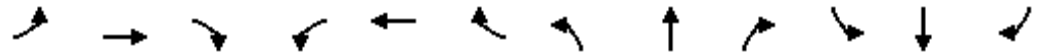
Area Type:	Other
Cycle Length:	84
Actuated Cycle Length:	84
Natural Cycle:	90
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	1.00
Intersection Signal Delay:	26.2
Intersection LOS:	C
Intersection Capacity Utilization:	120.1%
ICU Level of Service:	H
Analysis Period (min):	15

Splits and Phases: 1: Highway 10 & King Street



Queues  
1: Highway 10 & King Street

2031 Future Total - PM - Adjusted  
11/19/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	187	314	98	82	311	51	170	1883	75	24	812	110
v/c Ratio	1.00	0.70	0.22	0.47	0.69	0.12	0.50	0.92	0.09	0.32	0.41	0.12
Control Delay	101.5	38.2	7.0	37.0	37.9	6.5	16.8	25.8	3.8	22.9	10.8	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	101.5	38.2	7.0	37.0	37.9	6.5	16.8	25.8	3.8	22.9	10.8	2.0
Queue Length 50th (m)	30.0	45.8	0.0	11.2	45.3	0.0	14.9	132.5	1.4	1.8	35.2	0.0
Queue Length 95th (m)	#70.1	#74.2	11.1	25.3	#72.5	6.8	32.9	#195.0	6.6	9.0	47.1	6.1
Internal Link Dist (m)		332.8			67.7			367.2			132.8	
Turn Bay Length (m)	110.0		65.0	110.0		65.0	55.0		25.0	35.0		25.0
Base Capacity (vph)	187	450	453	176	450	435	343	2037	875	76	1961	949
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.70	0.22	0.47	0.69	0.12	0.50	0.92	0.09	0.32	0.41	0.12

Intersection Summary

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

# APPENDIX H

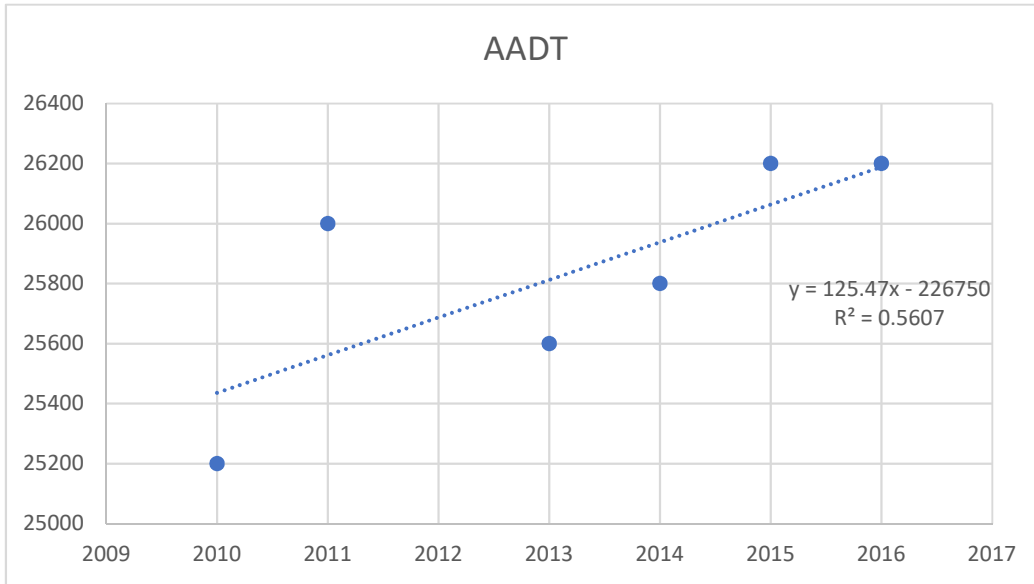
## Growth Rate Analysis

MTO Data - Peel Road 9 - King Street

Year	AADT
2010	25200
2011	26000
2012	28700
2013	25600
2014	25800
2015	26200
2016	26200

outlier \*28700

AADT
2010 25444.7
2016 26197.52
Growth Rate 0.49%



Region of Peel Data

ROAD_NAME	LOCATION	DIR	2016_NE	2015_NE	2014_NE	2013_NE	2012_NE	2011_NE	2010_NE	2009_NE	2008_NE	2007_NE	2006_NE	2005_NE	2004_NE	2003_NE	2002_NE	2001_NE	2000_NE	1999_NE	1998_NE	1997_NE	1996_NE
KING STREET	0.4 KM WEST OF KENNEDY RD.	EW	2788	2435	2142	2030	2088	1785	2303	4246	4582	4635	4364	4678	4422	4536	4504	4995	4646	4317	4270	4285	3684

ROAD_NAME	LOCATION	DIR	2016_SW	2015_SW	2014_SW	2013_SW	2012_SW	2011_SW	2010_SW	2009_SW	2008_SW	2007_SW	2006_SW	2005_SW	2004_SW	2003_SW	2002_SW	2001_SW	2000_SW	1999_SW	1998_SW	1997_SW	1996_SW
KING STREET	0.4 KM WEST OF KENNEDY RD.	EW	2655	2352	2050	2021	1976	1844	2158	4228	4920	4977	4740	5130	4710	4679	4431	3047	4318	4315	4279	4252	3892

East of Highway 10  
EB

Year	AADT
2010	2303
2011	1785
2012	2088
2013	2030
2014	2142
2015	2435
2016	2788

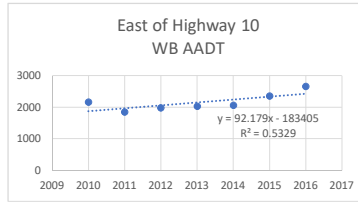
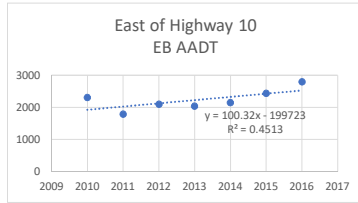
East of Highway 10  
WB

Year	AADT
2010	2158
2011	1844
2012	1976
2013	2021
2014	2050
2015	2352
2016	2655

AADT	
2010	1920.2
2016	2522.12
Growth Ra	4.65%

AADT	
2010	1874.79
2016	2427.864
Growth Ra	4.40%

4.5%



# APPENDIX I

## ITE Trip Generation Excerpts



# Trip Generation Manual

10<sup>th</sup> Edition • Volume 2: Data  
Services (Land Uses 900–999)

SEPTEMBER 2017

# Land Use: 932

## High-Turnover (Sit-Down) Restaurant

### Description

This land use consists of sit-down, full-service eating establishments with typical duration of stay of approximately one hour. This type of restaurant is usually moderately priced and frequently belongs to a restaurant chain. Generally, these restaurants serve lunch and dinner; they may also be open for breakfast and are sometimes open 24 hours a day. These restaurants typically do not take reservations. Patrons commonly wait to be seated, are served by a waiter/waitress, order from menus and pay for their meal after they eat. Some facilities contained within this land use may also contain a bar area for serving food and alcoholic drinks. Fast casual restaurant (Land Use 930), quality restaurant (Land Use 931), fast-food restaurant without drive-through window (Land Use 933), fast-food restaurant with drive-through window (Land Use 934), and fast-food restaurant with drive-through window and no indoor seating (Land Use 935) are related uses.

### Additional Data

***Users should exercise caution when applying statistics during the AM peak periods, as the sites contained in the database for this land use may or may not be open for breakfast. In cases where it was confirmed that the sites were not open for breakfast, data for the AM peak hour of the adjacent street traffic were removed from the database.***

The outdoor seating area is not included in the overall gross floor area. Therefore, the number of seats may be a more reliable independent variable on which to establish trip generation rates for facilities having significant outdoor seating.

Time-of-day distribution data for this land use for a weekday, Saturday, and Sunday are presented in Appendix A. For the 38 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:45 a.m. and 12:45 p.m. and 12:00 and 1:00 p.m., respectively.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), California, Florida, Georgia, Indiana, Kentucky, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Vermont, and Wisconsin.

### Source Numbers

126, 269, 275, 280, 300, 301, 305, 338, 340, 341, 358, 384, 424, 432, 437, 438, 444, 507, 555, 577, 589, 617, 618, 728, 868, 884, 885, 903, 927, 944, 961, 962, 977

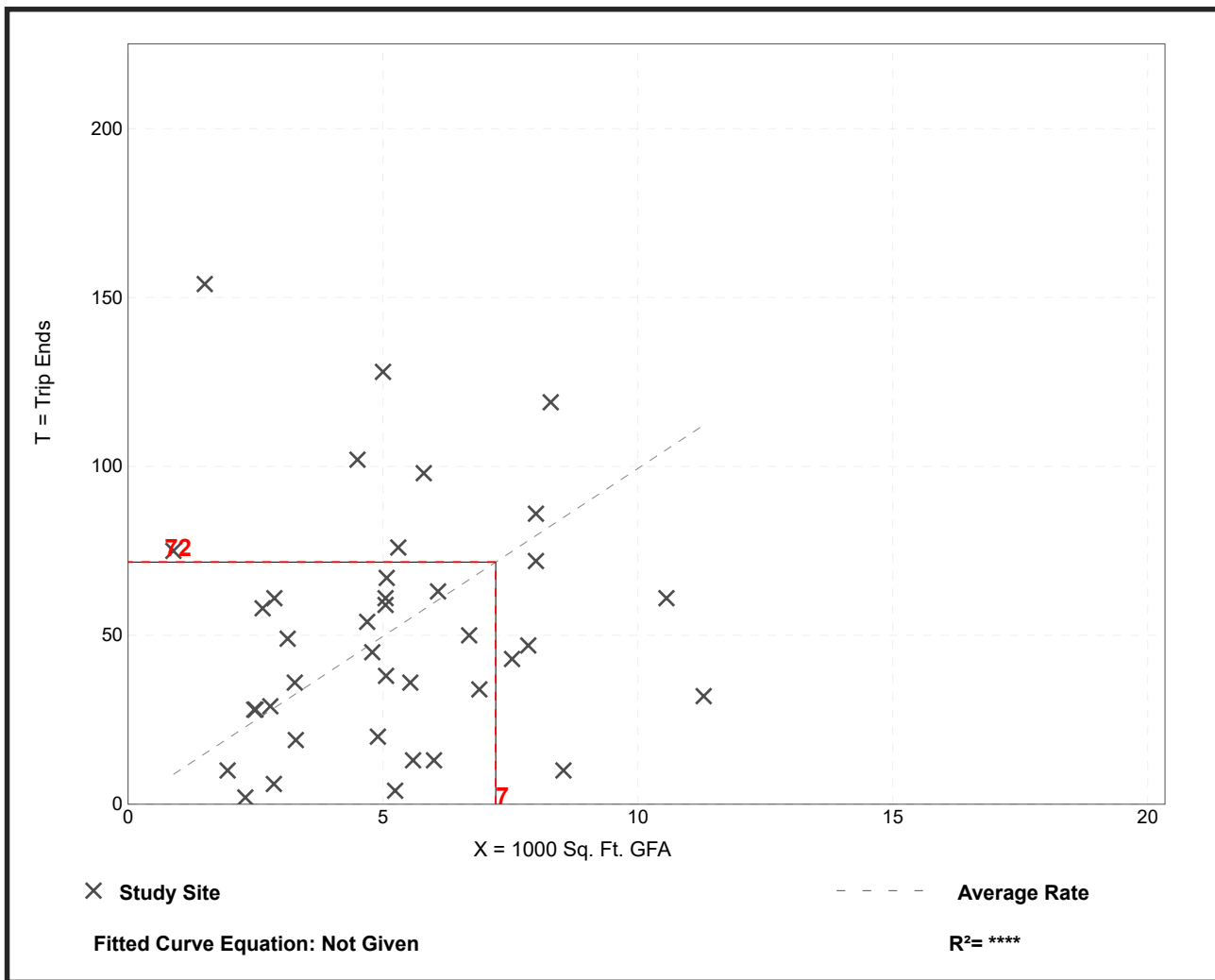
# High-Turnover (Sit-Down) Restaurant (932)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 39  
 Avg. 1000 Sq. Ft. GFA: 5  
 Directional Distribution: 55% entering, 45% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.94	0.76 - 102.39	11.33

## Data Plot and Equation



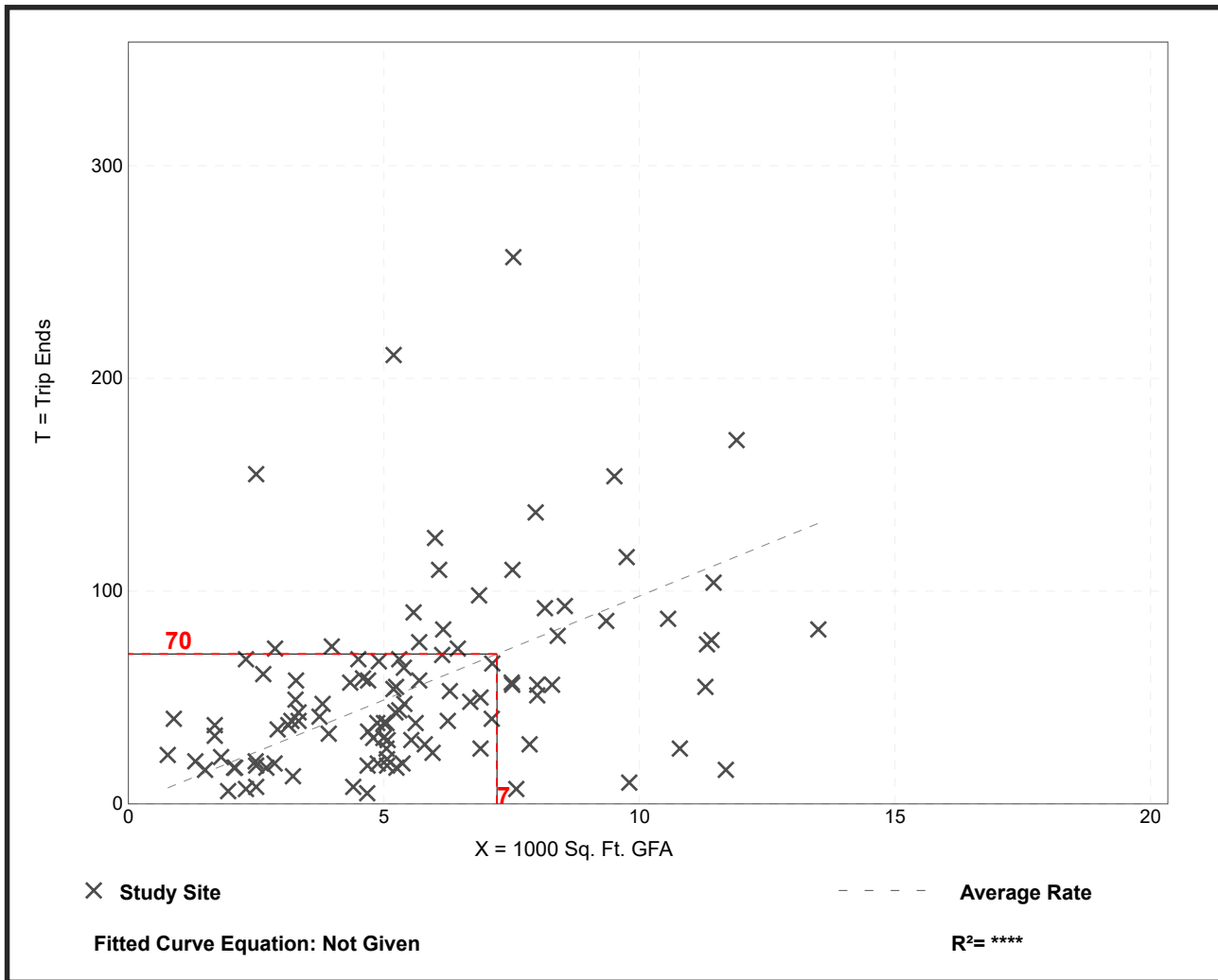
# High-Turnover (Sit-Down) Restaurant (932)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 107  
 Avg. 1000 Sq. Ft. GFA: 6  
 Directional Distribution: 62% entering, 38% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.77	0.92 - 62.00	7.37

## Data Plot and Equation



# Land Use: 934

## Fast-Food Restaurant with Drive-Through Window

### Description

This category includes fast-food restaurants with drive-through windows. This type of restaurant is characterized by a large drive-through clientele, long hours of service (some are open for breakfast, all are open for lunch and dinner, some are open late at night or 24 hours a day) and high turnover rates for eat-in customers. These limited-service eating establishments do not provide table service. Non-drive-through patrons generally order at a cash register and pay before they eat. Fast casual restaurant (Land Use 930), high-turnover (sit-down) restaurant (Land Use 932), fast-food restaurant without drive-through window (Land Use 933), and fast-food restaurant with drive-through window and no indoor seating (Land Use 935) are related uses.

### Additional Data

***Users should exercise caution when applying statistics during the AM peak periods, as the sites contained in the database for this land use may or may not be open for breakfast. In cases where it was confirmed that the sites were not open for breakfast, data for the AM peak hour of the adjacent street traffic were removed from the database.***

The outdoor seating area is not included in the overall gross floor area. Therefore, the number of seats may be a more reliable independent variable on which to establish trip generation rates for facilities having significant outdoor seating.

Time-of-day distribution data for this land use for a weekday, Saturday, and Sunday are presented in Appendix A. For the 46 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:45 a.m. and 12:45 p.m. and 12:00 and 1:00 p.m., respectively. For the one dense multi-use urban site with data, the same AM and PM peak hours were observed.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alaska, Alberta (CAN), California, Colorado, Florida, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Dakota, Texas, Vermont, Virginia, Washington, and Wisconsin.

### Source Numbers

163, 164, 168, 180, 181, 241, 245, 278, 294, 300, 301, 319, 338, 340, 342, 358, 389, 438, 502, 552, 577, 583, 584, 617, 640, 641, 704, 715, 728, 810, 866, 867, 869, 885, 886, 927, 935, 962, 977



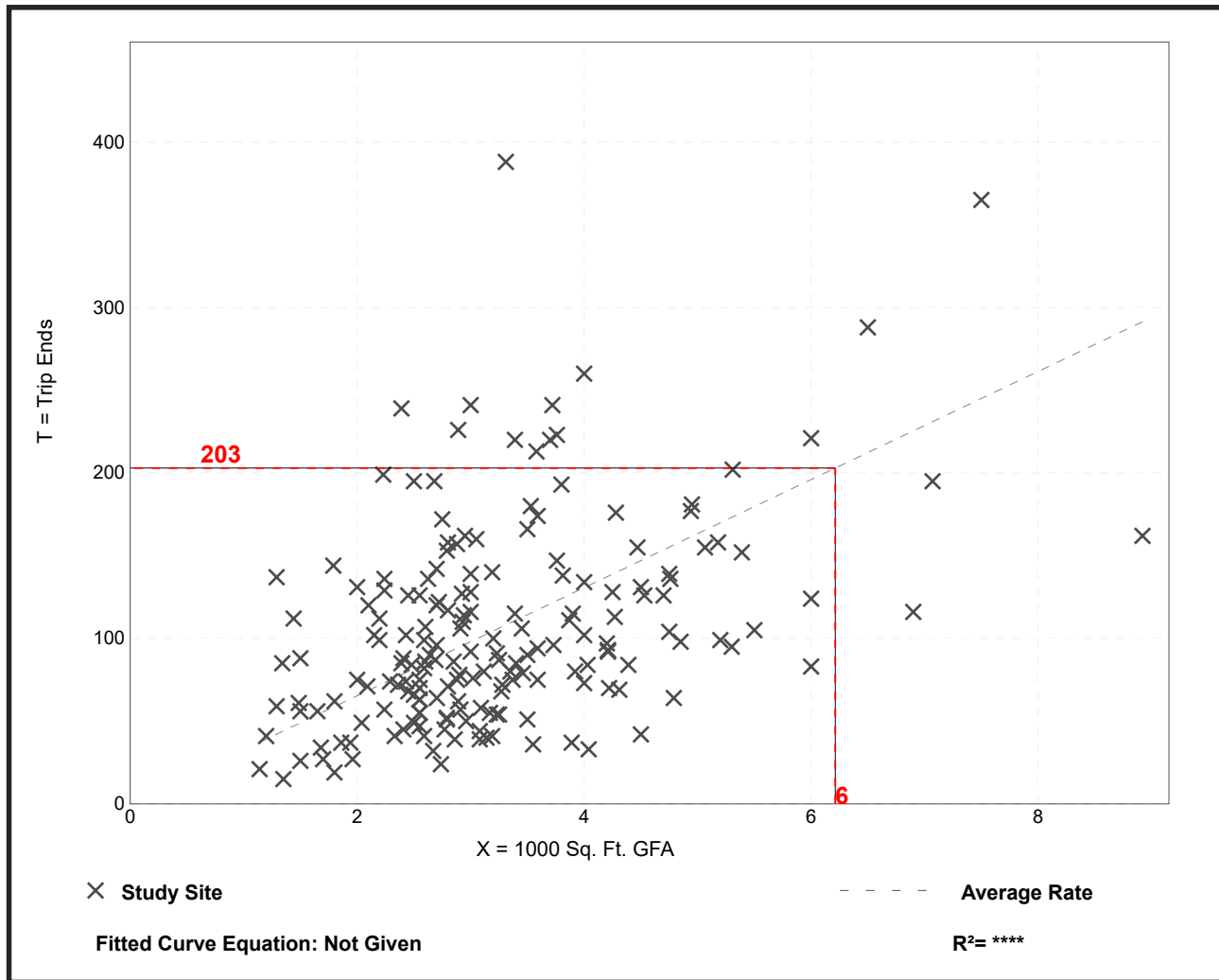
# Fast-Food Restaurant with Drive-Through Window (934)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 185  
 Avg. 1000 Sq. Ft. GFA: 3  
 Directional Distribution: 52% entering, 48% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
32.67	8.17 - 117.22	17.87

## Data Plot and Equation



# Land Use: 945

## Gasoline/Service Station with Convenience Market

### Description

This land use includes gasoline/service stations with convenience markets where the primary business is the fueling of motor vehicles. These service stations may also have ancillary facilities for servicing and repairing motor vehicles and may have a car wash. Some commonly sold convenience items are newspapers, coffee or other beverages, and snack items that are usually consumed in the car. The sites included in this land use category have the following two specific characteristics:

- The gross floor area of the convenience market is between 2,000 and 3,000 gross square feet
- The number of vehicle fueling positions is at least 10

Convenience market (Land Use 851), convenience market with gasoline pumps (Land Use 853), gasoline/service station (Land Use 944), truck stop (Land Use 950), and super convenience market/gas station (Land Use 960) are related uses.

### Additional Data

The independent variable, vehicle fueling positions, is defined as the maximum number of vehicles that can be fueled simultaneously.

Gasoline/service stations in this land use include “pay-at-the-pump” and traditional fueling stations.

Time-of-day distribution data for this land use are presented in Appendix A. For the five general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:30 and 8:30 a.m. and 3:45 and 4:45 p.m., respectively.

A multi-variable regression analysis based on both the convenience market gross floor area (GFA) and the number of vehicle fueling positions (VFP) produced a series of fitted curve equations. The equations are in the form of:

$$\text{Vehicle Trips} = [(\text{VFP Factor}) \times (\text{Number of VFP})] + [(\text{GFA Factor}) \times (\text{GFA})] + (\text{Constant})$$

The values for the VFP factor, GFA factor, and constant are presented in the following table for each time period for which a fitted curve equation could produce an R<sup>2</sup> value of at least 0.50.

Time Period	VFP Factor	GFA Factor	Constant	R <sup>2</sup>
Weekday, AM Peak Hour of Generator	15.6	108	-295	0.62
Weekday, PM Peak Hour of Generator	Not Available			
Weekday, AM Peak Hour of Adjacent Street	15.7	97.3	-284	0.59
Weekday, PM Peak Hour of Adjacent Street	Not Available			

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CA), California, Connecticut, Florida, Indiana, Iowa, Kentucky, Minnesota, New Hampshire, New Jersey, Texas, and Wisconsin.

### **Source Numbers**

245, 340, 350, 385, 440, 617, 813, 864, 865, 883, 888, 954, 960, 977

# Gasoline/Service Station With Convenience Market (945)

**Vehicle Trip Ends vs: Vehicle Fueling Positions**

**On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 7 and 9 a.m.**

**Setting/Location: General Urban/Suburban**

Number of Studies: 14

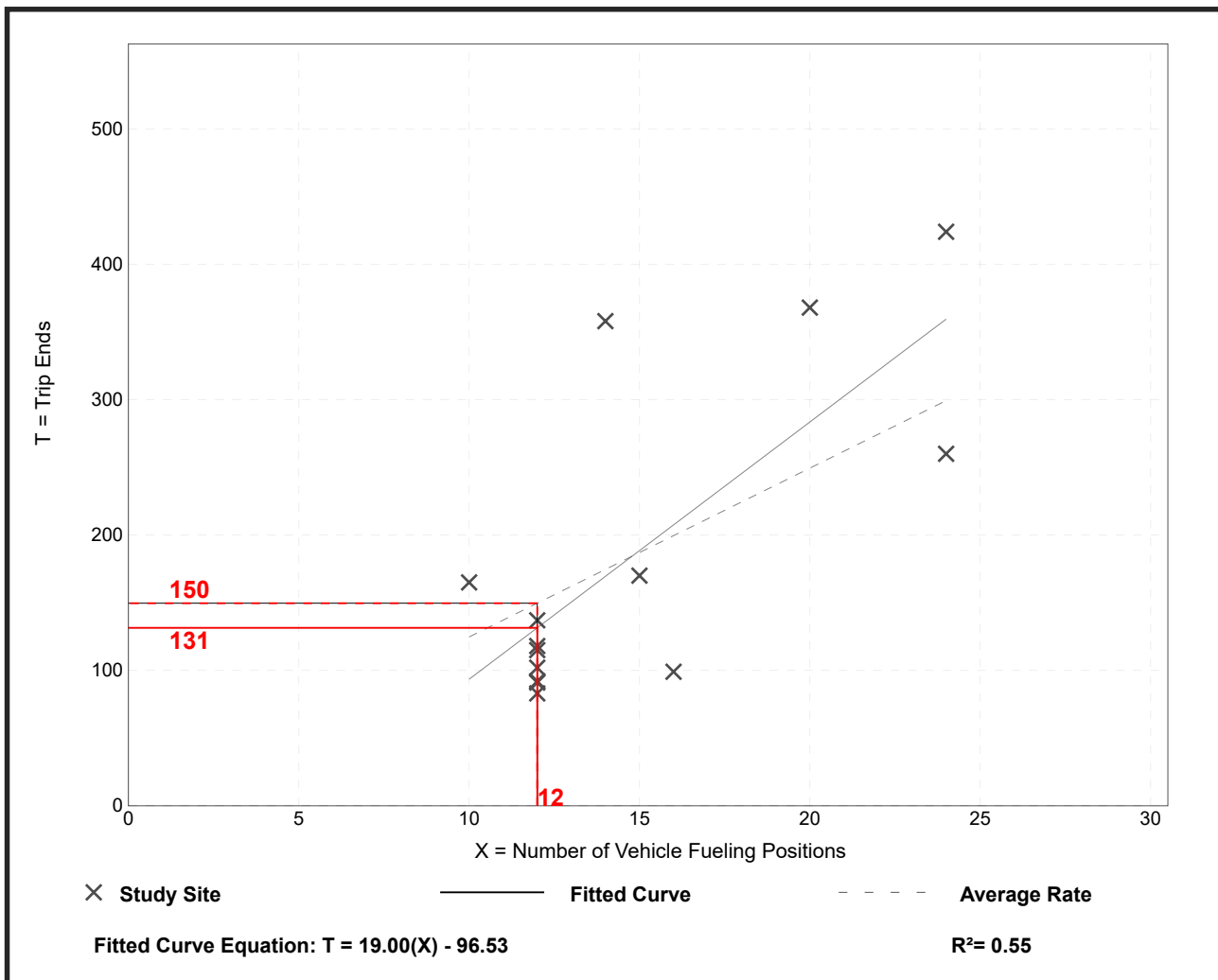
Avg. Num. of Vehicle Fueling Positions: 15

Directional Distribution: 51% entering, 49% exiting

## Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
12.47	6.19 - 25.57	5.56

## Data Plot and Equation



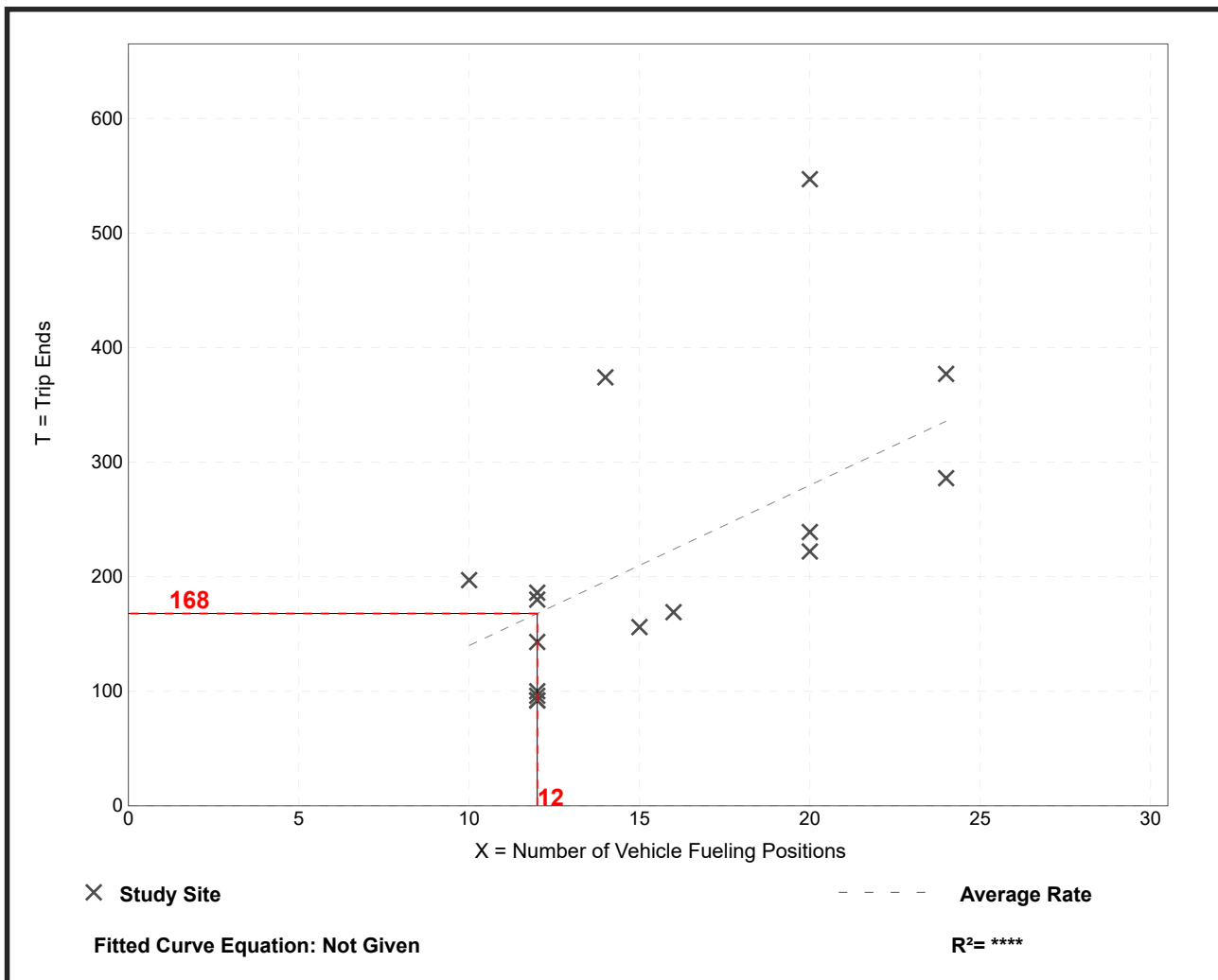
# Gasoline/Service Station With Convenience Market (945)

**Vehicle Trip Ends vs: Vehicle Fueling Positions**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 16  
 Avg. Num. of Vehicle Fueling Positions: 15  
 Directional Distribution: 51% entering, 49% exiting

## Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
13.99	7.67 - 27.35	6.18

## Data Plot and Equation





# Trip Generation Handbook 3rd Edition

SEPTEMBER 2017

**Table 6.1 Unconstrained Internal Person Trip Capture Rates  
for Trip Origins within a Mixed-Use Development**

		WEEKDAY	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Retail	28%	20%
	To Restaurant	63%	4%
	To Cinema/Entertainment	0%	0%
	To Residential	1%	2%
	To Hotel	0%	0%
From RETAIL	To Office	29%	2%
	To Restaurant	13%	29%
	To Cinema/Entertainment	0%	4%
	To Residential	14%	26%
	To Hotel	0%	5%
From RESTAURANT	To Office	31%	3%
	To Retail	14%	41%
	To Cinema/Entertainment	0%	8%
	To Residential	4%	18%
	To Hotel	3%	7%
From CINEMA/ENTERTAINMENT	To Office	0%	2%
	To Retail	0%	21%
	To Restaurant	0%	31%
	To Residential	0%	8%
	To Hotel	0%	2%
From RESIDENTIAL	To Office	2%	4%
	To Retail	1%	42%
	To Restaurant	20%	21%
	To Cinema/Entertainment	0%	0%
	To Hotel	0%	3%
From HOTEL	To Office	75%	0%
	To Retail	14%	16%
	To Restaurant	9%	68%
	To Cinema/Entertainment	0%	0%
	To Residential	0%	2%

Source: Bochner, B., K. Hooper, B. Sperry, and R. Dunphy. NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. Washington, DC: Transportation Research Board, Tables 99 and 100, 2011.

**Table 6.2 Unconstrained Internal Person Trip Capture Rates  
for Trip Destinations within a Mixed-Use Development**

		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Retail	4%	31%
	From Restaurant	14%	30%
	From Cinema/Entertainment	0%	6%
	From Residential	3%	57%
	From Hotel	3%	0%
To RETAIL	From Office	32%	8%
	From Restaurant	8%	50%
	From Cinema/Entertainment	0%	4%
	From Residential	17%	10%
	From Hotel	4%	2%
To RESTAURANT	From Office	23%	2%
	From Retail	50%	29%
	From Cinema/Entertainment	0%	3%
	From Residential	20%	14%
	From Hotel	6%	5%
To CINEMA/ENTERTAINMENT	From Office	0%	1%
	From Retail	0%	26%
	From Restaurant	0%	32%
	From Residential	0%	0%
	From Hotel	0%	0%
To RESIDENTIAL	From Office	0%	4%
	From Retail	2%	46%
	From Restaurant	5%	16%
	From Cinema/Entertainment	0%	4%
	From Hotel	0%	0%
To HOTEL	From Office	0%	0%
	From Retail	0%	17%
	From Restaurant	4%	71%
	From Cinema/Entertainment	0%	1%
	From Residential	0%	12%

Source: Bochner, B., K. Hooper, B. Sperry, and R. Dunphy. NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. Washington, DC: Transportation Research Board, Tables 101 and 102, 2011.

Internal/External Trip Calculations - Drive-thru Restaurant/Retail

Land Use	GFA (sq. ft)	Peak Hour	Trips Generated		
			Inbound	Outbound	Total
restaurant (Drive-thru)	5,468	A.M.	127	123	250
		P.M.	106	97	203
retail		A.M.	76	74	150
		P.M.	86	82	168
<b>Total</b>		<b>A.M.</b>	<b>203</b>	<b>197</b>	<b>400</b>
		<b>P.M.</b>	<b>192</b>	<b>179</b>	<b>371</b>

AM

		<b>balance:</b>	10				
<b>restaurant</b>		64		10	<b>shopping</b>		
enter	127	50%			enter	76	
exit	123				exit	74	
total	250	14%			total	150	
internal in	10	17			6 internal in	6	
internal out	6		<b>balance:</b>	6	internal out	10	
internal	16				internal	16	
<b>external in</b>	117				<b>external in</b>	70	187
<b>external out</b>	117				<b>external out</b>	64	181
<b>external total</b>	234				<b>external total</b>	134	368

PM

		<b>balance:</b>	24				
<b>restaurant</b>		31		24	<b>shopping</b>		
enter	106	29%			enter	86	
exit	97				exit	82	
total	203	41%			total	168	
internal in	24	40			43 internal in	40	
internal out	40		<b>balance:</b>	40	internal out	24	
internal	64				internal	64	
<b>external in</b>	82				<b>external in</b>	46	128
<b>external out</b>	57				<b>external out</b>	58	115
<b>external total</b>	139				<b>external total</b>	104	243

Internal/External Trip Calculations - High-Turnover Sit-down Restaurant/Retail

Land Use	GFA (sq. ft)	Peak Hour	Trips Generated		
			Inbound	Outbound	Total
restaurant (HT Sit-Down)	7,212	A.M.	39	33	72
		P.M.	43	27	70
retail		A.M.	76	74	150
		P.M.	86	82	168
<b>Total</b>		<b>A.M.</b>	<b>115</b>	<b>107</b>	<b>222</b>
		<b>P.M.</b>	<b>129</b>	<b>109</b>	<b>238</b>

AM

		<b>balance:</b>	10				
<b>restaurant</b>		20			10	<b>shopping</b>	
enter	39	50%		←————→	13%	enter	
exit	33					exit	
<b>total</b>	<b>72</b>	14%			8%	<b>total</b>	
internal in	10	5			6	internal in	
internal out	5	<b>balance:</b>	5			internal out	
internal	15					internal	
<b>external in</b>	<b>29</b>					<b>external in</b>	
<b>external out</b>	<b>28</b>					<b>external out</b>	
<b>external total</b>	<b>57</b>					<b>external total</b>	
							100
							92
							135
							192

PM

		<b>balance:</b>	12				
<b>restaurant</b>		12			24	<b>shopping</b>	
enter	43	29%		←————→	29%	enter	
exit	27					exit	
<b>total</b>	<b>70</b>	41%			50%	<b>total</b>	
internal in	12	11			43	internal in	
internal out	11	<b>balance:</b>	11			internal out	
internal	23					internal	
<b>external in</b>	<b>31</b>					<b>external in</b>	
<b>external out</b>	<b>16</b>					<b>external out</b>	
<b>external total</b>	<b>47</b>					<b>external total</b>	
							106
							86
							145
							192

**Table E.30 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period  
Land Use Code 932—High-Turnover (Sit-Down) Restaurant**

SEATS	SIZE (1,000 SQ. FT. GFA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS- BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
—	5.8	Orlando, FL	1992	150	2:00–6:00 p.m.	32	—	—	68	—	TPD Inc.
—	5	Casselberry, FL	1992	65	2:00–6:00 p.m.	58	—	—	42	—	TPD Inc.
168	5.3	Louisville area, KY	1993	24	4:00–6:00 p.m.	50	37	13	50	1,615	Barton- Aschman Assoc.
169	2.9	Louisville area, KY	1993	41	4:00–6:00 p.m.	37	27	36	63	3,935	Barton- Aschman Assoc.
150	3.1	Louisville area, KY	1993	21	4:00–6:00 p.m.	38	29	33	62	2,580	Barton- Aschman Assoc.
250	7.1	New Albany, IN	1993	—	4:00–6:00 p.m.	23	23	54	77	1,565	Barton- Aschman Assoc.
—	8	Kissimmee, FL	1995	664	2:00–6:00 p.m.	40	39	21	60	—	TPD Inc.
—	11	Orlando, FL	1996	267	2:00–6:00 p.m.	38	43	19	62	—	TPD Inc.
—	12	Orlando, FL	1996	317	2:00–6:00 p.m.	29	51	20	71	—	TPD Inc.
—	4.6	Orlando, FL	1992	276	2:00–6:00 p.m.	63	—	—	37	—	TPD Inc.
—	5.7	Orlando, FL	1994	308	2:00–6:00 p.m.	57	—	—	43	—	TPD Inc.
—	6.2	Orlando, FL	1995	521	2:00–6:00 p.m.	46	43	11	54	—	TPD Inc.

Average Pass-By Trip Percentage: 43

“—” means no data were provided

**Table E.31 Pass-By and Non-Pass-By Trips Weekday, AM Peak Period  
Land Use Code 934—Fast-Food Restaurant with Drive-Through Window**

SEATS	SIZE (1,000 SQ. FT. GFA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
—	<5	Chicago suburbs, IL	1987	84	7:00–9:00 a.m.	44	—	—	56	—	Kenig, O'Hara, Humes, Flock
88	1.4	Louisville area, KY	1993	—	7:00–9:00 a.m.	62	22	16	38	1,407	Barton-Aschman Assoc.
100	3.6	Louisville, KY	1993	—	7:00–9:00 a.m.	32	47	21	68	437	Barton-Aschman Assoc.
87	4.2	New Albany, IN	1993	—	7:00–9:00 a.m.	46	23	31	54	1,049	Barton-Aschman Assoc.
150	3.0	Louisville area, KY	1993	—	7:00–9:00 a.m.	43	14	43	57	2,903	Barton-Aschman Assoc.
—	3.3	varies	1996	—	6:00–9:00 a.m.	68	—	—	32	—	Oracle Engineering

Average Pass-By Trip Percentage: 49

“—” means no data were provided

**Table E.32 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period  
Land Use Code 934—Fast-Food Restaurant with Drive-Through Window**

SEATS	SIZE (1,000 SQ. FT. GFA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS- BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
—	~2.6	Minn-St. Paul, MN	1987	50	3:00–7:00 p.m.	25	27	48	75	—	—
—	<5.0	Chicago suburbs, IL	1987	80	3:00–6:00 p.m.	38	—	—	62	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	100	3:00–6:00 p.m.	55	—	—	45	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	159	3:00–6:00 p.m.	56	—	—	44	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	225	3:00–6:00 p.m.	48	—	—	52	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	88	3:00–6:00 p.m.	35	—	—	65	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	84	3:00–6:00 p.m.	44	—	—	56	—	Kenig, O'Hara, Humes, Flock
88	1.3	Louisville area, KY	1993	—	4:00–6:00 p.m.	68	22	10	32	2,055	Barton- Aschman Assoc.
120	1.9	Louisville area, KY	1993	33	4:00–6:00 p.m.	67	24	9	33	2,447	Barton- Aschman Assoc.
87	4.2	New Albany, IN	1993	—	4:00–6:00 p.m.	56	25	19	44	1,632	Barton- Aschman Assoc.
150	3.0	Louisville area, KY	1993	—	4:00–6:00 p.m.	31	31	38	69	4,250	Barton- Aschman Assoc.
—	3.1	Kissimmee, FL	1995	28	2:00–6:00 p.m.	71	—	—	29	—	TPD Inc.
—	3.1	Apopka, FL	1996	29	2:00–6:00 p.m.	38	—	—	62	—	TPD Inc.
—	2.8	Winter Springs, FL	1995	47	2:00–6:00 p.m.	66	—	—	34	—	TPD Inc.
—	4.3	Longwood, FL	1994	304	2:00–6:00 p.m.	62	—	—	38	—	TPD Inc.
—	3.2	Altamonte Springs, FL	1996	202	2:00–6:00 p.m.	40	39	21	60	—	TPD Inc.
—	2.9	Winter Park, FL	1996	271	2:00–6:00 p.m.	41	41	18	59	—	TPD Inc.
—	3.3*	several	1996	varies	4:00–6:00 p.m.	62	—	—	38	—	Oracle Engineering

\*Average of several combined studies.

Average Pass-By Trip Percentage: 50

“—” means no data were provided

**Table E.36 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period  
Land Use Code 944—Gasoline/Service Station**

SIZE (1,000 SQ. FT. GFA)	VEHICLE FUELING POSITIONS	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
—	—	Chicago suburbs, IL	1987	48	3:00–7:00 p.m.	21	—	—	79	—	Kenig, O'Hara, Humes, Flock
—	—	Chicago suburbs, IL	1987	34	3:00–6:00 p.m.	25	—	—	75	—	Kenig, O'Hara, Humes, Flock
—	—	Chicago suburbs, IL	1987	42	3:00–6:00 p.m.	20	—	—	80	—	Kenig, O'Hara, Humes, Flock
2.3	6	Gaithersburg, MD	1992	55	4:00–6:00 p.m.	40	11	49	60	2,760	RBA
2.1	6	Bethesda, MD	1992	30	4:00–6:00 p.m.	53	20	27	47	1,060	RBA
1.7	6	Wheaton, MD	1992	18	4:00–6:00 p.m.	61	6	33	39	2,510	RBA
2.0	8	Gaithersburg, MD	1992	47	4:00–6:00 p.m.	62	23	15	38	2,635	RBA
1.2	6	Damascus, MD	1992	26	4:00–6:00 p.m.	58	11	31	42	1,020	RBA
0.3	12	Wheaton, MD	1992	52	4:00–6:00 p.m.	38	10	52	62	3,835	RBA

Average Pass-By Trip Percentage: 42

“—” means no data were provided

**Table E.37 Pass-By and Non-Pass-By Trips Weekday, AM Peak Period  
Land Use Code 945—Gasoline/Service Station with Convenience Market**

SIZE (1,000 SQ. FT. GFA)	VEHICLE FUELING POSITIONS	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
0.8	8	Louisville area, KY	1993	61	7:00–9:00 a.m.	60	15	25	40	4,000	Barton- Aschman Assoc.
0.6	8	Louisville, KY	1993	48	7:00–9:00 a.m.	68	13	19	32	1,307	Barton- Aschman Assoc.
0.7	10	Louisville, KY	1993	47	7:00–9:00 a.m.	67	11	22	33	1,105	Barton- Aschman Assoc.
0.7	8	Louisville area, KY	1993	—	7:00–9:00 a.m.	56	22	22	44	1,211	Barton- Aschman Assoc.
0.7	10	Louisville area, KY	1993	—	7:00–9:00 a.m.	46	42	12	54	1,211	Barton- Aschman Assoc.
0.3	—	Louisville area, KY	1993	75	7:00–9:00 a.m.	72	15	13	28	—	Barton- Aschman Assoc.
0.8	8	Silver Spring, MD	1992	36	7:00–9:00 a.m.	47	14	39	53	3,095	RBA
0.4	8	Derwood, MD	1992	46	7:00–9:00 a.m.	75	0	25	25	3,770	RBA
2.2	8	Kensington, MD	1992	31	7:00–9:00 a.m.	47	34	19	53	1,785	RBA
1	8	Silver Spring, MD	1992	35	7:00–9:00 a.m.	78	9	13	22	7,080	RBA

Average Pass-By Trip Percentage: 62

“—” means no data were provided

**Table E.38 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period  
Land Use Code 945—Gasoline/Service Station with Convenience Market**

SIZE (1,000 SQ. FT. GFA)	VEHICLE FUELING POSITIONS	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
0.8	8	Louisville area, KY	1993	83	4:00–6:00 p.m.	52	8	40	48	4,965	Barton-Aschman Assoc.
0.6	8	Louisville, KY	1993	60	4:00–6:00 p.m.	53	20	27	47	1,491	Barton-Aschman Assoc.
0.7	10	Louisville, KY	1993	—	4:00–6:00 p.m.	57	19	24	43	1,812	Barton-Aschman Assoc.
0.7	8	Louisville area, KY	1993	—	4:00–6:00 p.m.	72	7	21	28	2,657	Barton-Aschman Assoc.
0.7	10	Louisville area, KY	1993	—	4:00–6:00 p.m.	55	16	29	45	2,657	Barton-Aschman Assoc.
0.8	8	Silver Spring, MD	1992	36	4:00–6:00 p.m.	67	14	19	33	3,095	RBA
0.4	8	Derwood, MD	1992	46	4:00–6:00 p.m.	46	11	43	54	3,770	RBA
2.1	8	Kensington, MD	1992	31	4:00–6:00 p.m.	52	13	35	48	1,785	RBA
1	8	Silver Spring, MD	1992	35	4:00–6:00 p.m.	54	3	43	46	7,080	RBA

Average Pass-By Trip Percentage: 56

“—” means no data were provided

# APPENDIX J

## TAC GDGCR Sight Distance Excerpts

Stopping sight distance is the sum of the distance travelled during the perception and reaction time and the braking distance.

$$SSD = 0.278Vt + 0.039 \frac{V^2}{a} \quad (2.5.2)$$

Where:

- SSD = Stopping sight distance (m)
- t = Brake reaction time, 2.5 s
- V = Design speed (km/h)
- a = Deceleration rate (m/s<sup>2</sup>)

**Table 2.5.2** gives the minimum stopping sight distances on level grade, on wet pavement, for a range of design speeds. These values are used for vertical curve design, intersection geometry and the placement of traffic control devices. The stopping sight distances quoted in **Table 2.5.2** may need to be increased for a variety of reasons related to grade and vehicle type as noted below.

**Table 2.5.2: Stopping Sight Distance on level roadways for Automobiles<sup>54</sup>**

Design speed (km/h)	Brake reaction distance (m)	Braking distance on level (m)	Stopping sight distance	
			Calculated (m)	Design (m)
20	13.9	4.6	18.5	20
30	20.9	10.3	31.2	35
40	27.8	18.4	46.2	50
50	34.8	28.7	63.5	65
60	41.7	41.3	83.0	85
70	48.7	56.2	104.9	105
80	55.6	73.4	129.0	130
90	62.6	92.9	155.5	160
100	69.5	114.7	184.2	185
110	76.5	138.8	215.3	220
120	83.4	165.2	248.6	250
130	90.4	193.8	284.2	285

Note: Brake reaction distance predicated on a time of 2.5 s; deceleration rate of 3.4 m/s<sup>2</sup> used to determine calculated sight distance.

**Table 9.9.3: Time Gap for Case B1, Left Turn from Stop**

Design Vehicle	Time Gap ( $t_g$ )(s) at Design Speed of Major Road
Passenger car	7.5
Single-unit truck	9.5
Combination truck (WB 19 and WB 20 )	11.5
Longer truck	To be established by road authority

Notes: Time gaps are for a stopped vehicle to turn left onto a two-lane highway with no median and with grades of 3% or less. The table values should be adjusted as follows:

- For multi-lane highways: For left turns onto two-lane highways with more than two lanes, add 0.5 s for passenger cars and 0.7 s for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle.
- For minor approach grades: If the approach grade is an upgrade that exceeds 3%, add 0.2 s for each percent grade for left turns.
- Some road authorities use higher values for certain specialized vehicles (e.g., Alberta uses 22 s for very long log trucks).

The intersection sight distance along the major road (distance  $b$  in **Figure 9.9.2**) is determined by:

$$ISD = 0.278 V_{\text{major}} t_g \quad (9.9.1)$$

Where:

ISD = intersection sight distance (length of the leg of sight triangle along the major road) (m)

$V_{\text{major}}$  = design speed of the major road (km/h)

$t_g$  = time gap for minor road vehicle to enter the major road (s)

For example, a passenger car turning left onto a two-lane major road should be provided sight distance equivalent to a time gap of 7.5 s in major-road traffic. If the design speed of the major road is 100 km/h, this corresponds to a sight distance of  $0.278(100)(7.5) = 208.5$  or 210 m, rounded for design.

A passenger car turning left onto a four-lane undivided roadway will need to cross two near lanes, rather than one. This increases the recommended gap in major-road traffic from 7.5 to 8.0 s. The corresponding value of sight distance for this example would be 223 m. If the minor-road approach to such an intersection is located on a 4% upgrade, then the time gap selected for intersection sight distance design for left turns should be increased from 8.0 to 8.8 s, equivalent to an increase of 0.2 s for each percent grade.

The design values for intersection sight distance for passenger cars are shown in **Table 9.9.4**. **Figure 9.9.4** includes design values, based on the time gaps for the design vehicles included in **Table 9.9.3**.

No adjustment of the recommended sight distance values for the major-road grade is generally needed because both the major- and minor-road vehicle will be on the same grade when departing from the intersection. However, if the minor-road design vehicle is a heavy truck and the intersection is located near a sag vertical curve with grades over 3%, then an adjustment to extend the recommended sight distance based on the major-road grade should be considered.

The time gaps in **Table 9.9.3** can be decreased by 1.0 s for right-turn maneuvers without undue interference with major-road traffic. These adjusted time gaps for the right turn from the minor road are shown in **Table 9.9.5**. Design values based on these adjusted time gaps are shown in **Table 9.9.6** for passenger cars. **Figure 9.9.5** includes the design values for the design vehicles for each of the time gaps in **Table 9.9.5**.

**Table 9.9.5: Time Gap for Case B2—Right Turn from Stop and Case B3—Crossing Maneuver**

Design Vehicle	Time Gap ( $t_g$ )(s) at Design Speed of Major Road
Passenger car	6.5
Single-unit truck	8.5
Combination truck (WB 19 and WB 20 )	10.5

Note: Time gaps are for a stopped vehicle to turn left onto a two-lane highway with no median and with grades of 3% or less. The table values should be adjusted as follows:

- For multi-lane highways: For left turns onto two-lane highways with more than two lanes, add 0.5 s for passenger cars and 0.7 s for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle.
- For minor approach grades: If the approach grade is an upgrade that exceeds 3%, add 0.1 s for each percent grade for left turns.



Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	36.1	40
30	35	54.2	55
40	50	72.3	75
50	65	90.4	95
60	85	108.4	110
70	105	126.5	130
80	130	144.6	145
90	160	162.6	165
100	185	180.7	185
110	220	198.8	200
120	250	216.8	220
130	285	234.9	235

Note: Intersection sight distance shown is for a stopped passenger car to turn right onto or to cross a two-lane highway with no median and with grades of 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

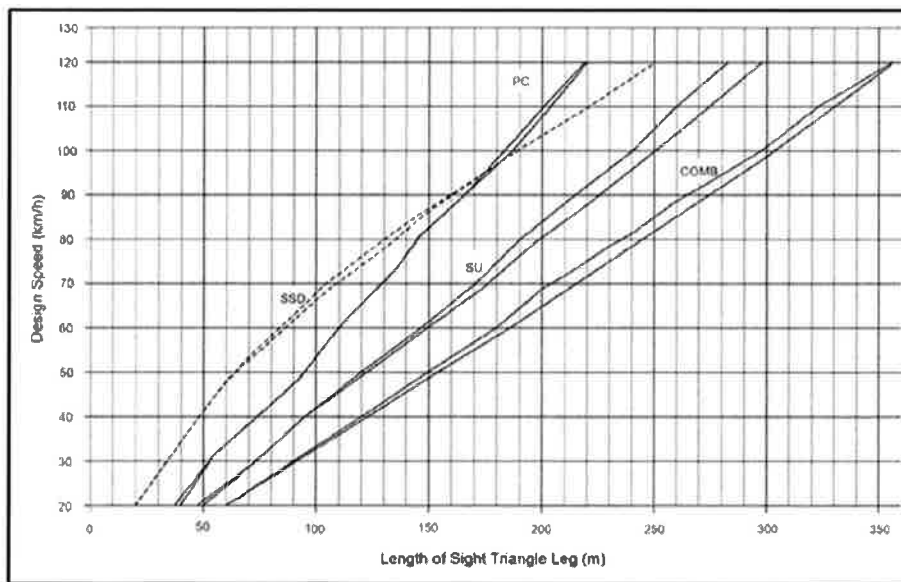


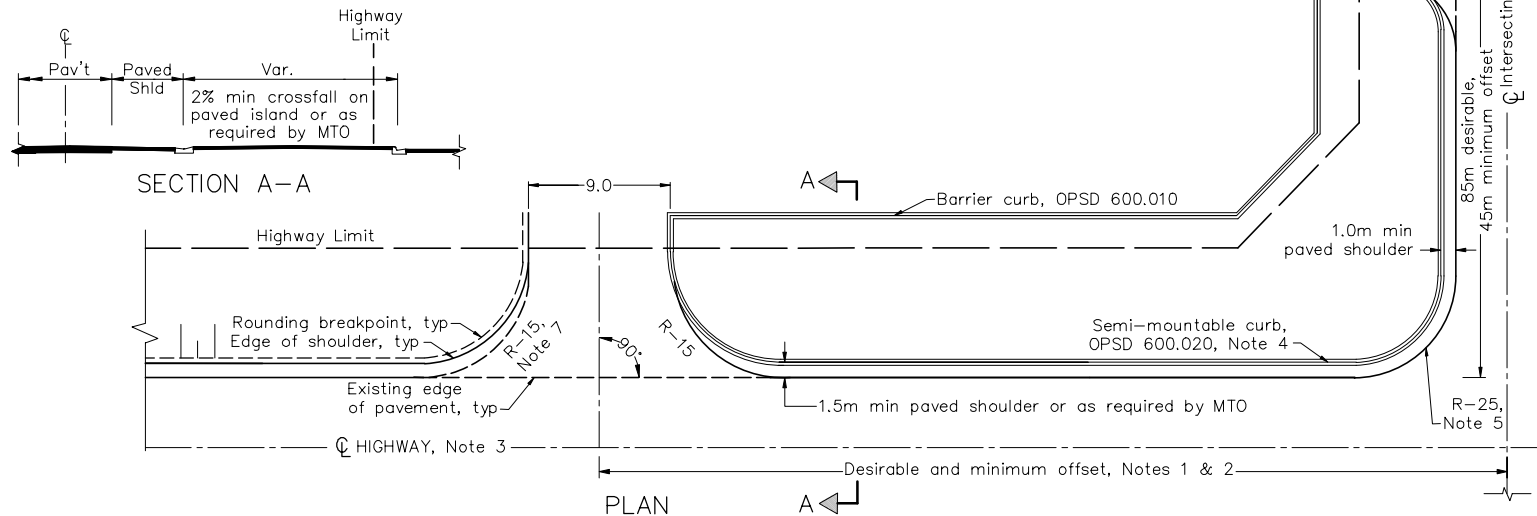
Figure 9.9.5: Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver (Calculated and Design Values Plotted)

# APPENDIX K

MTO Standard Drawing MTOD 305.030

NOTES:

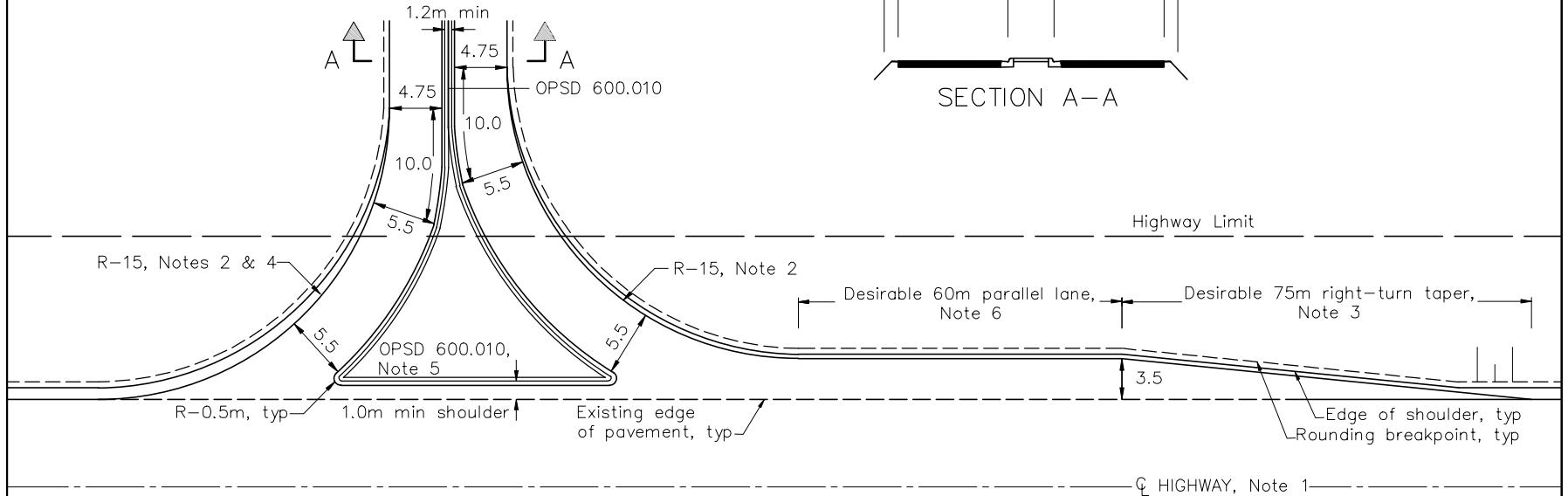
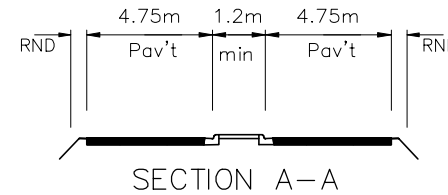
- 1 Desirable offset is 250m for highways with posted speed  $\geq 70\text{km/h}$  and 185m for highways with posted speed  $< 70\text{km/h}$ .
  - 2 Minimum offset is 125m for highways with posted speed  $\geq 70\text{km/h}$  and 80m for highways with posted speed  $< 70\text{km/h}$ .
  - 3 Raised median island in conjunction with signalized intersection may be required to prohibit left turns at entrance.
  - 4 Semi-mountable curb and gutter within highway limit for highways with posted speed  $\geq 70\text{km/h}$ . Barrier type curb and gutter for highways with posted speed  $< 70\text{km/h}$ .
  - 5 Larger radius, including the use of an equivalent compound curve as described in the TAC-GDG, may be required by MTO. Smaller radius may be appropriate for highways with posted speed  $< 70\text{km/h}$ .
  - 6 R-10 is for entrances on intersecting roads with posted speed  $< 70\text{km/h}$  and accommodates the TAC-GDG Heavy Single Unit (HSU) design vehicle. Radius should be increased to R-15 or larger for intersecting roads with posted speed  $\geq 70\text{km/h}$ .
  - 7 Shoulder width transitions from zero to existing over the length of the curve. Shoulder should be fully paved for 10m, then, if applicable, transition at a 5:1 rate.
- A All dimensions are in metres unless otherwise shown.  
 B Minimum sight triangles as required by MTO.  
 C Drainage works as required by MTO.



MINISTRY OF TRANSPORTATION ONTARIO DRAWING		August 2018	Rev	0
COMMERCIAL ENTRANCE SERVICE STATION, 2 & 4 LANE HIGHWAY FAR SIDE LOCATION, RAISED ISLAND		-----		
		MTOD 305.030		

NOTES:

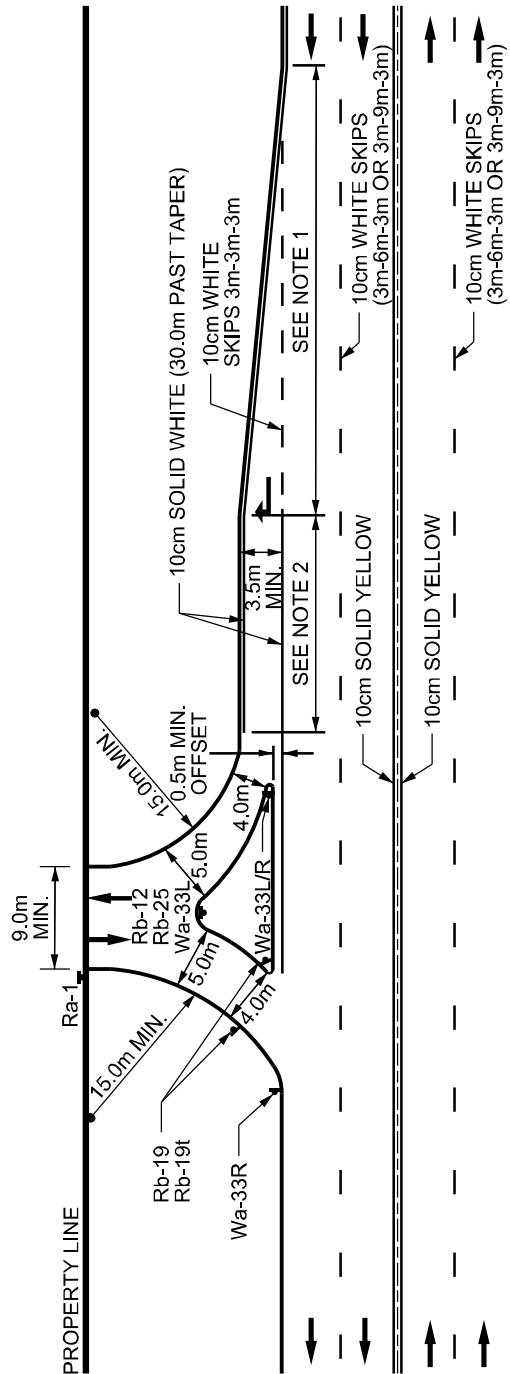
- 1 This layout shows minimum requirements for highways with posted speed < 70km/h. For highways with posted speed  $\geq$  70km/h, consult with MTO.
- 2 The design vehicle is a TAC-GDG Heavy Single Unit (HSU).
- 3 For RTT design, shoulder width transitions from existing to 1.0m minimum on a straight line parallel to the existing edge of pavement, then is constant to the beginning of curve, then transitions to zero over the length of the curve.
- 4 Shoulder width transitions from zero to existing over the length of the curve. Shoulder should be fully paved for 10m, then, if applicable, taper at a 5:1 rate.
- 5 For concrete curb and gutter design, semi-mountable for highways with posted speed  $\geq$  70km/h and barrier type for highways with posted speed < 70km/h.
- 6 85m minimum parallel lane length for highways with posted speed  $\geq$  70km/h.
- A All dimensions are in metres unless otherwise shown.
- B Minimum sight triangles as required by MTO.
- C Drainage as required by MTO.



MINISTRY OF TRANSPORTATION ONTARIO DRAWING	August 2018	Rev	0
COMMERCIAL ENTRANCE RIGHT-IN/RIGHT-OUT ENTRANCE TO COMMERCIAL SHOPPING CENTRE, 4 LANE DIVIDED HIGHWAY	-----		
	-----		
	MTOD 305.110		

# APPENDIX L

Peel Standard Drawing 5-1-4



**NOTES**

1. THE TAPER LENGTH IS BASED ON DESIGN SPEED OF THE ROADWAY UTILIZING THE TAC MANUAL AND THE ONTARIO TRAFFIC MANUAL
2. THE MINIMUM STORAGE IS 30.0 METERS, HOWEVER ACTUAL LENGTH WILL BE DETERMINED BASED ON PROPOSED TURNING VOLUMES
3. THE DIRECTIONAL ISLAND SHALL BE DESIGNED IN ACCORDANCE WITH THE ONTARIO TRAFFIC MANUAL
4. ALL PERMANENT LINE PAINTING APPLICATIONS SHALL BE DONE WITH DURABLE, THERMOPLASTIC PAINT
5. PROPOSED DESIGN AND LOCATION OF ALL ISLANDS SHALL BE VERIFIED AND DESIGNED USING PROPER TURNING TEMPLATES



**PUBLIC WORKS  
STANDARD DRAWING**

REV. DATE: JUNE 2016

APPROVED BY

DRAWN BY

G.K./S.L.

C.B.

STD. DWG. NUMBER

SCALE

**5-1-4**

N.T.S.

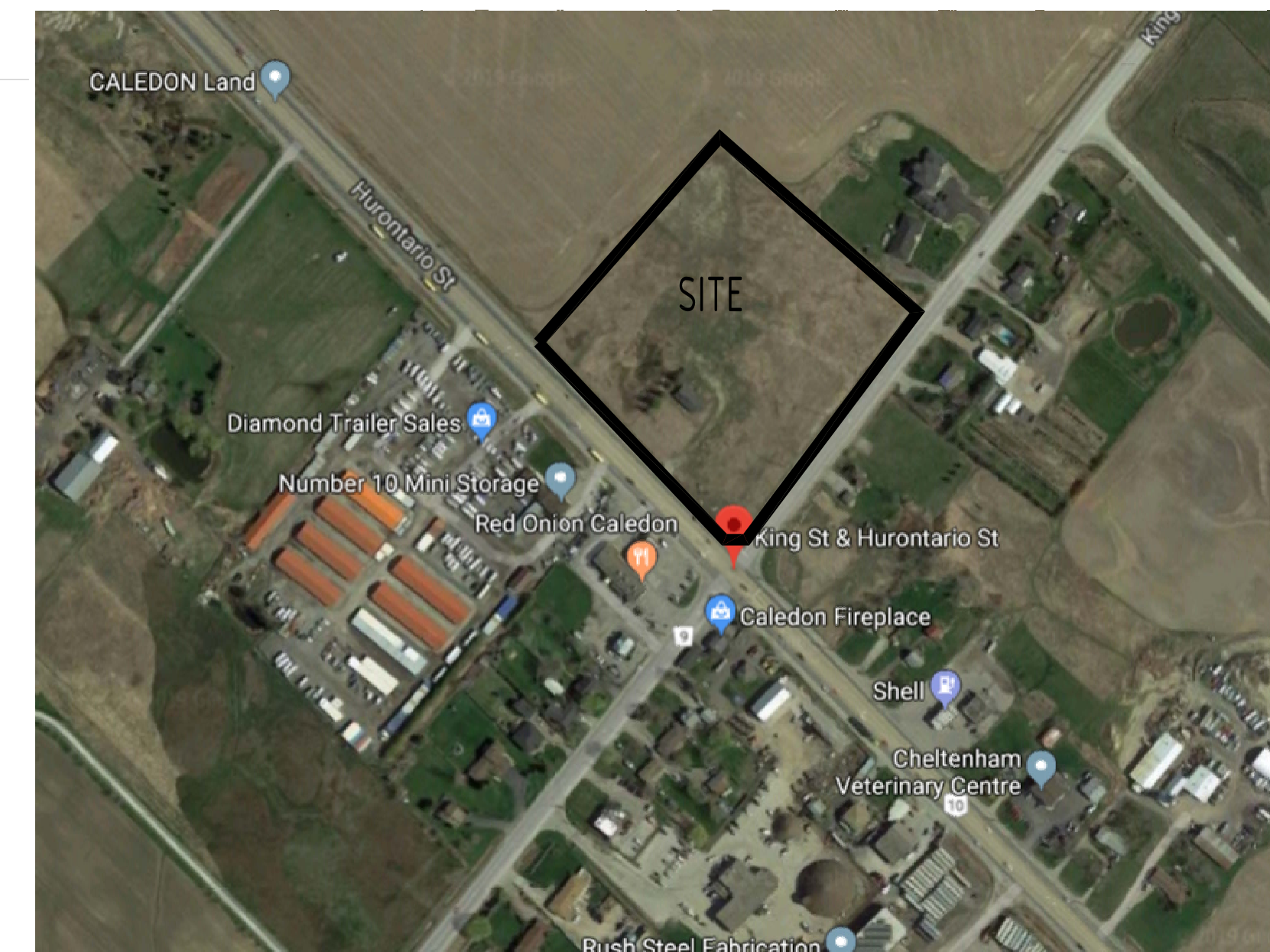
**TYPICAL DESIGN FOR A RIGHT IN/OUT ACCESS  
WITH DIRECTIONAL ISLAND  
(ROADS WITHOUT DIVIDED CENTRE MEDIAN ISLAND)**

# FIGURES

- Figure 1:** Site Plan
- Figure 2:** Site Location Plan
- Figure 3:** Boundary Road Network
- Figure 4:** 2019 Existing Traffic Volumes
- Figure 5:** 2021 Future Background Traffic Volumes
- Figure 6:** 2026 Future Background Traffic Volumes
- Figure 7:** 2031 Future Background Traffic Volumes
- Figure 8:** Primary Trip Distribution
- Figure 9:** Pass-By Trip Distribution
- Figure 10:** Primary Trip Assignment
- Figure 11:** Pass-By Trip Assignment
- Figure 12:** 2020 Future Total Traffic Volumes
- Figure 13:** 2025 Future Total Traffic Volumes
- Figure 14:** 2030 Future Total Traffic Volumes



SITE INFORMATION: - CV-267, A-1 AND A1-347		
	REQUIREMENTS	PROPOSED
A1 ZONING	NO BUILDING ON SITE	(AREA = 9,474.9 SQ.M.)
A1-347 ZONING	NO BUILDING ON SITE	(AREA = 4,204.8 SQ.M.)
CV-267 ZONING		(AREA = 18,200.8 SQ.M.)
MIN. LOT AREA (EXCLUDING A1 & A1-347 ZONING)	1390 SQ.M.	18,200.8 SQ.M.
MIN. LOT FRONTAGE (KING ST.)	210 M	122.0 M
MAX. BUILDING AREA	50%	8.3 %
MIN. FRONT SETBACK (KING ST.)	7.5 M	7.8 M
MIN. FLANK SETBACK (HWY. 10)	9 M	14 M
MIN. REAR SETBACK	7.5 M	29.0 M
MIN. SIDE SETBACK	7.5 M	25.1 M
BUILDING SETBACK EXEMPTION	N/A	N/A
BUILDING SEPARATION	-	SEE DWG.
GROSS FLOOR AREA	9,100.4 SQ.M. (TOTAL)	1516.5 SQ.M. (TOTAL)
MAX. BUILDING HEIGHT	10.5 M	10 M
MAX. NET FLOOR AREA PER USE	BUILDING "A" BUILDING "B" BUILDING "C" & "D" ] 9,100.4 SQ.M. (TOTAL)	RETAIL - 269.3 SQ.M. RESTAURANT - 1247.2 SQ.M.
MIN. LANDSCAPING AREA	20% (3,640.1 SQM)	21.2 % (3862.9 SQ.M.)
PLANTING STRIP LOCATION	-	NORTH OF LOT
MIN. PLANTING STRIP WIDTH	3.0 M	6.0 M
BERM LOCATION	-	SEE LANDSCAPE DWGS
BERM WIDTH	-	SEE LANDSCAPE DWGS
BERM HEIGHT	-	SEE LANDSCAPE DWGS
OPEN STORAGE AREA SIZE	-	0 SQ.M.
MIN. DRIVEWAY SETBACK	1.5 M	13.1 M
MIN. PARKING SPACES PER USE:		
RETAIL - 269.3 SQM @ 1/20 SQM = 14		
RESTAURANT (NET FLOOR AREA) - 1247.2 SQM @ 1/15 SQM = 84	98 SPACES	153 SPACES (148 CARS + 05 TRUCKS)
MIN. PARKING SPACE SETBACKS	1.5 M	3.0 M
MIN. DELIVERY SPACES	1	2
MIN. LOADING SPACES	1	1
TOTAL CONCRETE PAVEMENT AREA	-	517.0 SQ.M.
TOTAL ASPHALT PAVEMENT AREA WITH CURB	-	12,304.4 SQ.M.
TOTAL LANDSCAPE AREA	-	3,862.9 SQ.M.
TOTAL SITE AREA: (A1, A1-347, CV-267) = 31,880.5 SQ.M. (7.88 ACRES, 3.3 Ha)		
▲ DENOTES ENTRY/EXIT TO BUILDING		



PROPOSED SITE PLAN  
SCALE: 1:400




ISSUED FOR SPA: 14-11-2019  
PROJECT: PROPOSED DEVELOPMENT  
N-E CORNER OF HURONTARIO & KING ST  
CALEDON, ON L7C 3M1

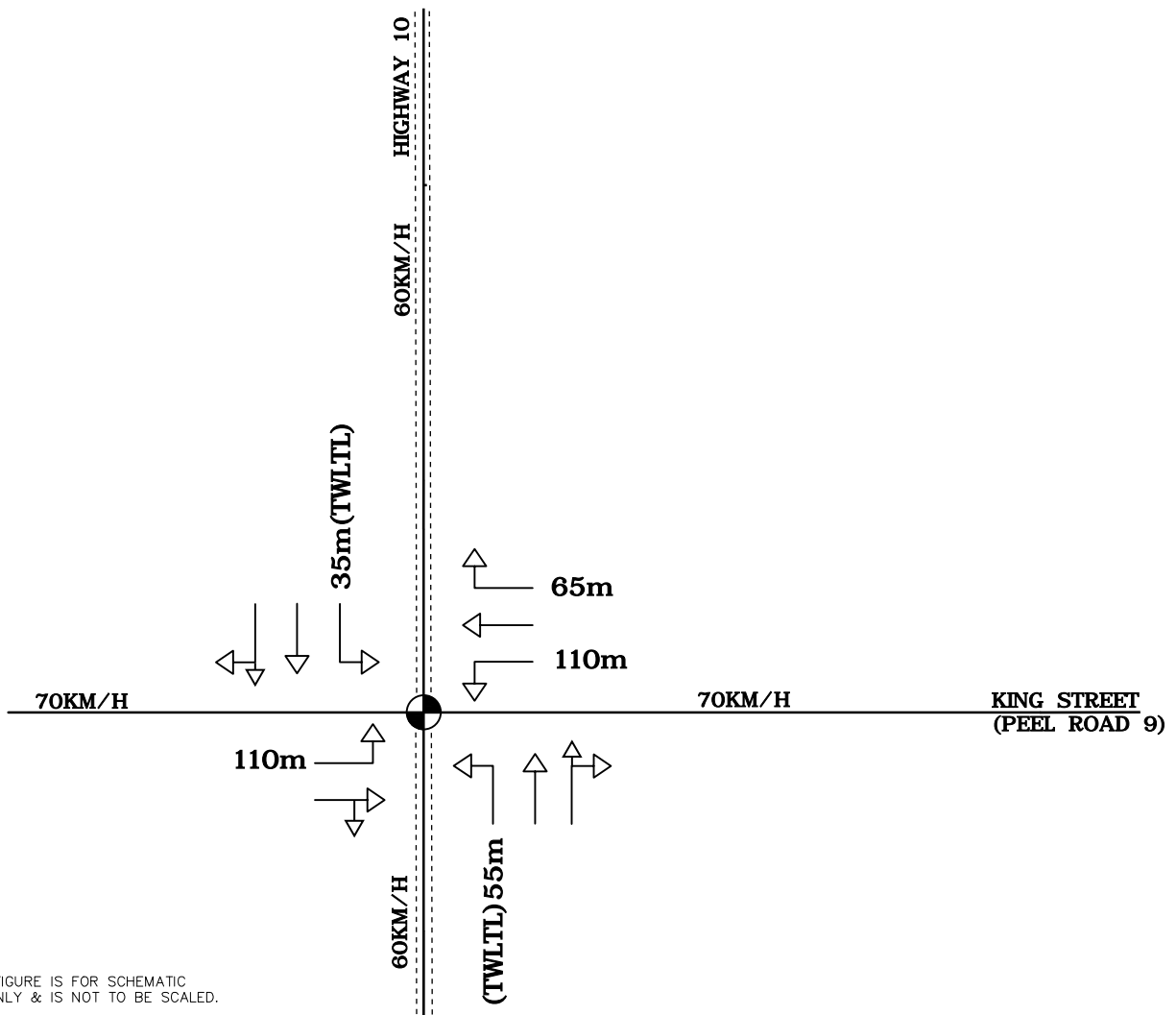
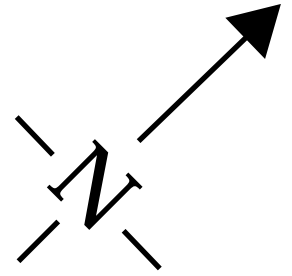
ALL INFORMATION AND DIMENSIONS MUST BE CHECKED AND VERIFIED ON SITE. DO NOT SCALE DRAWINGS. ANY VARIANCES OR DISCREPANCIES MUST BE REPORTED TO THE DESIGNER PRIOR TO COMMENCEMENT OF THE WORK. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH ALL BY-LAWS AND CODES HAVING JURISDICTION OVER THIS CONSTRUCTION SITE. THE DESIGN AND CONTRACT DRAWINGS ARE THE COPYRIGHT OF THE DESIGNER AND MAY NOT BE REPRODUCED, REUSED OR ALTERED WITHOUT THE WRITTEN PERMISSION OF THE DESIGNER.

DRAWN BY	NL
SCALE	1:400
PROJECT NO.	1862
DRAWING TITLE & NO.	PROPOSED SITE PLAN A0






NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.


Legend	Project	PROPOSED SERVICE/ COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL		 <b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers The HarbourEdge Building, 40 Huron Street, Suite 301, Collingwood, ON L9Y 4R3 705 446-3510 T 705 446-3520 F www.ccrozier.ca info@crozier.ca				
	Drawing	SITE LOCATION						
Drawn By		M.J.	Design By	M.J.	Project	1716-5215		
Scale		N.T.S.	Date	Nov. 14, 2019	Check By	M.F.	Drawing	FIG. 2



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

	SIGNAL CONTROL
	CENTRE TWLTL
	STORAGE

Project	<b>PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL</b>		
Drawing	<b>BOUNDARY ROAD NETWORK</b>		

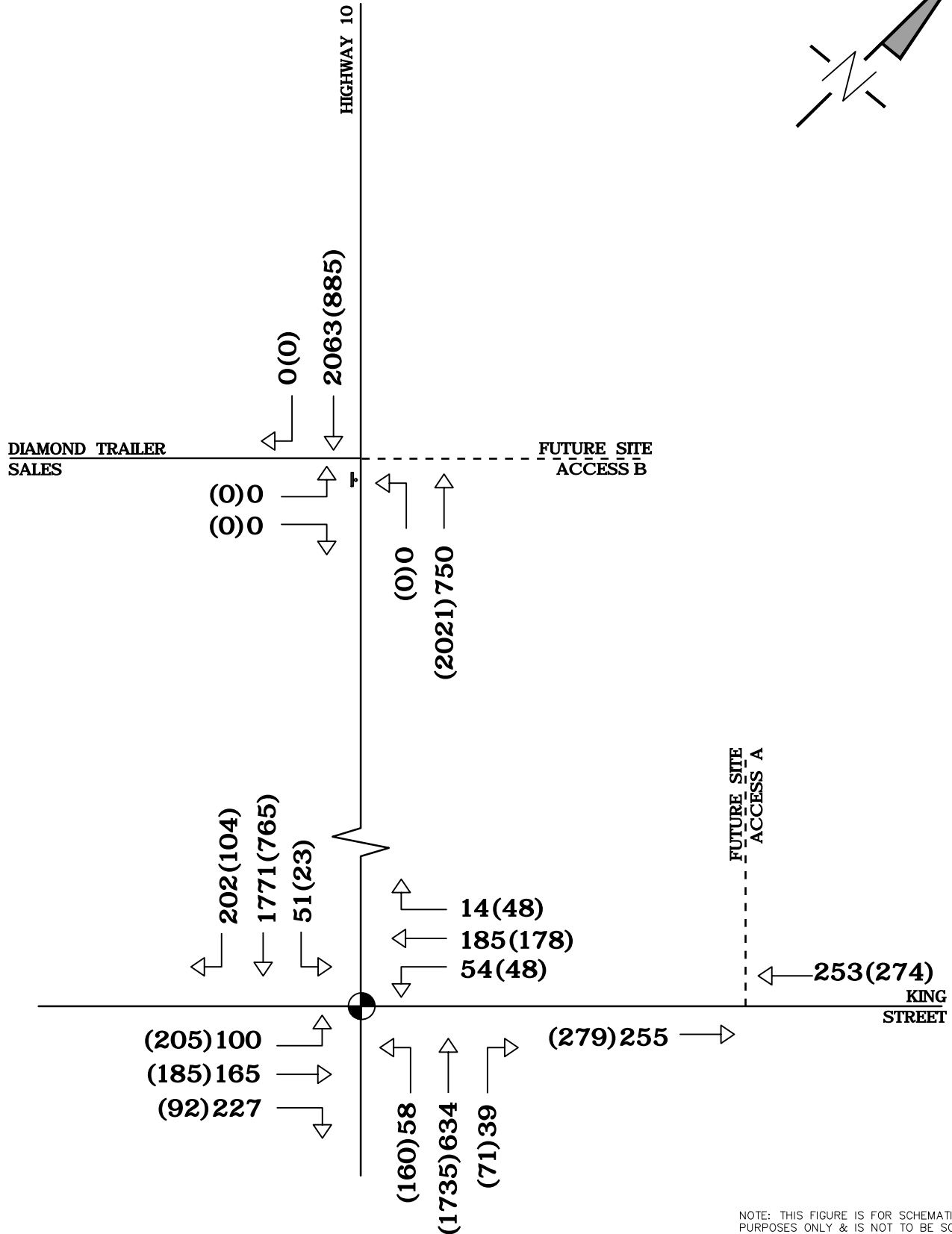
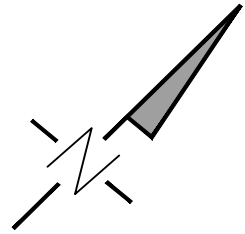


**CROZIER & ASSOCIATES**  
Consulting Engineers

THE HARBOUREDGE BUILDING,  
40 HURON STREET, SUITE  
301, COLLINGWOOD, ON  
L9Y 4R3

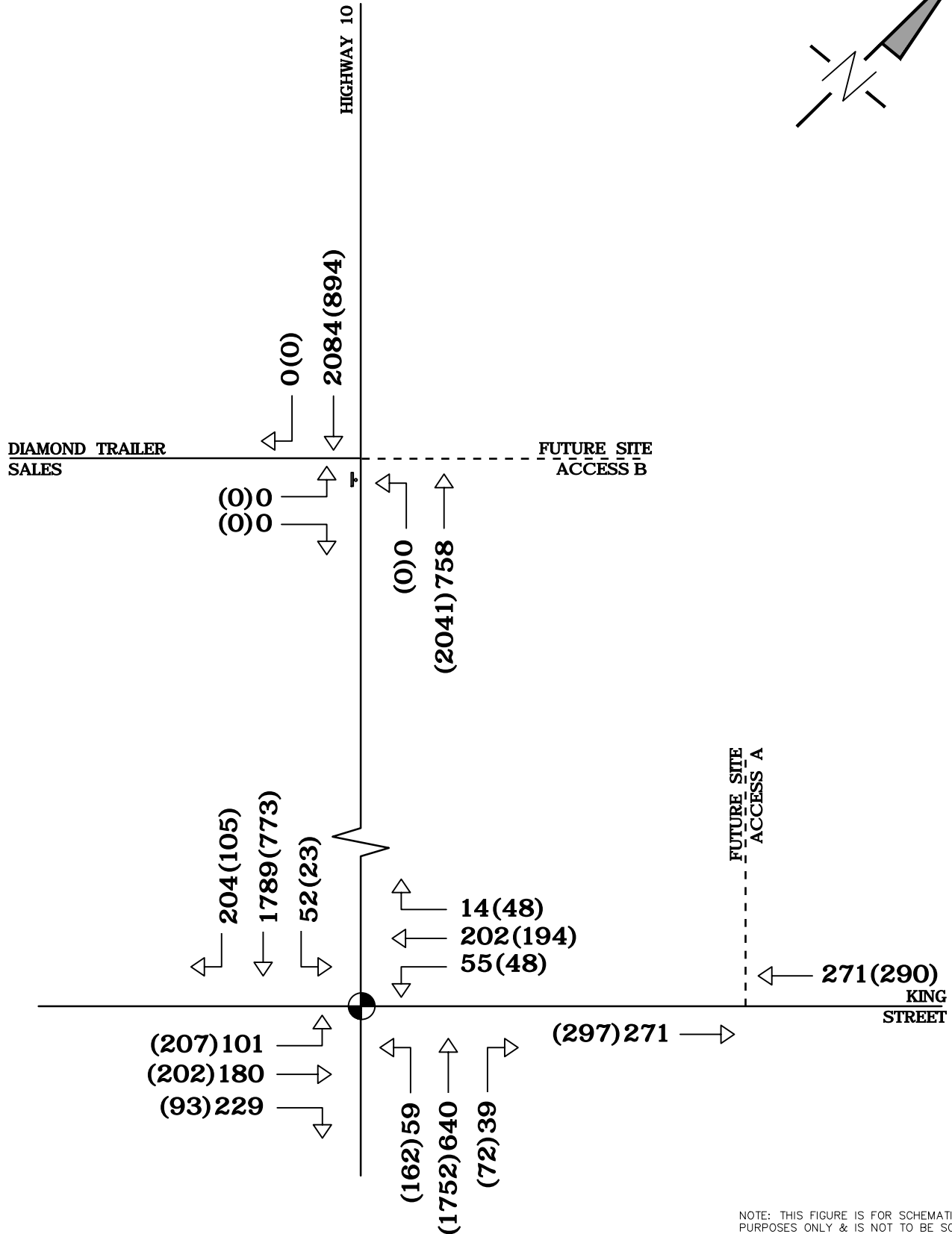
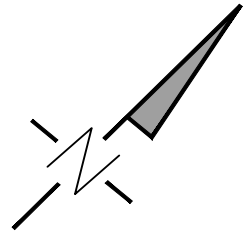
705-446-3510 T  
705-446-3520 F  
WWW.CFCROZIER.CA  
INFO@CFCROZIER.CA

Drawn By	C.P.	Design By	M.F.	Project	<b>1716- 5215</b>
Scale	N.T.S.	Date	<b>11/14/2019</b>	Check By	M.F.
					Drawing <b>FIG. 3</b>



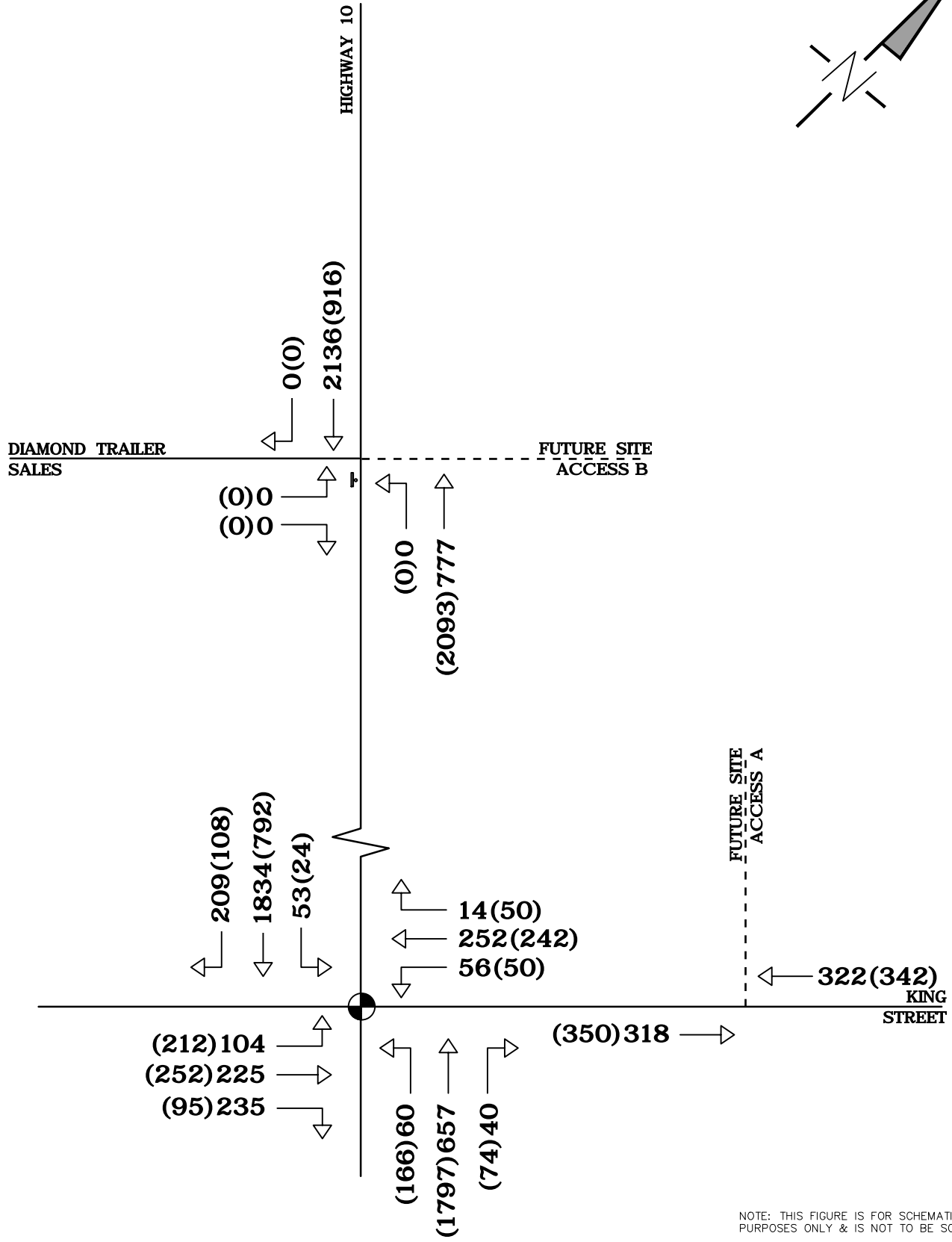
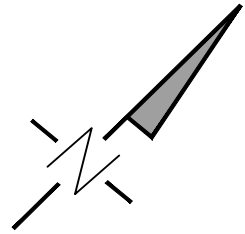
NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

<b>Legend</b> SIGNAL CONTROL STOP CONTROL XX(YY) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING,          40 HURON STREET, SUITE          301, COLLINGWOOD, ON          L9Y 4R3</small> <small>705-446-3510 T          705-446-3520 F          WWW.CFCROZIER.CA          INFO@CFCROZIER.CA</small>
	<b>Drawing</b> 2019 EXISTING TRAFFIC VOLUMES	



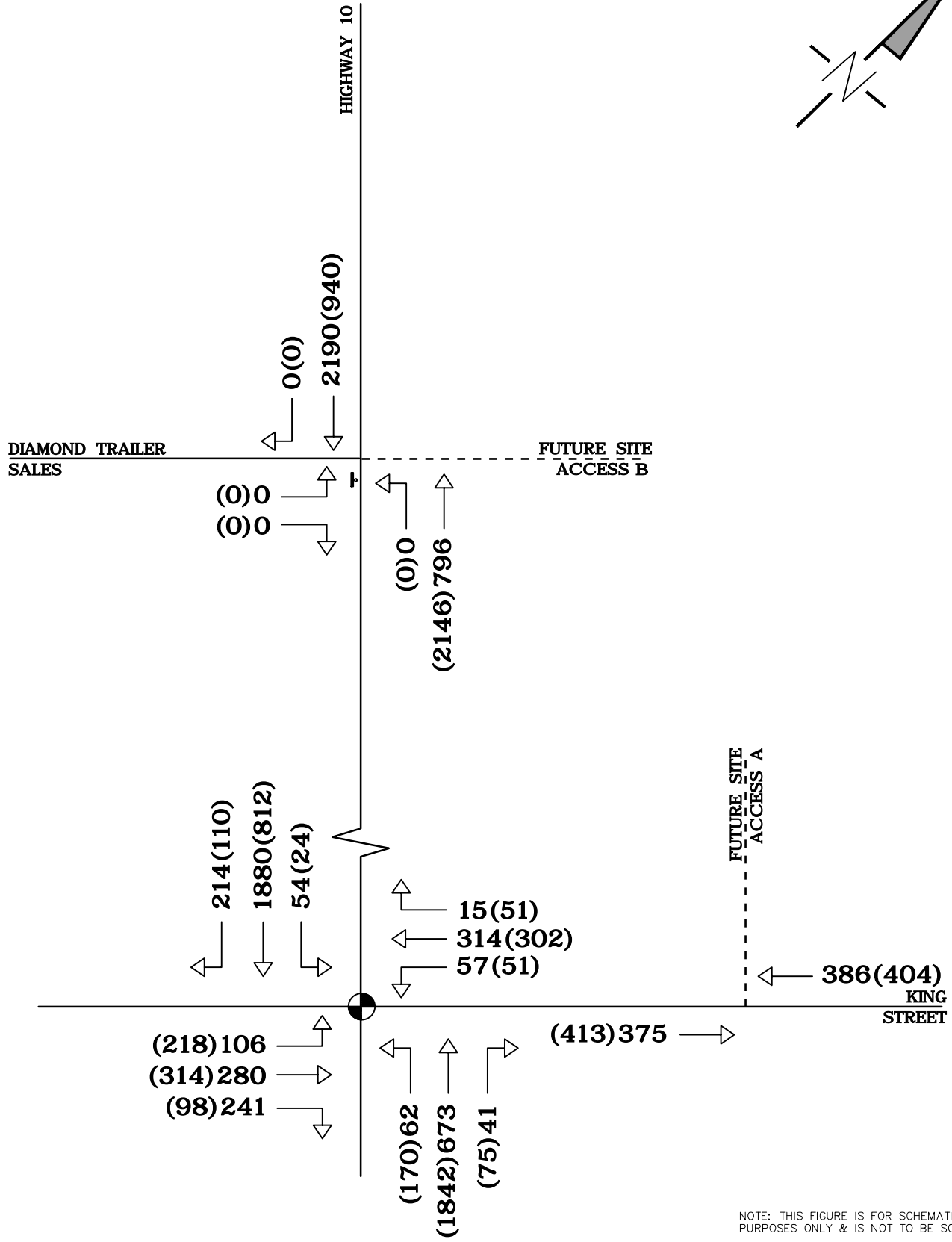
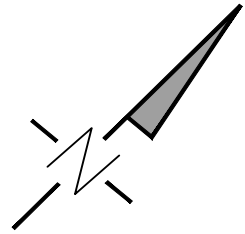
NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

<b>Legend</b> SIGNAL CONTROL STOP CONTROL xx(yy) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3</small> <small>705-446-3510 T 705-446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA</small>
	<b>Drawing</b> 2021 FUTURE BACKGROUND TRAFFIC VOLUMES	



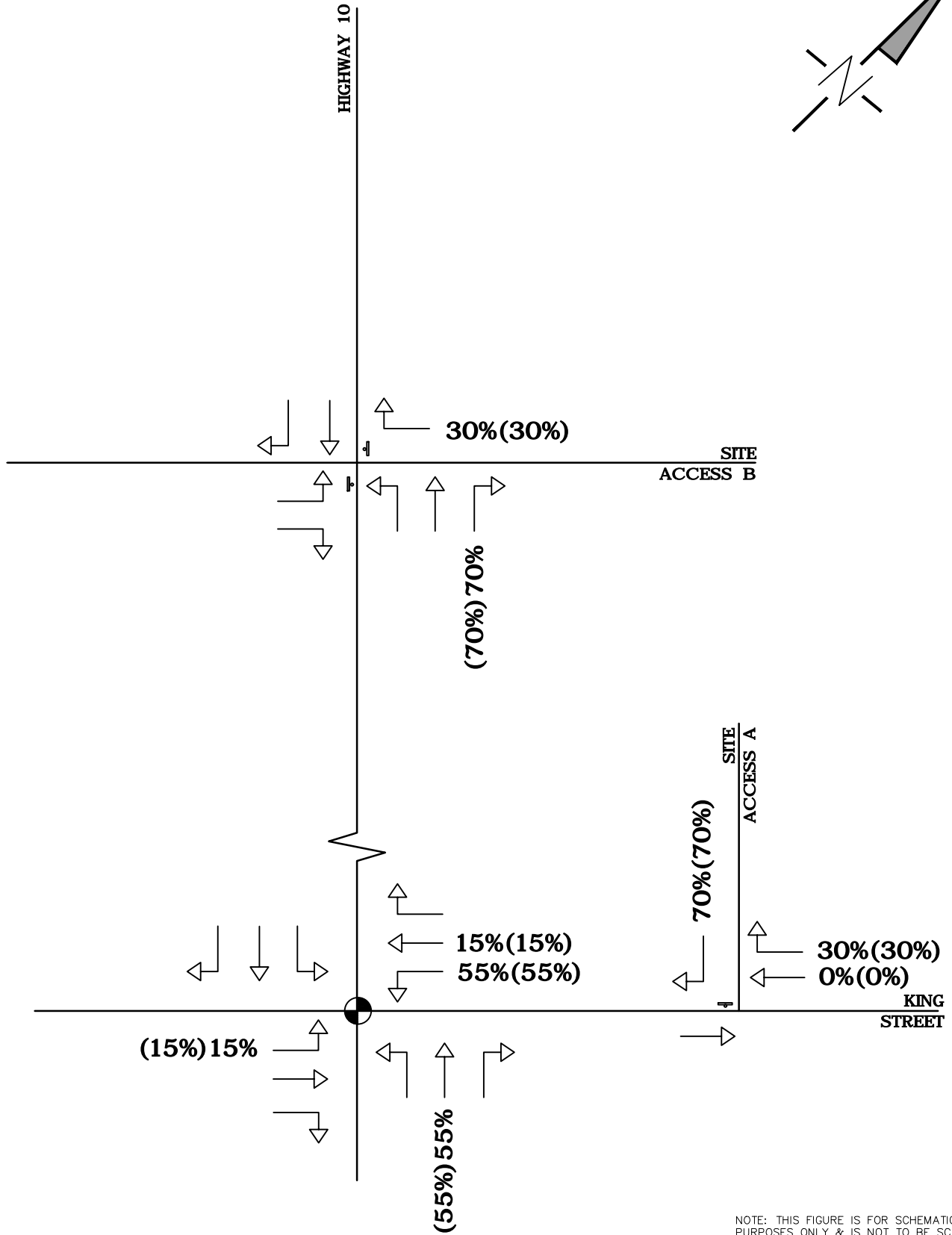
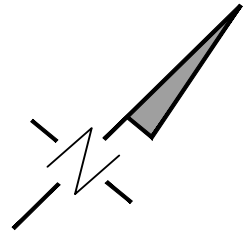
NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

<b>Legend</b> SIGNAL CONTROL STOP CONTROL xx(yy) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING,          40 HURON STREET, SUITE          301, COLLINGWOOD, ON          L9Y 4R3</small> <small>705-446-3510 T          705-446-3520 F          WWW.CFCROZIER.CA          INFO@CFCROZIER.CA</small>
	<b>Drawing</b> 2026 FUTURE BACKGROUND TRAFFIC VOLUMES	





NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.


<b>Legend</b> SIGNAL CONTROL STOP CONTROL xx(yy) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3</small> <small>705-446-3510 T 705-446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA</small>
	<b>Drawing</b> 2031 FUTURE BACKGROUND TRAFFIC VOLUMES	

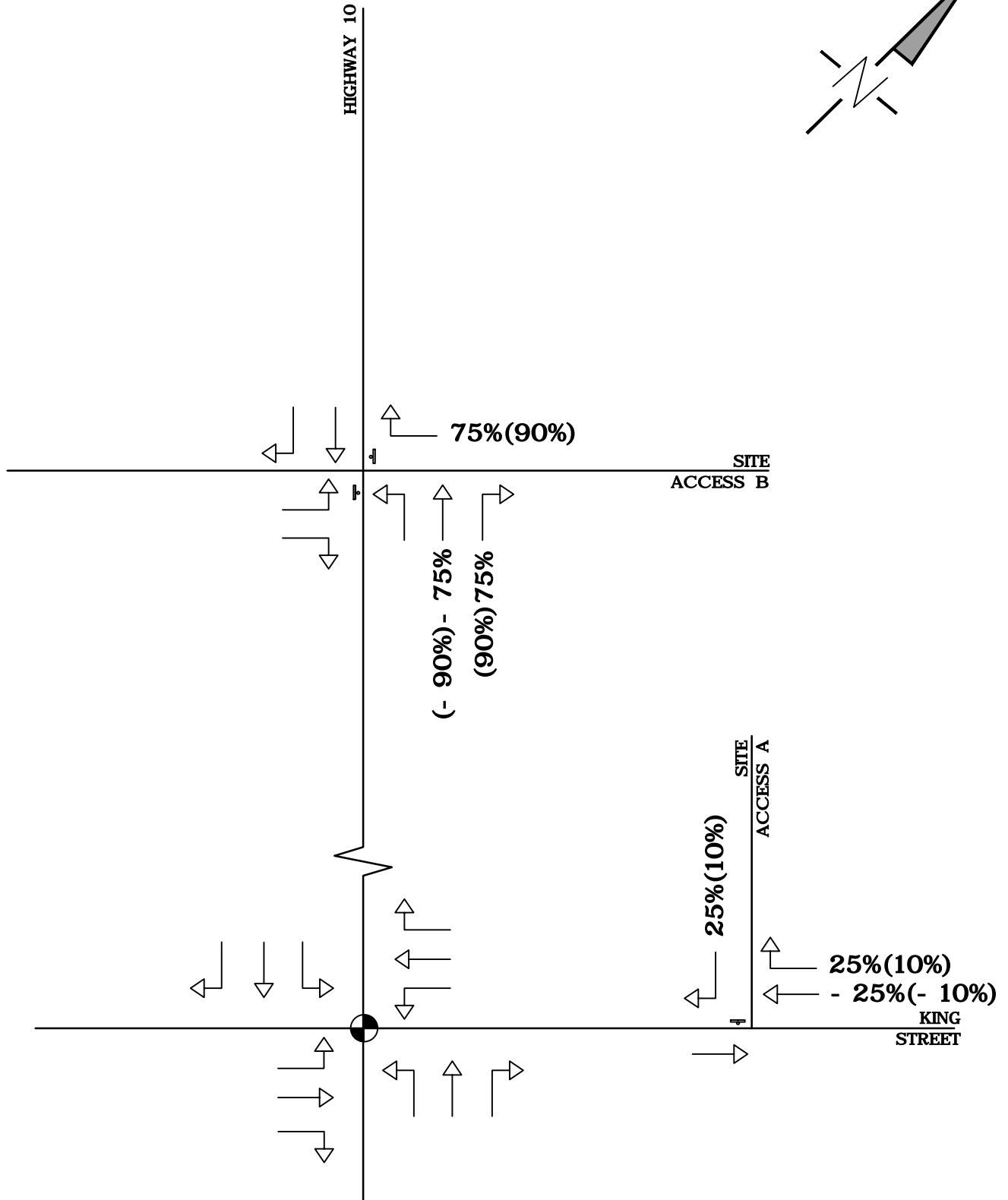
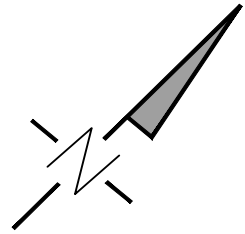


NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



 SIGNAL CONTROL  STOP CONTROL <b>xx(yy) AM(PM)</b>
--

<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL
<b>Drawing</b> PRIMARY TRIP DISTRIBUTION

 <b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers		THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3 705-446-3510 T 705-446-3520 F WWW.CFCROZIER.CA INFO@CFCROZIER.CA
Drawn By <b>C.P.</b>	Design By <b>M.F.</b>	Project <b>1716- 5215</b>
Scale <b>N.T.S.</b>	Date <b>11/14/2019</b>	Check By <b>M.F.</b> Drawing <b>FIG. 8</b>



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

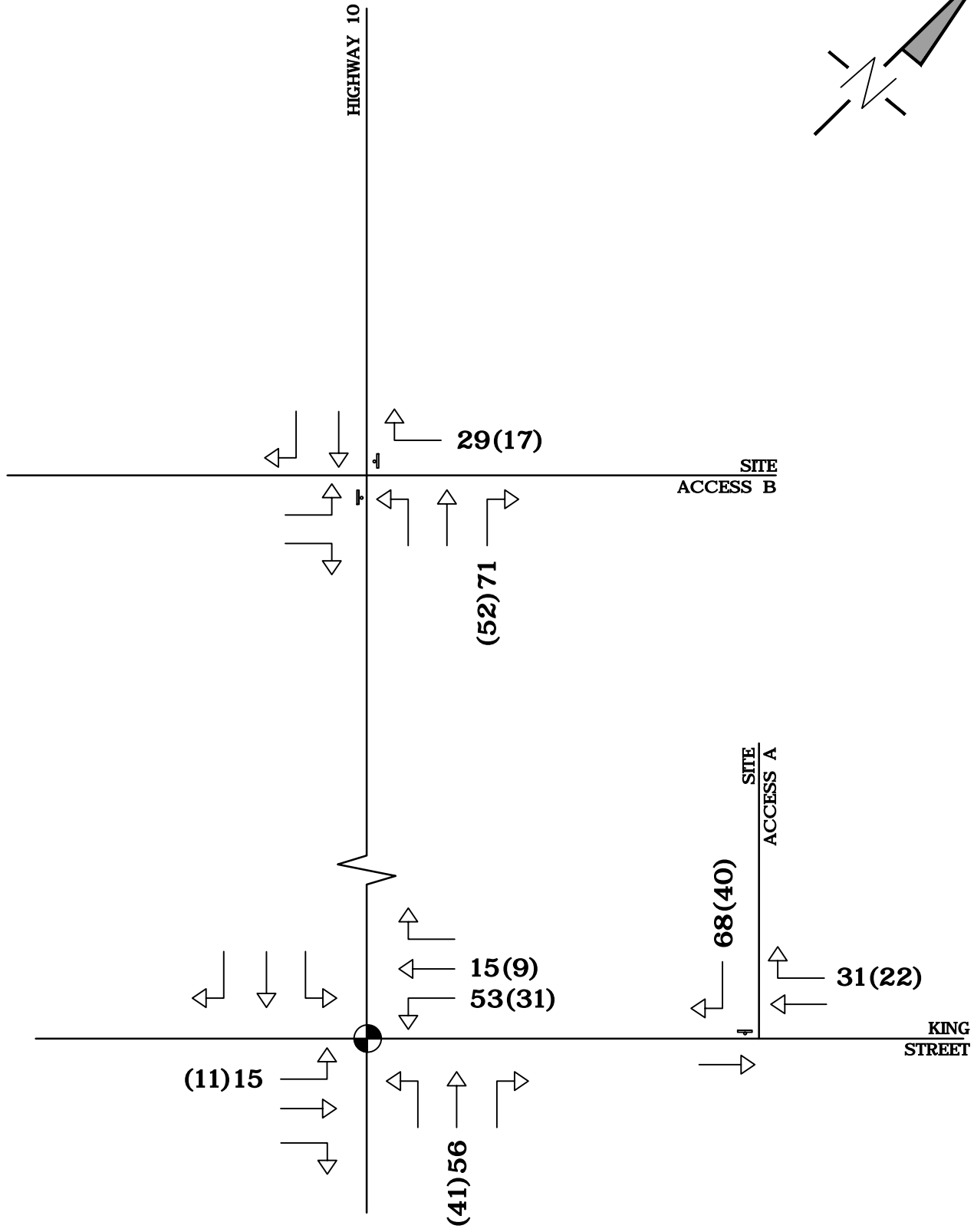
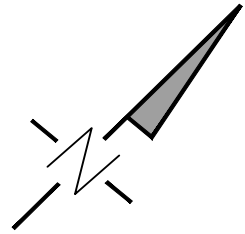
<p>Legend</p> <p> SIGNAL CONTROL</p> <p> STOP CONTROL</p> <p>xx(yy) AM(PM)</p>
--

<p>Project</p> <p><b>PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL</b></p>
<p>Drawing</p> <p><b>PASS- BY TRIP DISTRIBUTION</b></p>


**CROZIER & ASSOCIATES**  
 Consulting Engineers

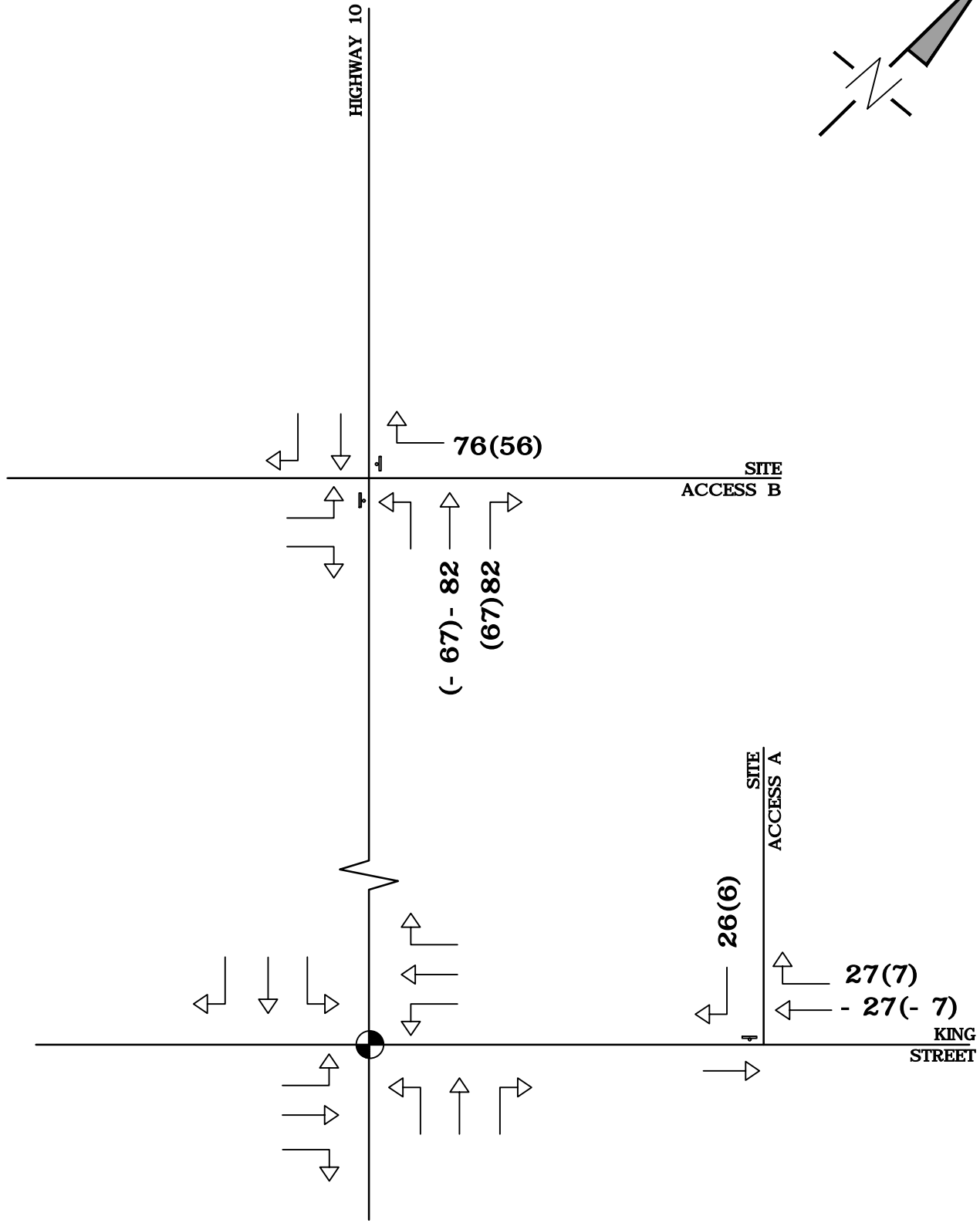
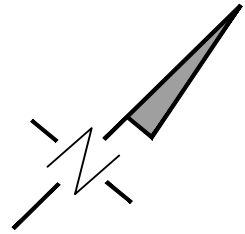
THE HARBOUREDGE BUILDING, 705-446-3510 T  
 40 HURON STREET, SUITE 705-446-3520 F  
 301, COLLINGWOOD, ON WWW.CFCROZIER.CA  
 L9Y 4R3 INFO@CFCROZIER.CA

Drawn By	C.P.	Design By	M.F.	Project	1716- 5215	
Scale	N.T.S.	Date	11/14/2019	Check By	M.F.	
					Drawing	FIG. 9






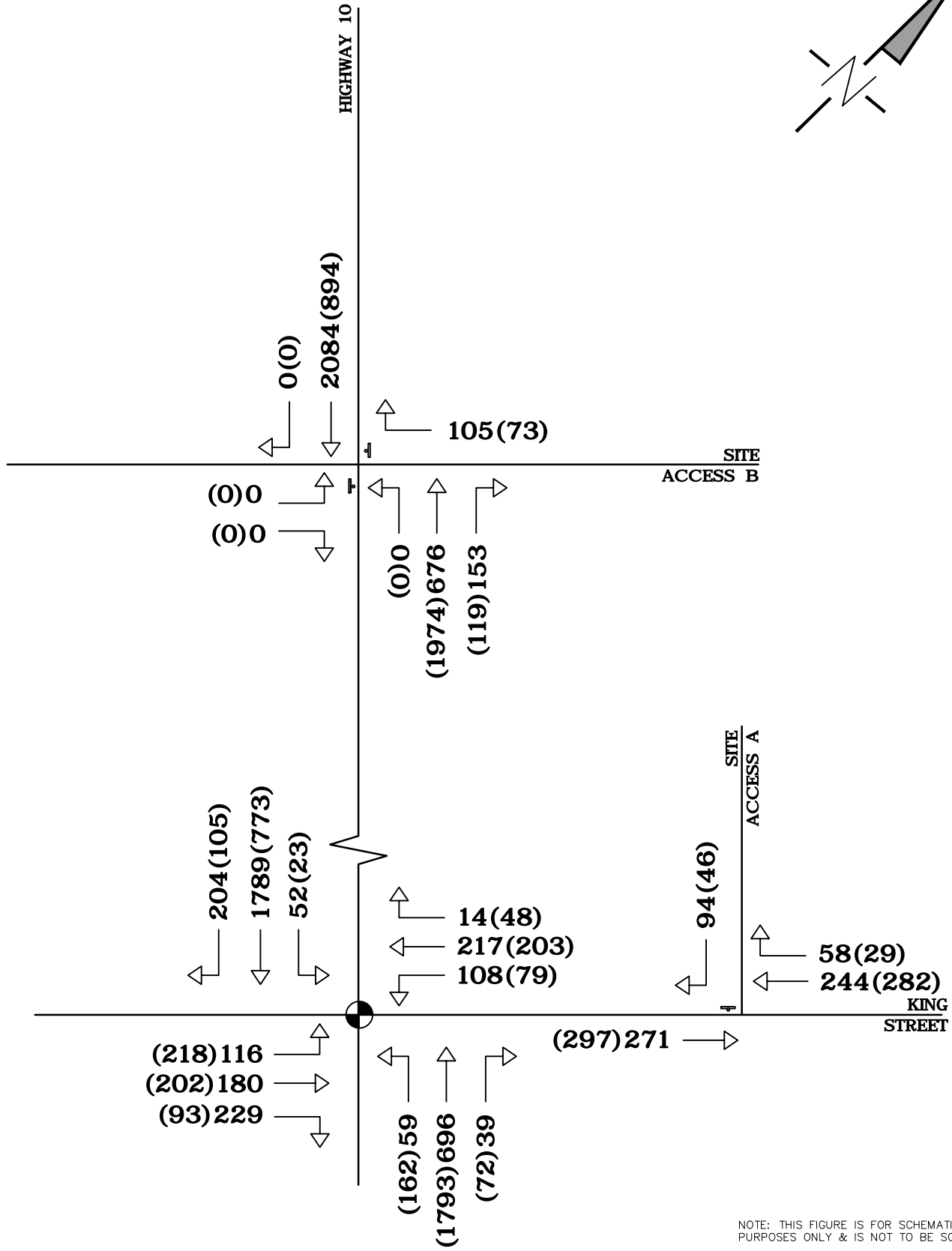
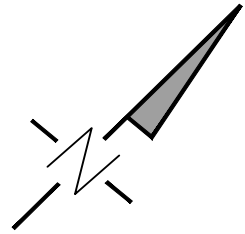
NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

<b>Legend</b> SIGNAL CONTROL STOP CONTROL xx(yy) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING,          40 HURON STREET, SUITE          301, COLLINGWOOD, ON          L9Y 4R3          705-446-3510 T          705-446-3520 F          WWW.CFCROZIER.CA          INFO@CFCROZIER.CA</small>
	<b>Drawing</b> PRIMARY TRIP ASSIGNMENT	



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

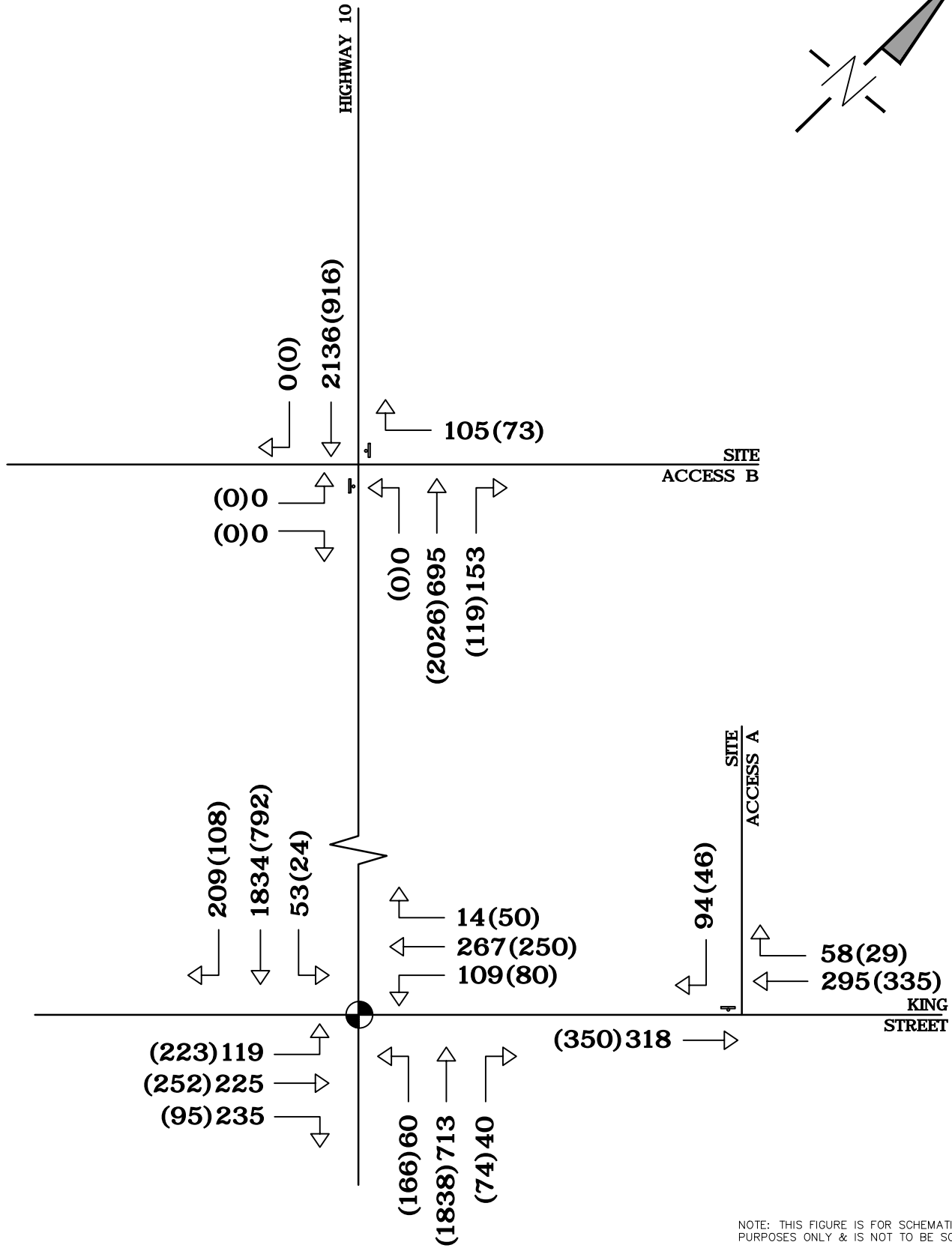
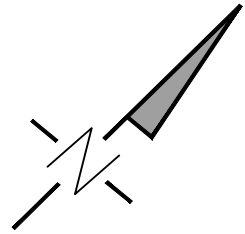
<b>Legend</b>  SIGNAL CONTROL  STOP CONTROL XX(YY) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	 <b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING,          40 HURON STREET, SUITE          301, COLLINGWOOD, ON          L9Y 4R3</small> <small>705-446-3510 T          705-446-3520 F          WWW.CFCROZIER.CA          INFO@CFCROZIER.CA</small>
	<b>Drawing</b> PASS- BY TRIP ASSIGNMENT	



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

<b>Legend</b> SIGNAL CONTROL STOP CONTROL XX(YY) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING,          40 HURON STREET, SUITE          301, COLLINGWOOD, ON          L9Y 4R3          705-446-3510 T          705-446-3520 F          WWW.CFCROZIER.CA          INFO@CFCROZIER.CA</small>											
	<b>Drawing</b> 2021 FUTURE TOTAL TRAFFIC VOLUMES		<b>Table</b> <table border="1"> <tr> <td>Drawn By</td> <td>C.P.</td> <td>Design By</td> <td>M.F.</td> <td>Project</td> <td>1716- 5215</td> </tr> <tr> <td>Scale</td> <td>N.T.S.</td> <td>Date</td> <td>11/14/2019</td> <td>Check By</td> <td>M.F.</td> </tr> </table>	Drawn By	C.P.	Design By	M.F.	Project	1716- 5215	Scale	N.T.S.	Date	11/14/2019
Drawn By	C.P.	Design By	M.F.	Project	1716- 5215								
Scale	N.T.S.	Date	11/14/2019	Check By	M.F.								

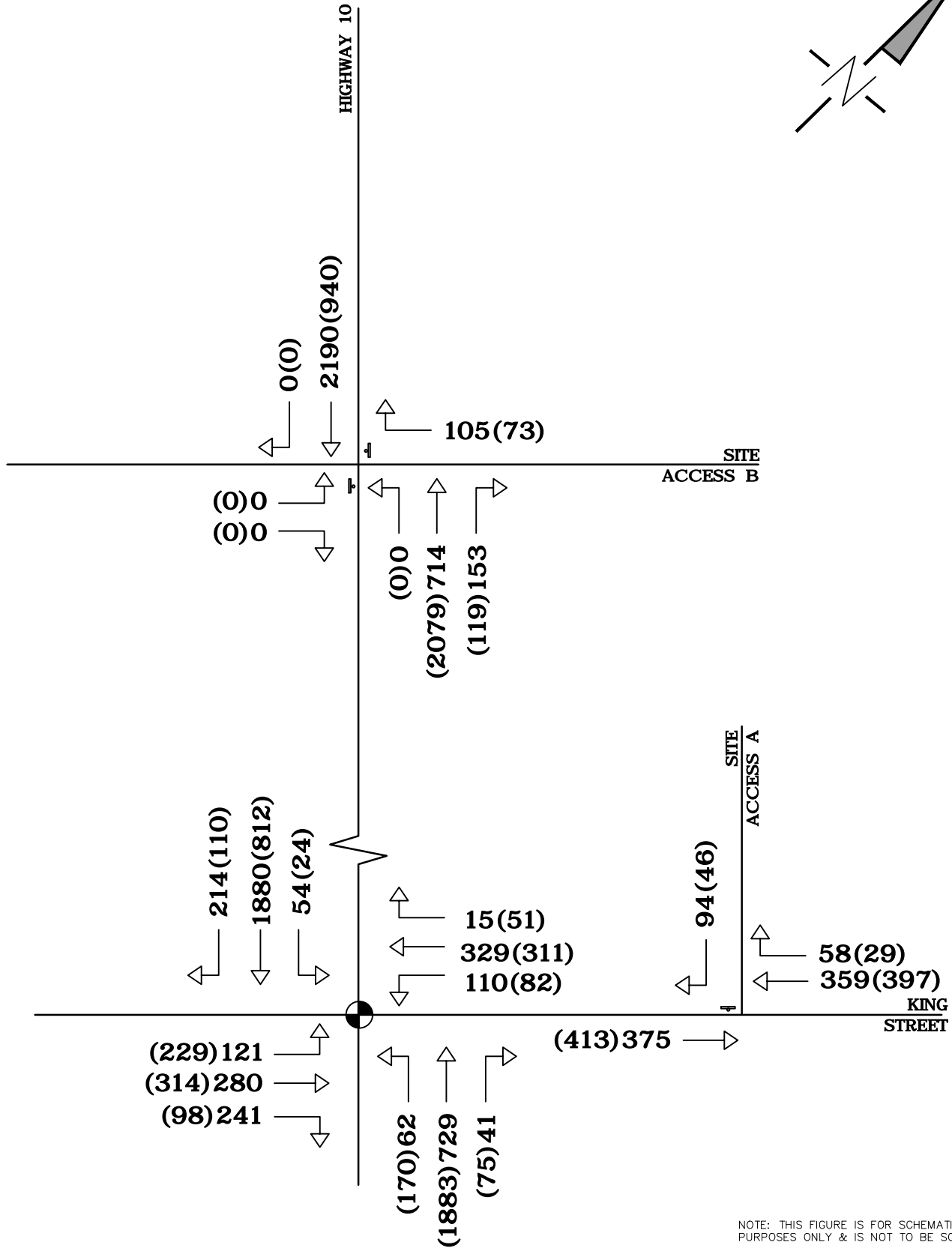
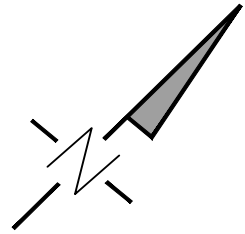
FIG. 12



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

<b>Legend</b> SIGNAL CONTROL STOP CONTROL XX(YY) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING,          40 HURON STREET, SUITE          301, COLLINGWOOD, ON          L9Y 4R3          705-446-3510 T          705-446-3520 F          WWW.CFCROZIER.CA          INFO@CFCROZIER.CA</small>											
	<b>Drawing</b> 2026 FUTURE TOTAL TRAFFIC VOLUMES		<table border="1"> <tr> <td>Drawn By</td> <td>C.P.</td> <td>Design By</td> <td>M.F.</td> <td>Project</td> <td>1716- 5215</td> </tr> <tr> <td>Scale</td> <td>N.T.S.</td> <td>Date</td> <td>11/14/2019</td> <td>Check By</td> <td>M.F.</td> </tr> </table>	Drawn By	C.P.	Design By	M.F.	Project	1716- 5215	Scale	N.T.S.	Date	11/14/2019
Drawn By	C.P.	Design By	M.F.	Project	1716- 5215								
Scale	N.T.S.	Date	11/14/2019	Check By	M.F.								

FIG. 13



NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

<b>Legend</b> SIGNAL CONTROL STOP CONTROL XX(YY) AM(PM)	<b>Project</b> PROPOSED SERVICE/COMMERCIAL DEVELOPMENT TOWN OF CALEDON, REGION OF PEEL	<b>CROZIER &amp; ASSOCIATES</b> Consulting Engineers <small>THE HARBOUREDGE BUILDING,          40 HURON STREET, SUITE          301, COLLINGWOOD, ON          L9Y 4R3          705-446-3510 T          705-446-3520 F          WWW.CFCROZIER.CA          INFO@CFCROZIER.CA</small>
	<b>Drawing</b> 2031 FUTURE TOTAL TRAFFIC VOLUMES	