APPENDIX D.2 – Transportation Memos

MORRISON HERSHFIELD

REPORT - FINAL

Teston Road Area Transportation Improvements Individual Environmental Assessment

Transportation System Technical Report # 2

Presented to:

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1. INTRODUCTION

The Regional Municipality of York (York Region) has retained Morrison Hershfield (MH) to conduct an Individual Environmental Assessment (IEA) for transportation improvements in the Teston Road area.

The purpose of this report is to document the process undertaken to identify, generate, and evaluate Alternatives to the Undertaking (Alternative to) and the selection of the preferred Alternative to.

2. SUMMARY OF PROBLEMS AND OPPORTUNITIES FROM REPORT #1

Transportation System Technical Report #1 (TSTR) identified the following problems and opportunities (P&O) for the study area:

- Future land-use change surrounding Teston Road from primarily rural to residential and mixed use will considerably increase future travel demand within the Study Area. The screenline analysis indicates that AM peak hour travel demand along arterial roads is projected to increase from 2016 to 2041 on average by 66% (SL 1, 2 and 3) and 72% (SL 4 and 5), respectively, in the westbound and southbound directions under the Do-Nothing scenario (i.e., 2041 TMP Network excluding a Teston Road Extension between Keele and Dufferin), with even higher increases under the 2041 TMP Network scenario (including GTA West).

- The estimated 2041 AM peak hour traffic volumes in the westbound direction between Keele Street and Dufferin Street exceed available capacity under the Do-Nothing scenario. The estimated 2041 AM peak hour traffic volumes in the southbound direction between Kirby Road and Major MacKenzie Drive generally exceed available capacity under the Do-Nothing scenario.

- The discontinuity on Teston Road between Keele Street and Dufferin Street is a barrier to local and regional east/west trips and adds traffic load to parallel east/west alternatives routes such as the already congested Major Mackenzie Drive and Kirby Road. AM peak hour over-capacity conditions are noted for Teston Road, Kirby Road and Major MacKenzie Drive at the Keele Street and Dufferin Streets intersections for movements.

- There is limited east-west accessibility along the Teston Road corridor to access existing and planned Highway 400 interchanges (i.e., Teston Road Interchange, Major Mackenzie Drive Interchange and Kirby Road Interchange). Current levels of congestion and out-of-way travel faced by commuters would be exacerbated by increasing traffic demands. While it is anticipated that links within the vicinity of Highway 400 would have greater capacity due to proposed future widenings, east of this facility, the same capacity is not provided which produces bottlenecks at major intersections.

- The discontinuity on Teston Road between Keele Street and Dufferin Street is a barrier to residents from better access to amenities (e.g., schools, parks, recreational facilities, emergency, and other public services, etc.).

- The discontinuity on Teston Road between Keele Street and Dufferin Street results in longer trip distances which may increase greenhouse gas emissions and have negative impacts on climate change.

- The area of Teston Road between Keele Street and Dufferin Street is identified in York Region's TMP as having a separated cycling facility by 2041. The current network requires significant out-of-way travel by cyclists and pedestrians, channeling additional cycling and pedestrian traffic to Keele Street or Dufferin Street to use Kirby Road or Major Mackenzie Drive to cross this barrier.

- Westbound AM peak hour transit ridership and Transit Mode Share are both projected to increase significantly within the study area between 2016 and 2041 (e.g., at SL2 transit ridership to increase by 741% and Transit Modal Share from 3% to 13% for the Do Nothing Scenario). While the above is a very significant increase the opportunity may exist to further increase transit ridership and Transit Mode Share within the study area.

- Teston Road between Keele Street and Dufferin Street is identified in York Region's 2016 TMP to be served by frequent transit service by the year 2041. Currently, transit is only available on Teston Road in four short sections at Jane Street (Route 20), Keele Street (Route 107), Thornhill Woods (Route 23) and Elgin Mills (Route 80). The discontinuity on Teston Road between Keele Street and Dufferin Street is a barrier to increased transit service and ridership along this corridor.

- Based on the discussion with the Deputy Fire Chief, City of Vaughan Fire and Rescue Service, there is a need for another fire station on the west side of the study area. The location of the station depends on the findings of the IEA.

3. ALTERNATIVES TO

The P&O provided the foundation for the generation of alternatives discussed in this report. Additionally, the Teston Road IEA Terms of Reference provided guidance on the range of alternatives to be considered. The selection of a preferred Alternative To is undertaken in a multi-step process as depicted in **Figure 1**.

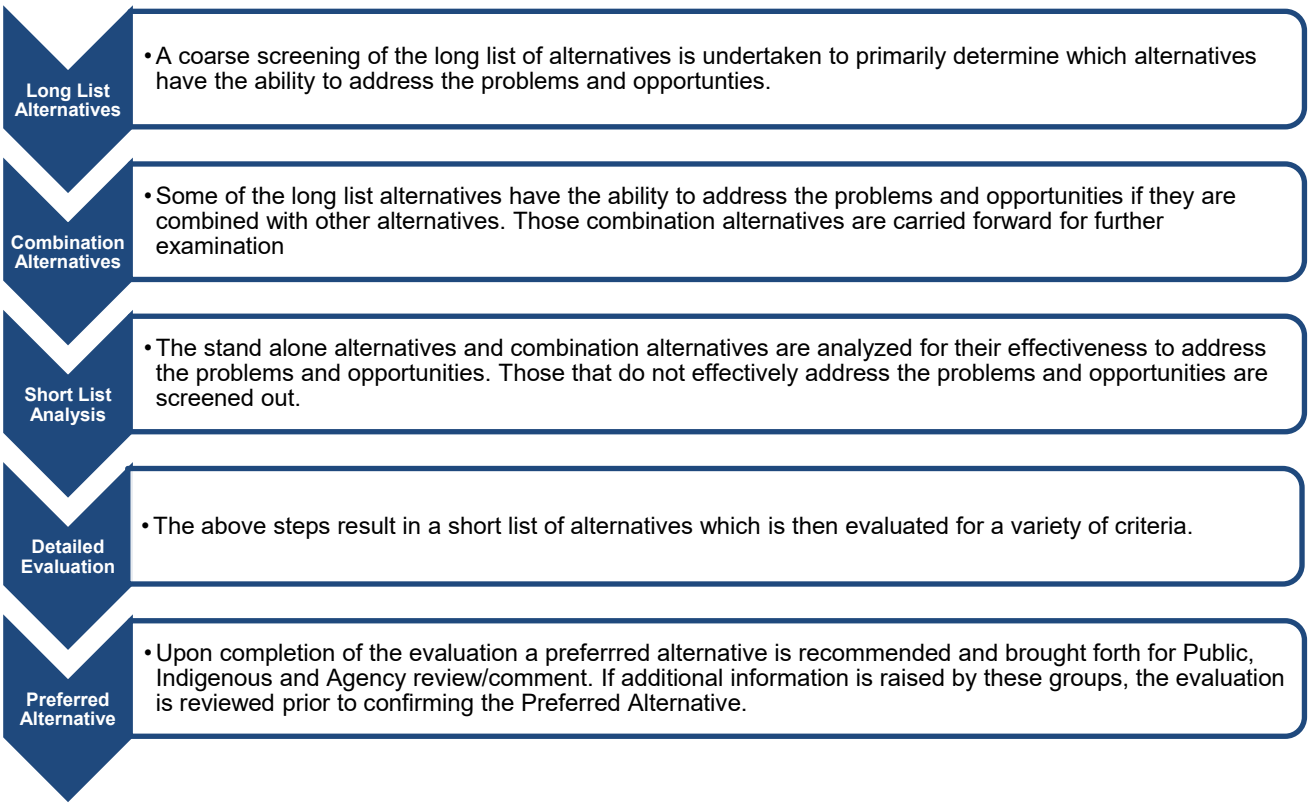


Figure 1: Alternative To Generation and Evaluation Process

Alternatives To examine functionally different ways to address transportation P&O and must be examined to determine their effectiveness at addressing these P&Os. The first step in this process is to generate a list of all possible Alternatives To.

The Terms of Reference (WSP, 2018), provided the following principles to be considered when generating Alternatives To:

- Make effective and efficient use of existing infrastructure.
- Develop a network that focuses on:
    - Encouraging economic growth and vitality of the Region.
    - Improving livability, health, and social well-being to the residents.
    - Protecting and sustaining the natural and built environment.

  - Maintaining the financial sustainability, openness, accessibility, transparency, accountability and reliability of the Region's government and related programs and services.

- Ensure effective co-ordination with other York Region and local planning initiatives.

These principles, along with the identified P&O are the foundation of the Alternatives To process and were consistently reviewed throughout the process.

3.1 Long List of Alternatives

The Terms of Reference (WSP, 2018) identified several categories of Alternatives To, to be examined during the IEA process. The IEA Study Team used these categories and the examples provided in the ToR to generate a long list of alternatives as shown in **Table 1**.

Alternatives that could not significantly address the P&O as either a stand-alone or combination alternative were not carried forward. Many of the alternatives that were not carried forward from the long list (e.g., Travel Demand Management, Transportation System Management) are still anticipated to contribute to addressing future transportation related needs.

The long list alternatives are explained in the subsequent sections.

Table 1: Long List of Alternatives To

1.0 Do Nothing
1.1 Future Do Nothing
2.0 Travel Demand Management
2.1 Shifting demand to off-peak periods
2.2 Promoting alternative transportation options (Transit, cycling, walking, etc.)
3.0 Travel Systems Management
3.1 Prioritize transit
3.2 Intelligent Transportation System strategies
3.3 Carpooling
3.4 Autonomous/ driverless & connected vehicles
3.5 Providing real-time information to users (i.e., traffic & transit delays via phone apps)
3.6 Ride-sharing services
3.7 Park and Ride facilities
3.8 High Occupancy Vehicle Lanes
3.9 Reserved Bus Lanes
3.10 Intersection improvements
4.0 New Cycling and/or Pedestrian Infrastructure
4.1 New Cycling and/or Pedestrian Infrastructure
5.0 Improved and/or New Transit Services
5.1 Expand transit system capacity by increasing service frequency
5.2 Create new routes on existing corridors
5.3 Build bus rapidways / Reserved Bus Lanes on existing corridors

6.0 Improved Existing/Planned Transitways
6.1 Improved Existing / Planned Transitways
7.0 New Transitways
7.1 New Transitways
8.0 Improved Existing Roadways
8.1 Improved Existing Roadways
9.0 New Roadways
9.1 New Roadways
10.0 Combinations of the above
10.1 Combinations of the above

3.1.1 Future Do Nothing

The Future Do Nothing alternative refers to a scenario where all planned Provincial, Regional, and local Municipal infrastructure (to the horizon year of 2041) is implemented within the study area excluding the planned Teston Road 'missing link' connection between Keele Street and Dufferin Street, as documented in York Region's 2016 Transportation Master Plan.

The Future Do Nothing alternative is carried forward through this phase of the study to provide a baseline to compare against should none of the alternatives be implemented.

3.1.2 Travel Demand Management

Travel Demand Management (TDM) alternatives attempt to address the problems and opportunities by shifting the demand on infrastructure away from peak periods. This often involves promoting additional transportation options (i.e., active transportation and transit).

While TDM is an important aspect of optimizing the transportation network it is assumed that York Region already maximizes TDM to the extent that is possible and that additional measures would not be feasible to address the P&O.

This alternative was screened out as it would not address the P&O either as a standalone alternative or in combination with other alternatives.

3.1.3 Travel Systems Management (TSM)

The implementation of TSM measures typically improves the efficiency of the existing transportation system. This includes initiatives that could reduce the network usage or provide greater access to another mode of transportation (i.e., carpool lots, ride-sharing services, or prioritizing transit). It can also use technologies to create efficiencies (i.e., intersection improvements, autonomous vehicles, or phone applications that provide real-time information). The following subsections address a variety of TSM measures that were identified in the ToR.

3.1.3.1 Prioritize Transit

This alternative was not carried forward as either a standalone or combination alternative as it would not fully address the P&O despite a projected increase in transit usage in the study area. While routes exist within the study area, prioritizing them would have only minor impacts on improving the network efficiency.

3.1.3.2 Intelligent Transportation System (ITS) Strategies

ITS strategies refer to the implementation of technology to increase the efficiency of the transportation network. This can include variable message signage telling users about accidents or travel times, using cameras to monitor traffic conditions and to dispatch emergency services to accidents, or using automated enforcement (such as red-light cameras). ITS could also play a key role in the implementation of autonomous or driverless vehicles (discussed below).

ITS Strategies were not carried forward as they would not fully address the P&O either alone or in combination with other alternatives.

3.1.3.3 Carpooling

Carpooling does assist in the reduction of vehicles on the road as it decreases the number of vehicles required to carry the same number of travelers.

However, this alternative was not carried forward as either a standalone or combination alternative. Carpooling infrastructure (i.e., carpool lots and high-occupancy vehicle lanes) is being implemented by the Province of Ontario and the Region at large in order to increase the appeal of carpooling. However, these measures would not fully address the P&O either alone or in combination with other alternatives

3.1.3.4 Autonomous/Driverless & Connected Vehicles

Autonomous/driverless and connected vehicles refer to advancements in automobile technology that allows for vehicles to make decisions based on the surrounding environment. Generally, this is thought to prevent accidents and increase safety but can also include decisions that result in more efficient use of the transportation network. This may include more efficient use of routes, speed control and/or more efficient turning movements at intersections. The decrease in accidents would also alleviate traffic as a result of blocked lanes or closures due to accidents.

At present, this technology is not yet advanced enough to address the study's P&Os, as such it was not carried forward.

3.1.3.5 Providing Real-time Information to Users

Providing real-time information to users (i.e., traffic & transit delays via phone apps) can create some efficiencies within the transportation network by providing information that can assist in decision making, such as changing routes or travelling at different times.

Generally, traffic information is readily available through various phone applications (e.g., Waze, Google Maps) and transit information is provided in various ways throughout the transit network (e.g., via signage at bus stops).

This alternative was not carried forward as it is already heavily used and increasing usage is not likely to have a material impact in addressing the P&Os.

3.1.3.6 Ridesharing Services

Ridesharing services refer to website/applications that match passengers to a driver to complete a specific trip (e.g., Uber, Lyft). Ridesharing services are available in the study area but likely do not account for a significant amount of traffic during peak periods.

The Region could implement a ridesharing program of its own or subsidize trips made via private ridesharing companies, however, this would not fully address the study's P&Os. Generally, ridesharing trips do not reduce the density of passenger trips because there is often only one traveler in each vehicle (plus a driver who would not have made the trip otherwise).

Ridesharing differs in this way from Carpooling as generally people carpooling are all heading to the same destination and as such, it reduces the number of vehicles on the road.

As ridesharing is available throughout the Region, and in most instances does not reduce the number of vehicles on the road, it was not carried forward.

3.1.3.7 Park and Ride Facilities

Park and Ride facilities provide parking at transit hubs to attract users to take transit for most of their trip but provides convenience of travelling to the nearest transit hub in their vehicle.

While park and ride facilities are available in the study area and throughout the Region at various provincial and regional transit

hubs, there are no additional locations within the study area that would warrant park and ride facilities, as such, this alternative was not carried forward.

3.1.3.8 High Occupancy Vehicle (HOV) Lanes

HOV lanes dedicate lane(s) to vehicles that carry more than 1 passenger, be it a transit vehicle or passenger car. HOV lanes may be active during peak times or at all times.

HOV lanes will be examined during the assessment of alternatives that provides new roadway lanes. But this alternative is not carried forward as a standalone or combination alternative. This is because it is recognized that converting existing lanes to HOV lanes would likely be a detriment to the transportation network, however, adding an HOV lane to an existing or new roadway, may help address the P&Os.

3.1.3.9 Reserved Bus Lanes

Like HOV lanes, reserved bus lanes are dedicated lanes for transit vehicles only. These lanes may be reserved for buses at all times or just during peak travel times.

Reserved bus lanes were not carried forward either as a standalone or combination alternative as transit will not make up a significant enough portion of user trips in the study area to be able to fully address the P&O. See additional discussions on transit usage in **Sections 2.1.3.1**, **2.1.5**, and **2.1.7**.

3.1.3.10 Intersection Improvements

Intersection improvements refer to a variety of changes that can be made at intersection to increase the efficiency of vehicle movements through the intersection, thus reducing congestion. This could include making adjustment to traffic signal timing to allow more vehicles to pass through the intersection or providing new or additional turning lanes, so that through-traffic is not impeded by turning traffic.

To improve network performance issues identified from the 2041 Future Do Nothing scenario, localized intersection improvement techniques were considered (e.g., traffic signal improvements, channelization, etc.). **Table 2** provides a list of the mitigation measures needed to improve operations.

Table 2: Intersection Mitigation Measures for Future Do Nothing Option (2041)

Intersection	AM Peak Hour
Teston / Jane	*Geometric Modifications* Westbound Dual Left Lanes *Phasing Adjustments* Fully Protected EB and WB Left Turns Southbound Right Turn Overlap
Teston / Keele	*Geometric Modifications* Eastbound Right Turn Lane Westbound Right Turn Lane *Phasing Adjustments* Southbound Right Turn Overlap
Teston / Dufferin	*Geometric Modifications* Westbound Dual Left Lanes Northbound Dual Left Lanes Eastbound Right Turn Lane Westbound Right Turn Lane Southbound Right Turn Lane *Phasing Adjustments* Fully Protected Left Turns (All Approaches)

The mitigation measures included provide substantial reductions in vehicle delays at study area intersections. However, this alternative was not carried forward as it would not fully address the P&O either as a standalone or combination with other alternatives.

3.1.4 New Cycling and/or Pedestrian Infrastructure

New infrastructure for cycling and/or pedestrians could include bike paths, multiuse paths, sidewalks, cycle-tracks and/or on-road bike lanes.

While this type of infrastructure could not address the study's P&O as a standalone alternative it could work in combination with other alternatives to address connectivity or create more opportunities for pedestrians and cyclists to not use a vehicle.

These types of improvements will be examined for inclusion with the preferred alternative if a new roadway or expanded roadway is preferred.

3.1.5 Improved and/or New Transit Services

3.1.5.1 Expand Transit System Capacity by Increasing Service Frequency

Increased transit service, facilities and ridership are expected to make a significant contribution to accommodating future travel

demand within and across the study area (likely 14% of transit mode share in 2041). A sensitivity analysis was conducted to increase 2041 transit ridership/transit mode share by 10 to 15%. Consequently, a link analysis was performed for the year 2041 using York Region's 2041 travel demand (Origin-Destination Matrix with 15% reduction) and 2041 Future Do Nothing network.

It can be observed in **Figure 2** that congested conditions will exist in the westbound direction along Kirby Road and Major Mackenzie Drive particularly between Keele Street and Dufferin Street. In addition, the majority of southbound movements experience very congested conditions mainly south of Teston Road.

The analysis results suggest that it is very unlikely that transit alone can address the P&O as the network will not adequately accommodate the trip patterns of many travelers and a growth in transit mode share to up to 30% to 40% is likely unrealistic in 2041.

While this alternative is not carried forward as a standalone due to the above, it could work in combination with other alternatives.

A snapshot of the 2041 EMME subarea network for the Future Do Nothing Option and 2041 reduced travel demand is included in **Appendix C**.

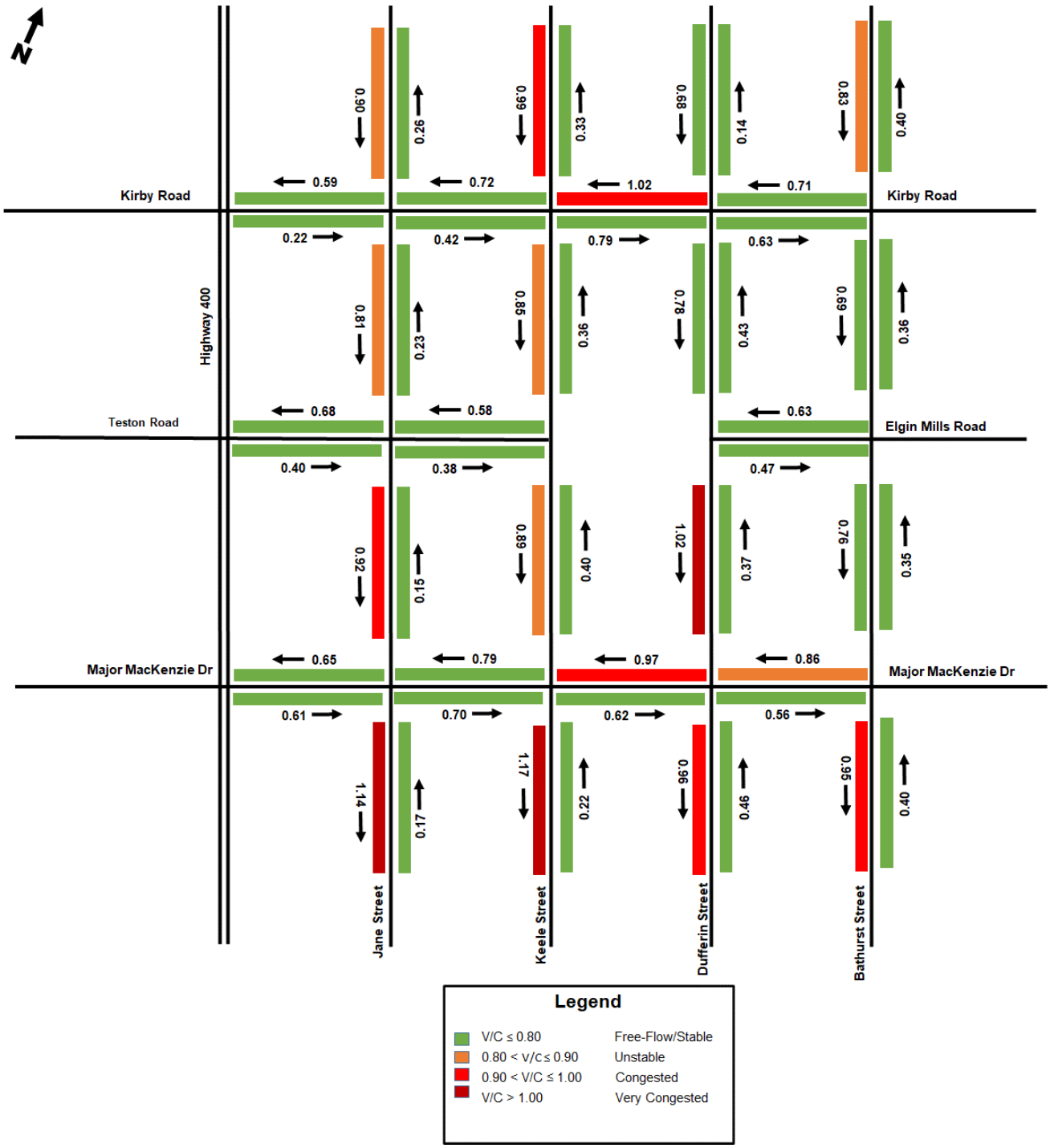


Figure 2: 2041 Link Analysis for the Do Nothing Option and Reduced Travel Demand – AM Peak Hour

3.1.5.2 Create New Transit Routes on Existing Corridors

York Region uses other studies to determine appropriate routes for new transit and implements them as feasible.

Similarly to **Section 2.1.5.1**, it is very unlikely that transit alone can fully address the P&O as the network will not adequately accommodate the trip patterns of many travelers and the growth in travel demand, therefore this alternative is carried forward in combination with other alternatives but not as a standalone alternative.

3.1.5.3 Build Bus Rapidways / Reserved Bus Lanes (Bus Only Lanes) on Existing Corridors

Providing additional bus rapidways or Bus Only Lanes (BOL) on expanded existing corridors (above and beyond planned Major MacKenzie Drive rapidway) has the potential to address the problem/opportunities in combination with other alternatives.

To implement this alternative, it would likely require some new roadway capacity (at least one lane per direction on an existing corridor) which constrains the feasibility of this alternative.

This alternative was carried forward for analysis in combination with other alternatives.

3.1.6 Improved Existing/Planned Transitways

While the provision of improved capacity and operations on existing transitways may increase the performance of the transportation network, opportunities to do so within the study area are limited and this would not be in conformance with Regional policy. The only planned existing transitway is along Major Mackenzie Drive West which has not yet been implemented.

One way to improve this planned transitway would be to provide grade separation but this would be cost-prohibitive and not likely to attract significant additional transit ridership.

This alternative was not carried forward.

3.1.7 New Transitways

New Transitways would require a new corridor through the Study Area to provide dedicated infrastructure exclusive to transit. This alternative was determined to not be feasible as there is no undeveloped area that could serve as a dedicated transitway serving peak period east-west travel demand.

In addition, as discussed previously, it is very unlikely that transit alone can fully address the P&O as the network will not adequately accommodate the trip patterns of many travelers and the growth in travel demand, therefore this alternative is not carried forward in combination with other alternatives or as a standalone alternative.

3.1.8 Improved Existing Roadways

Improving existing roadways includes widening roads to provide more capacity. This could include additional lanes for general purpose use, HOV, or reserved bus lanes.

Improving existing roadways beyond currently planned improvements could address the problem/opportunities either as a stand-alone alternative or in combination with other alternatives. Therefore, this alternative was carried forward.

3.1.9 New Roadways

New roadways beyond currently planned improvements could address the problem/opportunities either as a stand-alone alternative or in combination with other alternatives.

This alternative was carried forward.

3.1.10 Combinations of the Above

Based on the above analysis, several alternatives could be combined to potential address the P&O. These alternatives include:

- **4.1 New Cycling and/or Pedestrian Infrastructure**
    - **A** - New Pedestrian/Cycling Crossing of Don River Tributary between Keele and Dufferin
- **5.0 Improved and/or New Transit Services** including one or more of the following:
    - **B1** - Expand Transit System Capacity by Increasing Service Frequency and/or Create New Transit Routes on Existing Corridors
    - **B2** - Widen Kirby (Yonge to Hwy. 400 with 1 new BOL/Direction)
- **8.1 Improved Existing Roadways (including GPLs or HOV lane**s) – Various Options
    - **C1 / C2** - Widen Kirby (Yonge to Hwy. 400 with 1 new GPL/Direction or 1 new GPL plus 1 new HOV Lane/Direction)
    - **D1 / D2** - Widen Teston (Yonge to Dufferin with 1 to 2 new GPLs/Direction) + Widen Dufferin (Teston to Kirby with up to 1 to 2 new GPLs/Direction) + Widen Kirby (Dufferin to

Hwy. 400 with 1 new GPL/Direction or 1 new GPL plus 1 new HOV Lane/Direction)

- **E** - Widen Dufferin (Teston to MMD with 1 new GPL/Direction), Widen MMD (Dufferin to Keele with 1 new GPL/Direction) & Widen Keele (MMD to Teston with up to 1 new GPL/Direction)

- **F1 / F2** - Widen Dufferin (Teston to Kirby with up to 1 to 2 new GPLs/Direction), Widen Kirby (Dufferin to Keele with 1 to 2 new GPLs/Direction) & Widen Keele (Kirby to Teston with 1 to 2 new GPLs/Direction)

- **G** - Widen Dufferin (MMD to Kirby with 1 new GPL/Direction), Widen MMD (Dufferin to Keele with 1 new GPL/Direction), Widen Kirby (Dufferin to Keele with 1 new GPL/Direction), and Widen Keele (MMD to Kirby with 1 new GPL/Direction).

3.2 Short List of Alternatives

The long list of alternatives was screened to produce the following four shortlisted alternatives to address the P&O Statement:

- Alternative 1 - 1.1 Future Do Nothing (for comparison only)

- Alternative 6M - New Ped/Cycling Crossing of Don River Tributary between Keele and Dufferin + Widen Kirby to 6 Lanes (Bathurst to Hwy. 400) with 1 new HOV Lane/Direction

- Alternative 8M - New Ped/Cycling Crossing of Don River Tributary between Keele and Dufferin + Widen Kirby to 6 Lanes (Dufferin to Keele) with 1 new GPL/Direction & Widen Keele to 6 Lanes (Kirby to Teston) with 1 new GPL/Direction

- Alternative 10 - New 4-lane Teston Extension – Keele to Dufferin (Including New Pedestrian/Cycling Facilities and Transit Service/Routes on the Corridor)

4. ANALYSIS OF SHORT-LISTED ALTERNATIVES

Analysis of the 2041 planning horizon was undertaken to assess each of the short-listed alternatives from a traffic perspective. Two types of analysis were employed – the first assessed link capacity utilizing demand forecasts from the Region's EMME model by looking at screenline demand versus capacity, while intersection capacity was assessed using Synchro/Sim-Traffic and looked at specific turning movements.

4.1 Analysis Methodology

As mentioned in TSTR #1, link and intersection traffic volumes were estimated using existing turning movement counts (TMC), the existing (2016) and the future (2041) EMME models. The York Region EMME models (comparing the 2016 model vs. the 2041 model) were used to estimate the growth rate between existing and future traffic conditions.

4.1.1 Link Analysis

Midblock road network conditions were assessed for all short-listed alternatives using the volume to capacity ratio (V/C) to assess link operation. The V/C ratio reflects AM peak hour traffic demand measured against roadway capacity. For further discussions please refer to **Table 37** in TSTR #1.

Screenline Analysis

The travel demands were developed at strategic screenlines for all short-listed alternatives. The 2041 peak direction (westbound and southbound) travel demands at five screenlines were then compared with the available capacity and the travel deficiency or surplus was derived. **Figure 3** illustrates the location of these five screenlines.

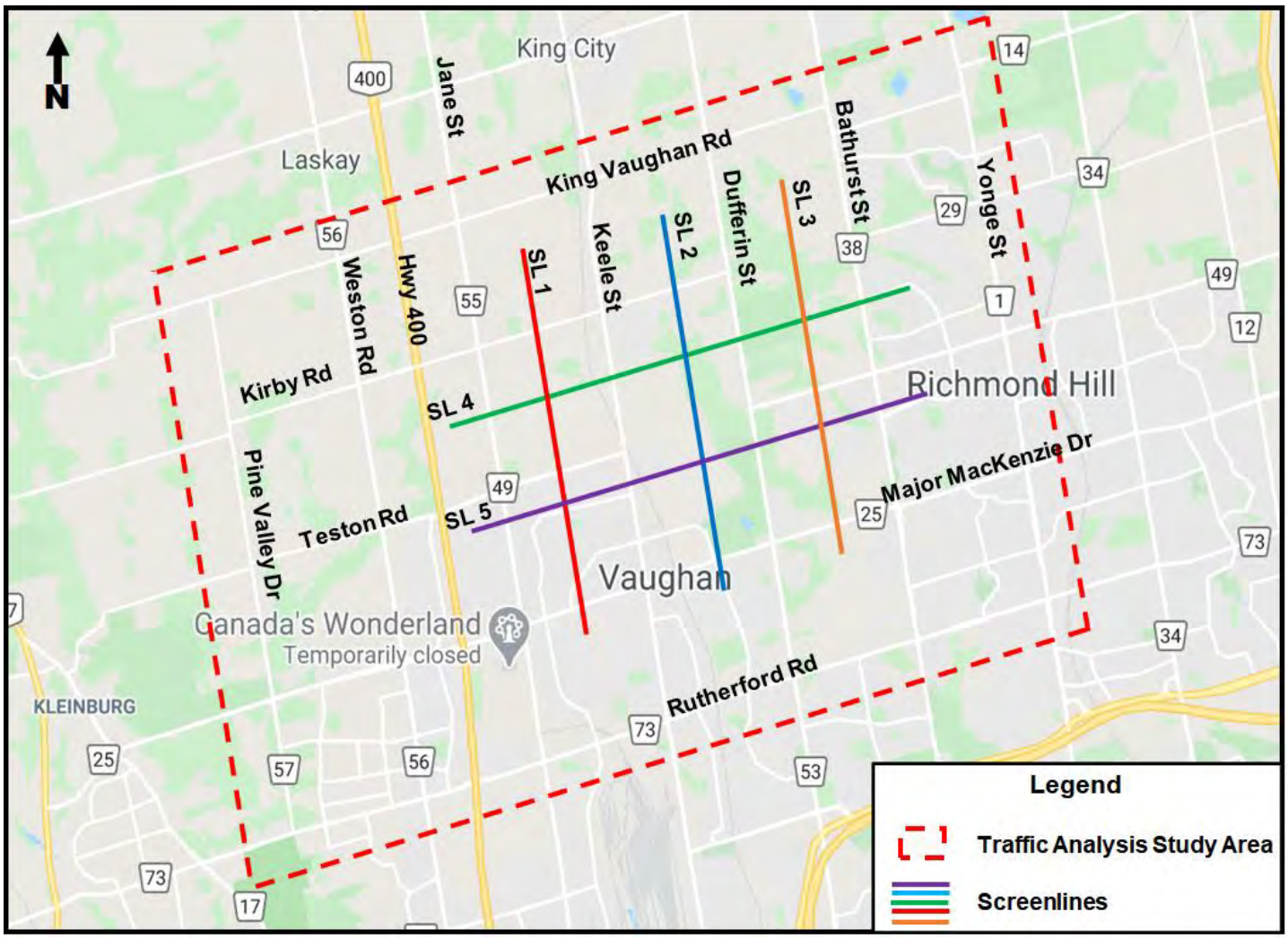


Figure 3: Study Area Screenlines

4.1.2 Intersection Analysis

An evaluation of the performance of the signalized intersections within the study area was completed using Synchro 10 for short listed alternatives (2041) during the morning peak hour.

Based on the discussion with York Region staff, it was determined that V/C targets of 90% or better for Screenline analysis and 85% or better for intersections are the Region's expectations for this level of planning.

5. ALTERNATIVE 1 FUTURE DO NOTHING

As show in **Figure 4**, the Future Do Nothing Alternative includes planned / proposed 2041 transportation network improvements identified in the York Region's 2016 TMP (e.g., GTA West) with the exception of the Teston Road extension between Keele Street and Dufferin Street.

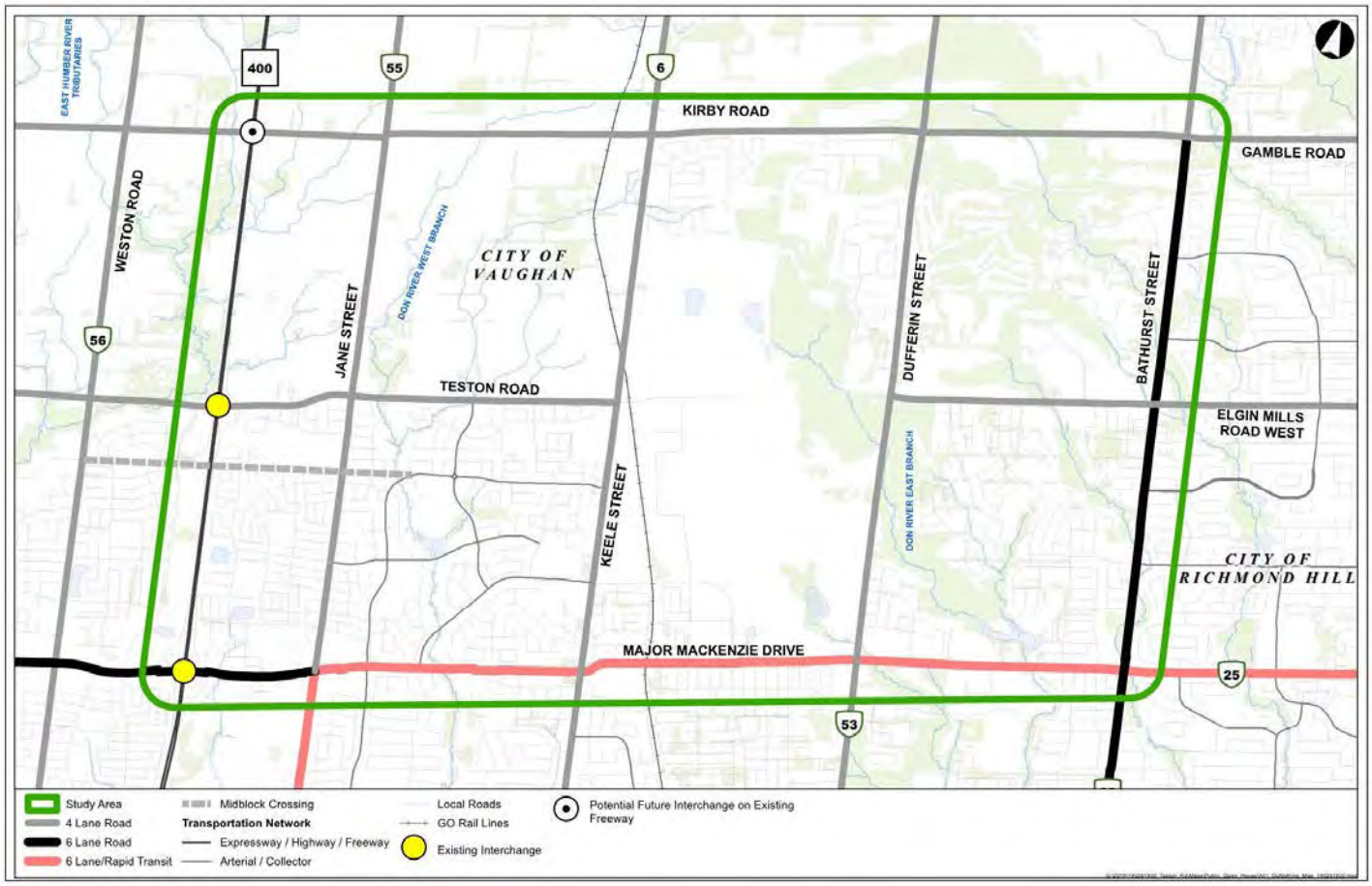


Figure 4: Alternative 1 – Future Do Nothing

5.1 Traffic Analysis

A detailed traffic analysis was completed for the 2041 Do Nothing scenario in TSTR # 1, and the results are summarized in the subsequent sections.

5.1.1 Link Analysis for Alternative 1 (Do Nothing)

A link analysis was conducted for Alternative 1 (Do Nothing) using the 2041 traffic volumes reported from the model during the morning peak hour. **Figure 5** illustrates the 2041 V/C ratios for each key roadway. The figure indicates that virtually all westbound movements on parallel arterial roads to the north and south of Teston Road and all southbound movements along north-south arterial roads are expected to exceed capacity.

It is very evident that the traffic flow in order to complete their direction of travel causes increased vehicle movements on adjacent arterial roads (e.g., Keele Street) and creates a barrier to people from other subdivisions (e.g., Drummond Drive) to access these already congested roadways.

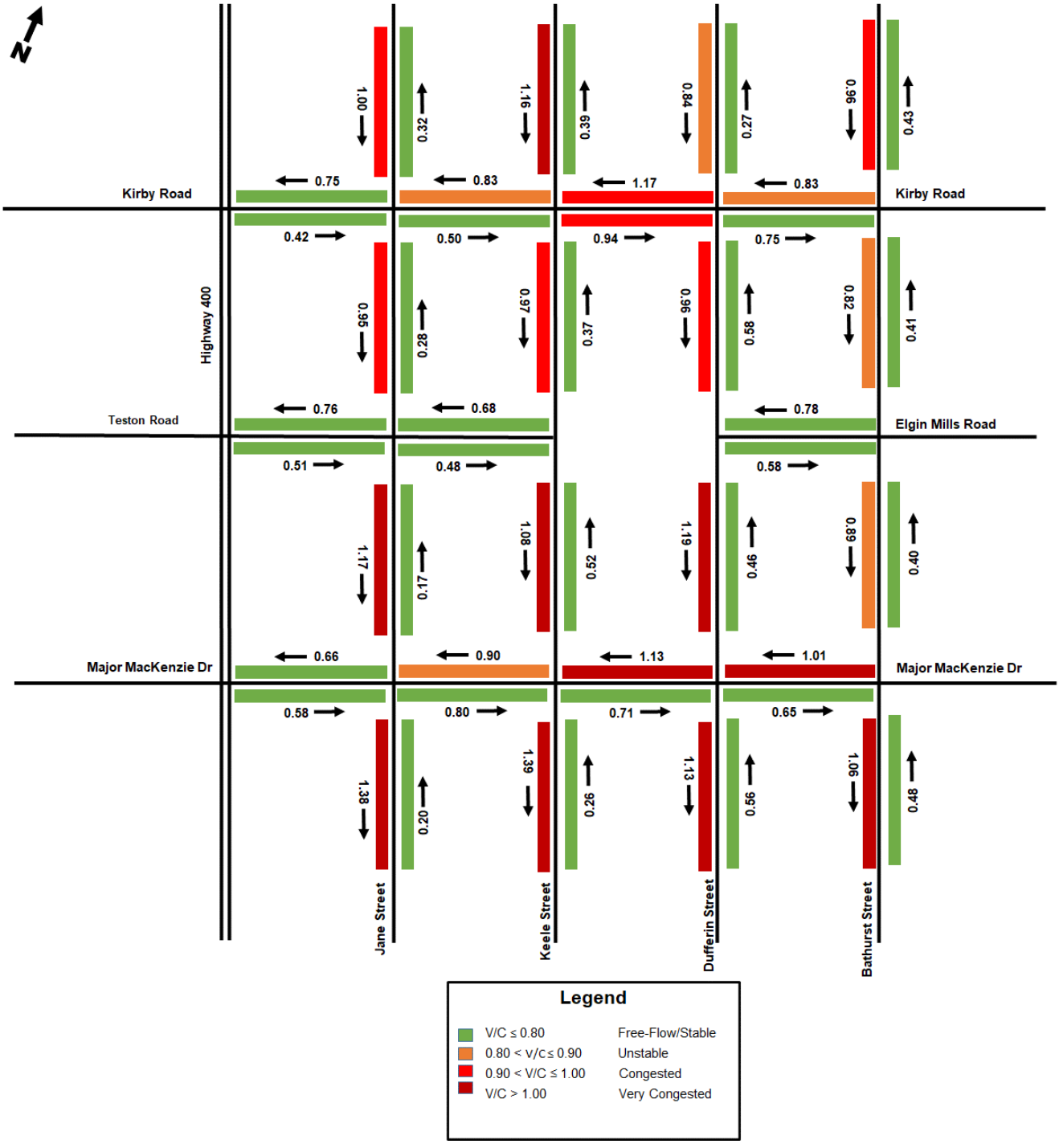


Figure 5: 2041 Link Analysis for Alternative 1 (Do Nothing) - AM Peak Hour

Table 3 illustrates the V/C ratio for each key roadway at the five screenlines in the study area for the 2041 Do Nothing Option. The overall V/C for Screenlines SL1, SL3 and SL4 exhibit values of 0.90 or less; however, Screenlines SL2 and SL5 exhibit values of 1.15 and 1.05, respectively, indicating that the demand exceeds the available capacity.

A snapshot of the 2041 EMME subarea network for Do Nothing Option is included in **Appendix A**.

Table 3: AM Peak Hour / Peak Direction Assigned Volumes and V/C (2041 EMME Model for Alternative 1 "Do Nothing")

Section	Volume	# Lanes (Per Direction)	Lane Capacity (Per Direction)	Total Capacity (Per Direction)	V/C
Screenline 1					
Major Mackenzie Dr	1,439	2	800	1,600	0.90
Teston Rd	1,217	2	900	1,800	0.68
Kirby Rd	1,497	2	900	1,800	0.83
Screenline Total	4,153	6		5,200	0.80
Screenline 2					
Major Mackenzie Dr	2,039	2	900	1,800	**1.13**
Kirby Rd	2,114	2	900	1,800	**1.17**
Screenline Total	4,153	4		3,600	**1.15**
Screenline 3					
Major Mackenzie Dr	1,823	2	900	1,800	**1.01**
Teston Rd	1,406	2	900	1,800	0.78
Kirby Rd	1,489	2	900	1,800	0.83
Screenline Total	4,718	6		5,400	0.87
Screenline 4					
Jane St	1,901	2	1,000	2,000	0.95
Keele St	1,748	2	900	1,800	0.97
Dufferin St	1,914	2	1,000	2,000	0.96
Bathurst St	2,942	3	1,200	3,600	0.82
Screenline Total	8,505	9		9,400	0.90
Screenline 5					
Jane St	2,112	2	900	1,800	**1.17**
Keele St	1,728	2	800	1,600	**1.08**
Dufferin St	2,139	2	900	1,800	**1.19**
Bathurst St	2,657	3	1,000	3,000	0.89
Screenline Total	8,636	9		8,200	**1.05**

5.1.2 Intersection Capacity Analysis for Alternative 1 (Do Nothing)

A detailed traffic analysis was completed in TSTR # 1 for the 2041 Do Nothing scenario to provide an assessment of the projected traffic volume condition at study area intersections.

The results of the traffic analysis indicate that the projected traffic volumes cannot be accommodated by the 2041 Do Nothing scenario. Numerous failing (i.e., LOS F) turning movements were reported along with some locations reporting failing conditions for the whole intersection. The following

Table 4 provides a summary of intersections reporting the highest impacts to traffic operations within the study area. Detailed Synchro reports are provided in **Appendix B**.

Table 4: Critical Intersection Summary – 2041 Do Nothing Scenario

Intersections	Movements	Delay (s)	LOS	v/c Ratio	95th Queue (m)
Teston / Keele	NBL	88	F	1.01	109
	SBT	56	E	0.97	176
	Overall	42	D	0.77	-
Teston / Dufferin	WBL	113	F	1.09	205
	SBL	97	F	1.08	181
	SBTR	80	E	1.05	296
	Overall	77	E	0.88	-
Major MacKenzie / Keele	EBTR	58	E	0.92	244
	WBL	93	F	0.92	78
	WBTR	153	F	1.22	410
	SBTR	191	F	1.31	437
	Overall	126	F	1.20	-
Major MacKenzie / Dufferin	EBL	76	E	0.90	68
	WBL	58	E	0.88	93
	WBT	87	F	1.07	290
	NBL	246	F	1.39	131
	SBT	101	F	1.10	284
	Overall	76	E	1.08	-
Kirby / Keele	EBL	186	F	1.18	110
	EBR	57	E	0.64	81
	WBL	384	F	1.76	474
	NBL	323	F	1.42	42
	SBT	130	F	1.19	391
	Overall	139	F	1.43	-
Kirby / Dufferin	WBT	95	F	1.09	255
	NBL	143	F	1.18	204
	SBT	78	E	1.01	177
	SBR	63	E	0.84	143
	Overall	65	E	1.03	-

It was evident from examining planned / proposed roadway and intersection operations and reviewing forecast traffic flow demands that the 2041 Do Nothing Alternative is not a viable option. Attempting to “throw – off” the existing and forecasted Teston Road traffic flow demand will have a detrimental impact on the operations of numerous area roads and intersections.

The 2041 Do Nothing alternative is carried forward through this phase of the study to provide a baseline to compare against if none of the alternatives are implemented.

6. ALTERNATIVE 6M

Improving existing roadways includes widening the roads to provide more capacity. This could include additional lanes for general purpose use, HOV, or reserved BOLs.

York Region policy is not to build 6-lane roadways except where BOLs or HOV lanes are being warranted/included.

The 2041 Alternative 6M includes a new pedestrian/cycling crossing over the Don River Tributary between Keele Street and Dufferin Street and modifying the planned four-lane cross-section along Kirby Road to incorporate additional widening between Bathurst Street and Highway 400 (from 4 GPL lanes to 4 GPL lanes + 2 HOV lanes).

As shown in **Figure 6**, Alternative 6M includes York Region's 2041 EMME model with all planned / proposed network improvements identified in the York Region's 2016 TMP (e.g., GTA West) except for the Teston Road extension between Keele Street and Dufferin Street.

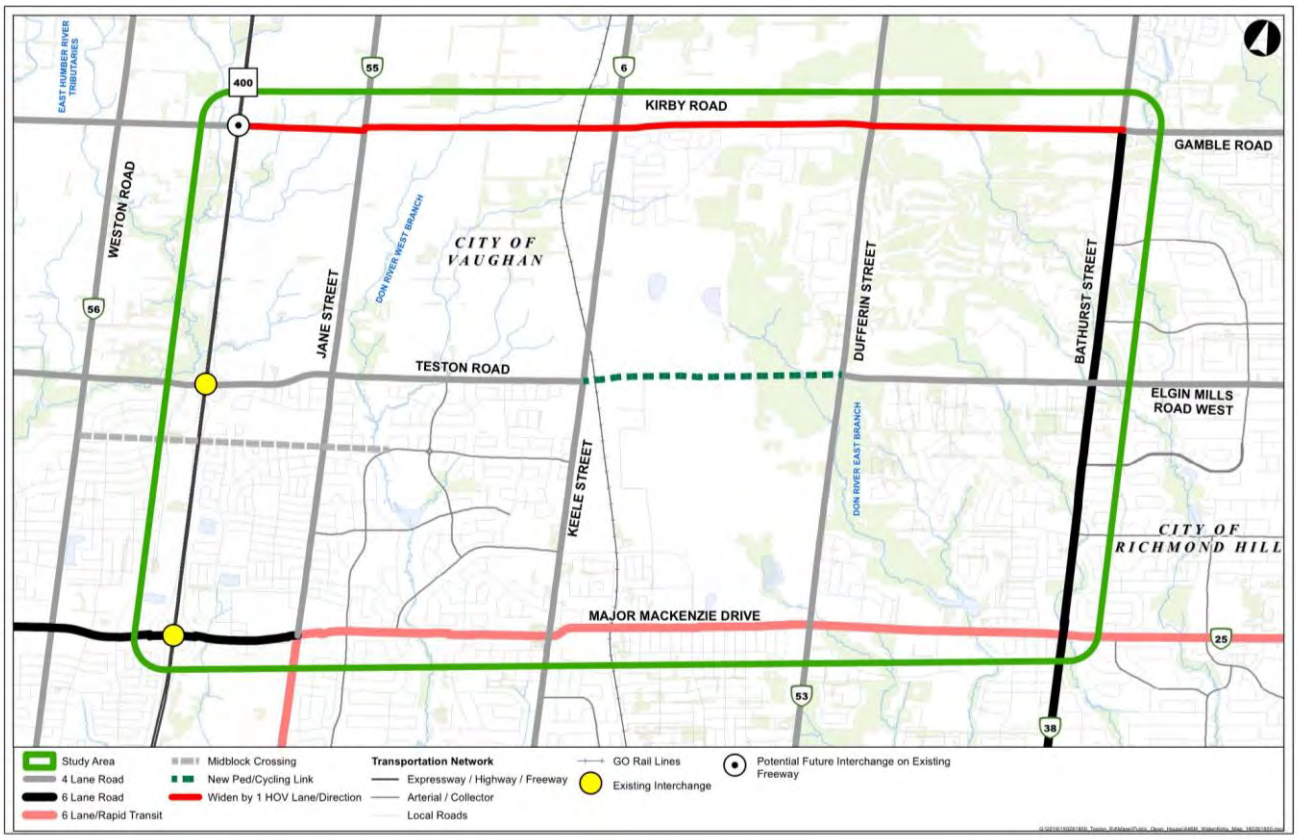


Figure 6: Alternative 6M

6.1 New Pedestrian/Cycling Crossing of Don River Tributary

A new crossing over the Don River Tributary would be included as part of Alternative 6M for dedicated pedestrian and cycling facilities only – likely a combination of a

bridge structure with approach embankments – which would extend between Keele Street and Dufferin Street.

6.2 Widening Kirby Road to 6 lanes (4 GPL Lanes + 2 HOV Lanes)

Currently Kirby Road has a two-lane rural cross-section without any cycling facilities. Narrow shoulders offer limited space for users and disabled vehicles. A concrete sidewalk of approximately 2.0 meters in width is available on the south side beyond the ditch from Keele Street to Dufferin Street. Utility poles and some vegetation are located relatively close to the edge of pavement. There is also a gated at-grade crossing of the Barrie GO Rail line approximately 300 m west of Keele Street.

York Region's 2016 TMP includes widening of Kirby Road between Pine Valley Drive and Dufferin Street from two to four lanes and the extension of Kirby Road between Dufferin Street and Bathurst Street as a four-lane roadway including a potential Kirby Road interchange with Highway 400.

Based on York Region's recommended cycling network for 2041, Kirby Road (between Highway 27 and Dufferin Street) will be a component of the overall bicycle network for York Region. Moreover, based on York Region's proposed strategic goods movement network for 2041, Kirby Road is designated as a primary arterial corridor to accommodate goods movement demands.

As mentioned above, the 2041 Alternative 6M involves modifying the planned four-lane cross-section along Kirby Road to incorporate additional widening between Bathurst Street and Highway 400 (from 4 GPL lanes to 4 GPL lanes + 2 HOV lanes) to accommodate the increased demand along the corridor due to background growth and new developments in the study area.

6.3 Traffic Analysis

A detailed traffic analysis was completed for Alternative 6M, and the results are summarized below.

6.3.1 Link Analysis for Alternative 6M

A link analysis was conducted for Alternative 6M using the 2041 traffic volumes reported from the EMME model during the morning peak hour.

Figure 7 illustrates the 2041 V/C ratios for each key roadway. This figure indicates that by 2041 with the Kirby Road widening to 6 lanes, the V/C ratios in the eastbound (-23%) and westbound (-13%) directions along Kirby Road (between Bathurst Street and Highway 400) are expected to improve significantly compared to Alternative 1. However, the V/C ratios improvements in the eastbound and westbound directions along Major Mackenzie Drive (between Bathurst Street and Highway 400) are negligible.

It is very evident that the traffic flows, in order to complete their direction of travel, still impact adjacent arterial roads (e.g., Dufferin Street and Keele Street) and create a barrier to travelers to access these already congested roadways. The figure indicates that virtually all southbound movements along north-south arterial roads are expected to exceed capacity.

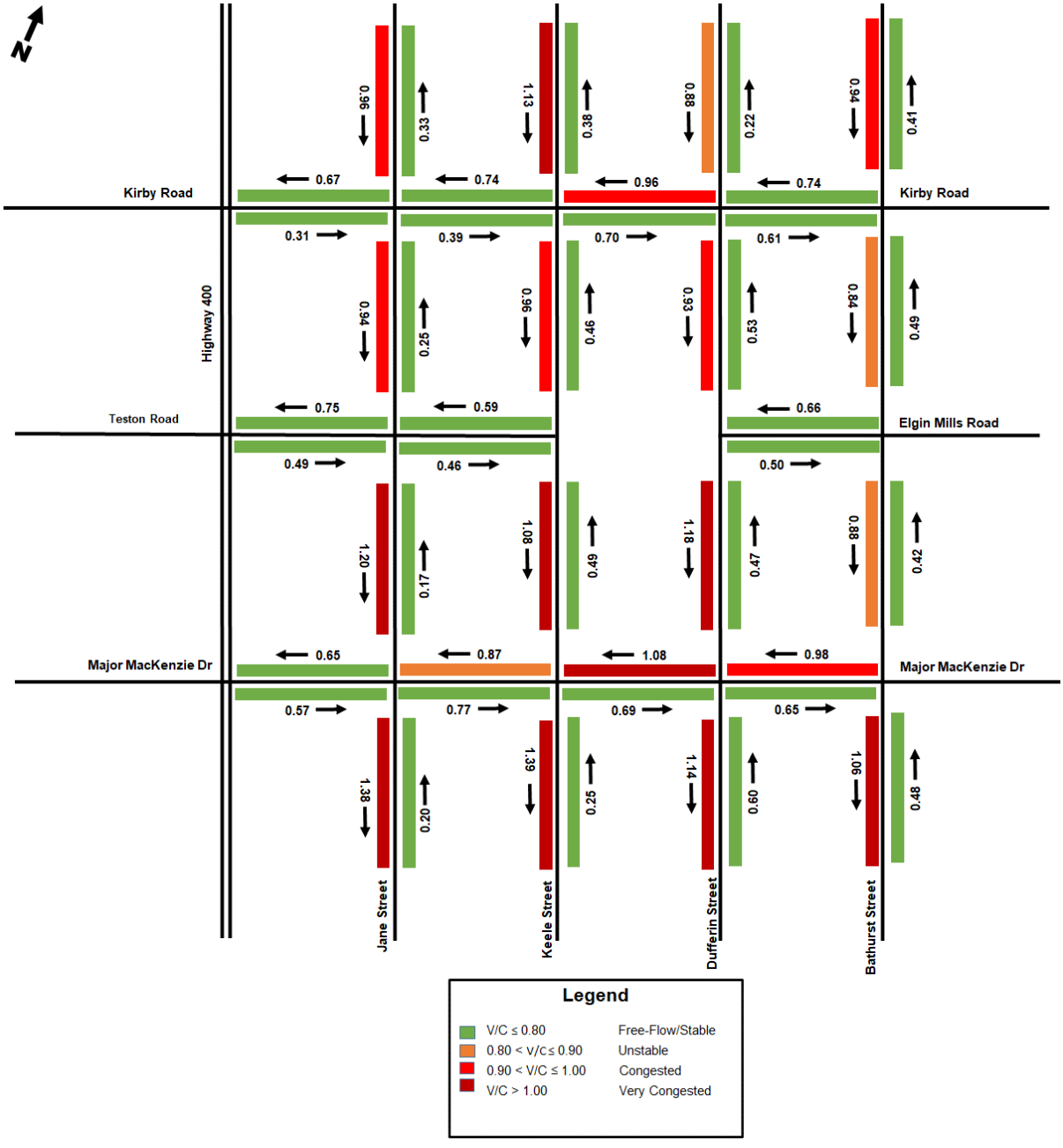


Figure 7: 2041 Link Analysis for Alternative 6M – AM Peak Hour

Table 5 illustrates the V/C ratio for each key roadway at the five screenlines in the study area for the 2041 Alternative 6M. The overall V/C for Screenlines

SL1, SL3 and SL4 exhibit values of 0.91 or less (although on average approximately 5% better than Alternative 1). Screenlines SL2 and SL5 exhibit values of 1.01 and 1.06, respectively, indicating that the demand still exceeds the available capacity (although on average approximately 6% better than Alternative 1).

A snapshot of the 2041 EMME subarea network for Alternative 6M is included in **Appendix D**.

Table 5: AM Peak Hour / Peak Direction Assigned Volumes and V/C (2041 EMME Model for Alternative 6M)

Section	Volume	# Lanes (Per Direction)	Lane Capacity (Per Direction)	Total Capacity (Per Direction)	V/C
Screenline 1					
Major Mackenzie Dr	1,388	2	800	1,600	0.87
Teston Rd	1,053	2	900	1,800	0.59
Kirby Rd	2,006	3	900	2,700	0.74
Screenline Total	4,447	7		6,100	0.73
Screenline 2					
Major Mackenzie Dr	1,936	2	900	1,800	**1.08**
Kirby Rd	2,588	3	900	2,700	0.96
Screenline Total	4,524	5		4,500	**1.01**
Screenline 3					
Major Mackenzie Dr	1,770	2	900	1,800	0.98
Teston Rd	1,191	2	900	1,800	0.66
Kirby Rd	1,990	3	900	2,700	0.74
Screenline Total	4,951	7		6,300	0.79
Screenline 4					
Jane St	1,886	2	1000	2000	0.94
Keele St	1,722	2	900	1800	0.96
Dufferin St	1,868	2	1000	2000	0.93
Bathurst St	3,038	3	1200	3600	0.84
Screenline Total	8,514	9		9,400	0.91
Screenline 5					
Jane St	2,152	2	900	1800	**1.20**
Keele St	1,735	2	800	1600	**1.08**
Dufferin St	2,127	2	900	1800	**1.18**
Bathurst St	2,649	3	1000	3000	0.88
Screenline Total	8,663	9		8,200	**1.06**

6.3.2 Intersection Capacity Analysis for Alternative 6M

Synchro is not a suitable tool to conduct analysis of HOV lanes; it cannot adequately replicate the on-street conditions and therefore, the synchro analysis was excluded for Alternative 6M.

7. ALTERNATIVE 8M

The 2041 Alternative 8M also incorporates the improvements proposed in Alternative 6M (Active Transportation Improvements) as well as modifying the planned four-lane cross-section along Kirby Road to incorporate additional widening between Dufferin Street and Keele Street (from 4 GPL lanes to 6 GPL lanes) and modifying the existing four-lane cross-section along Keele Street to incorporate widening Keele Street between Kirby Road and Teston Road (from 4 GPL lanes to 6 GPL lanes)

As shown in **Figure 8**, alternative 8M includes York Region's 2041 EMME model with all planned/ proposed network improvements identified in the York Region's 2016 TMP (e.g., GTA West) except for the Teston Road extension between Keele Street and Dufferin Street.

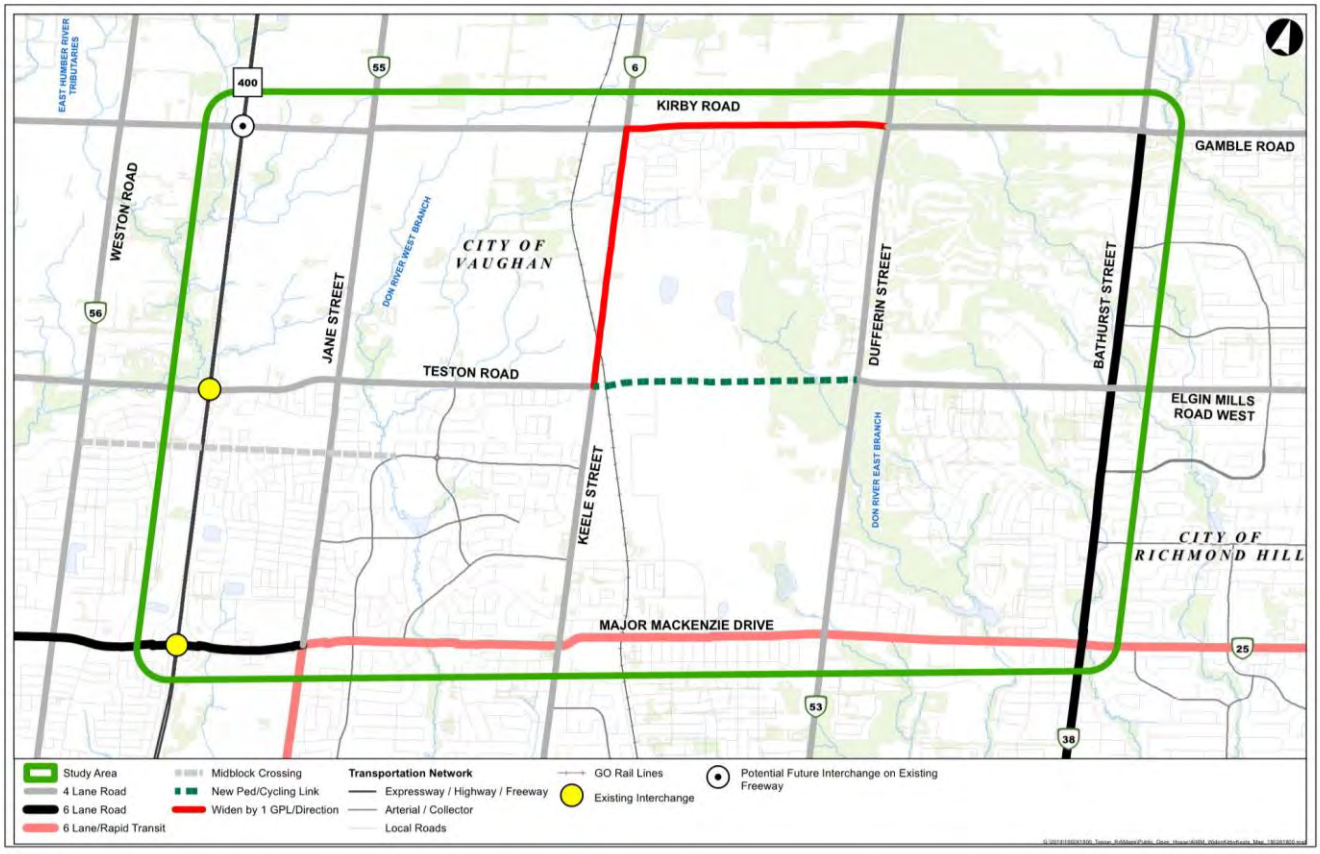


Figure 8: Alternative 8M

7.1 Widening Kirby Road and Keele Street to 6 GPLs

Currently Keele Street (York Regional Road 6) is a north-south urban arterial road with a 4-lane cross section and a posted speed limit of 50 km/h. Keele Street is generally surrounded by residential and agricultural lands as well as industrial lands to the north-east and south-east of the Teston Road intersection. The road is generally urban with sidewalks on both sides from Major Mackenzie Drive to McNaughton Road. The west side sidewalk continues to Teston Road. Keele Street then becomes a rural road with gravel shoulders to the north of Teston Road beyond

the Barrie GO Line grade separation structure. Dedicated on-street bike lanes are present on Keele Street between Masters Avenue to the north of McNaughton Road.

Based on York Region's recommended cycling network for 2041, dedicated facilities will be provided along Keele Street between Rutherford Road and Kirby Road to protect cyclists from vehicular traffic. There are no identified recommended improvements along Keele Street in the 2016 York Region TMP.

As mentioned above, the 2041 Alternative 8M involves modifying the planned four-lane cross-section along Kirby Road to incorporate additional widening between Dufferin Street and Keele Street (from 4 GPL lanes to 6 GPL lanes) and modifying the existing four-lane cross-section along Keele Street to incorporate widening Keele Street between Kirby Road and Teston Road (from 4 GPL lanes to 6 GPL lanes) to accommodate the increased demand along the corridor due to background growth and new developments in the study area.

7.2 Traffic Analysis

A detailed traffic analysis was completed for Alternative 8M and the results are summarized below.

7.2.1 Link Analysis for Alternative 8M

A link analysis was conducted for Alternative 8M using the 2041 traffic volumes reported from the EMME model during the morning peak hour. **Figure 9** illustrates the 2041 V/C ratios for each key roadway. The figure indicates that virtually all westbound movements on parallel arterial roads north and south of Teston Road and all southbound movements along north-south arterial roads are expected to exceed capacity.

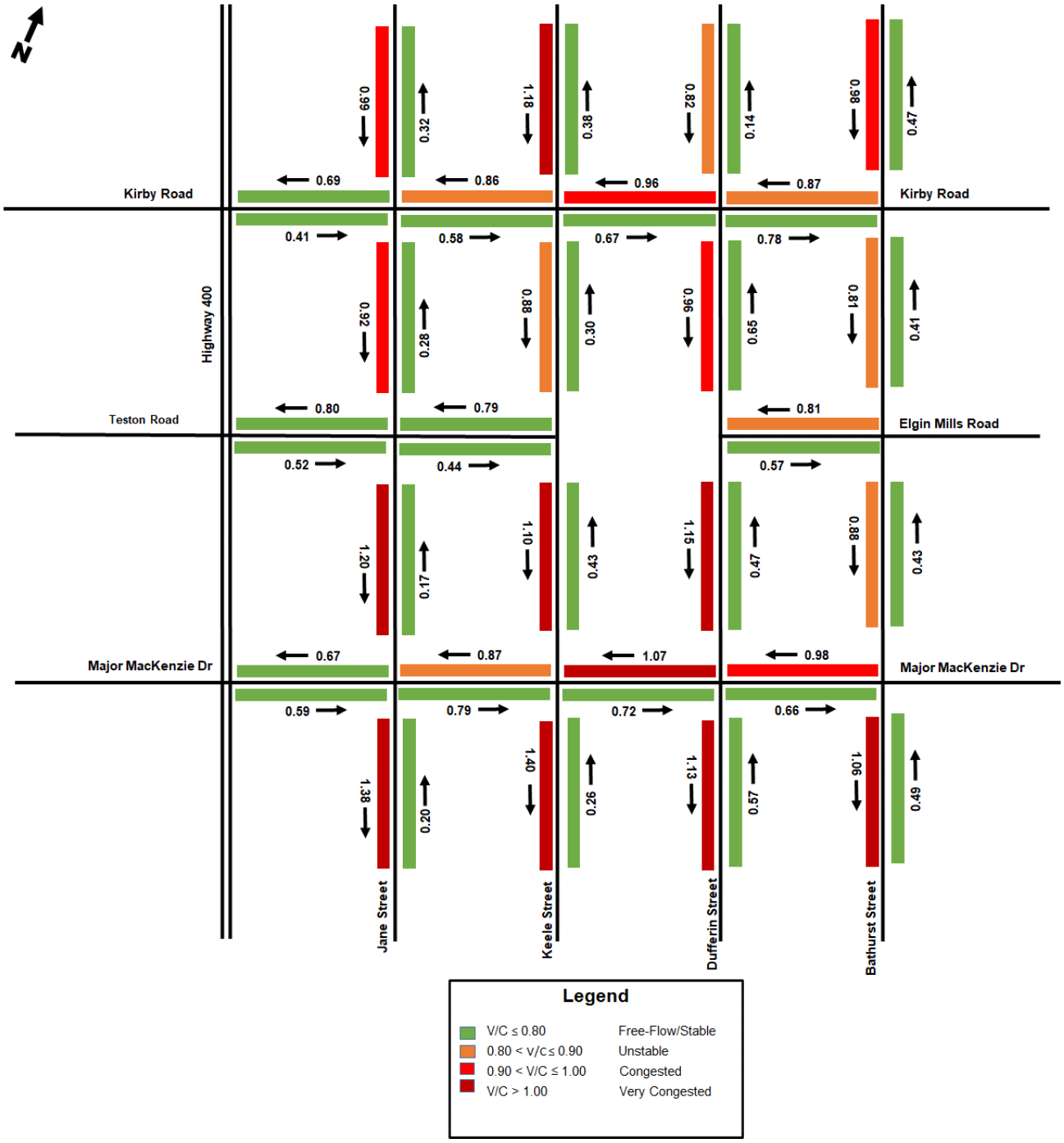


Figure 9: 2041 Link Analysis for Alternative 8M – AM Peak Hour

Table 6 illustrates the V/C ratio for each key roadway at the five screenlines in the study area for Alternative 8M. The overall V/C for Screenlines SL1, SL3 and SL4 exhibits values of 0.88 or less (although on average approximately 1% worse than Alternative 1). Screenlines SL2 and SL5 exhibit values of 1.00 and 1.05, respectively, indicating that the demand would still exceed the

available capacity (although on average approximately 7% better than Alternative 1).

A snapshot of the 2041 EMME subarea network for Alternative 8M is included in **Appendix E**.

Table 6: AM Peak Hour / Peak Direction Assigned Volumes and V/C (2041 EMME Model for Alternative 8M)

Section	Volume	# Lanes (Per Direction)	Lane Capacity (Per Direction)	Total Capacity (Per Direction)	V/C
Screenline 1					
Major Mackenzie Dr	1,398	2	800	1,600	0.87
Teston Rd	1,418	2	900	1,800	0.79
Kirby Rd	1,542	2	900	1,800	0.86
Screenline Total	4,358	6		5,200	0.84
Screenline 2					
Major Mackenzie Dr	1,926	2	900	1,800	**1.07**
Kirby Rd	2,596	3	900	2,700	0.96
Screenline Total	4,522	5		4,500	**1.00**
Screenline 3					
Major Mackenzie Dr	1,770	2	900	1,800	0.98
Teston Rd	1,449	2	900	1,800	0.81
Kirby Rd	1,563	2	900	1,800	0.87
Screenline Total	4,782	6		5,400	0.89
Screenline 4					
Jane St	1,845	2	1000	2000	0.92
Keele St	2,373	3	900	2700	0.88
Dufferin St	1,924	2	1000	2000	0.96
Bathurst St	2,924	3	1200	3600	0.81
Screenline Total	9,066	10		10,300	0.88
Screenline 5					
Jane St	2,159	2	900	1800	**1.20**
Keele St	1,766	2	800	1600	**1.10**
Dufferin St	2,078	2	900	1800	**1.15**
Bathurst St	2,643	3	1000	3000	0.88
Screenline Total	8,646	9		8,200	**1.05**

7.2.2 Projected Intersection Traffic Volumes (2041) for Alternative 8M

As shown in **Figure 10,** projected turning movement volumes were developed for the 2041 Alternative 8M based on trip patterns in the EMME model.

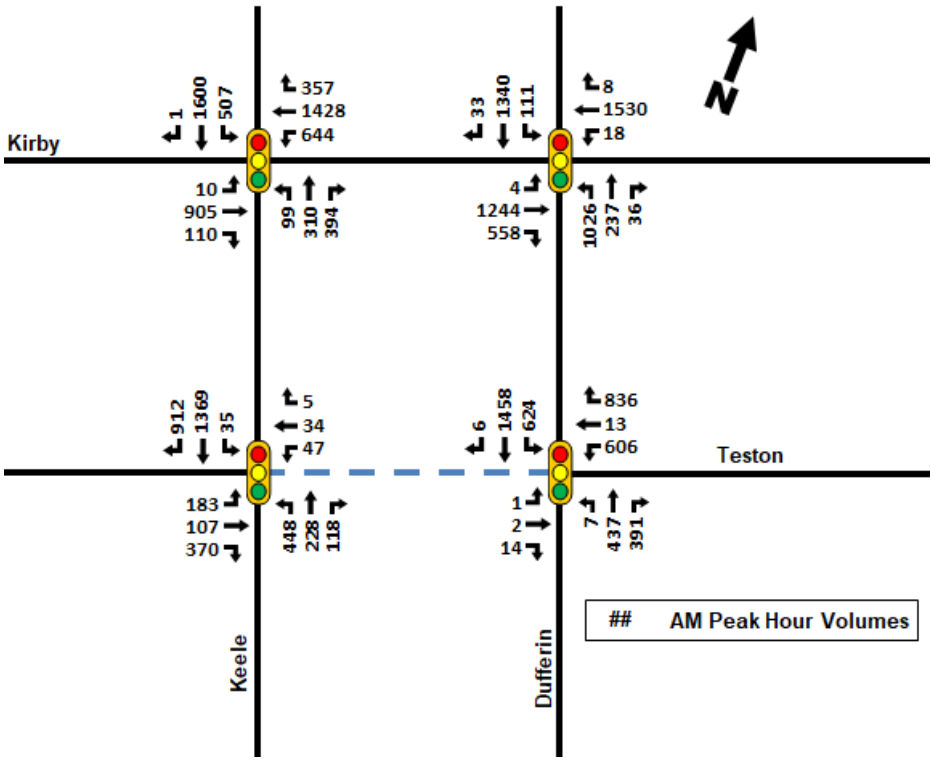
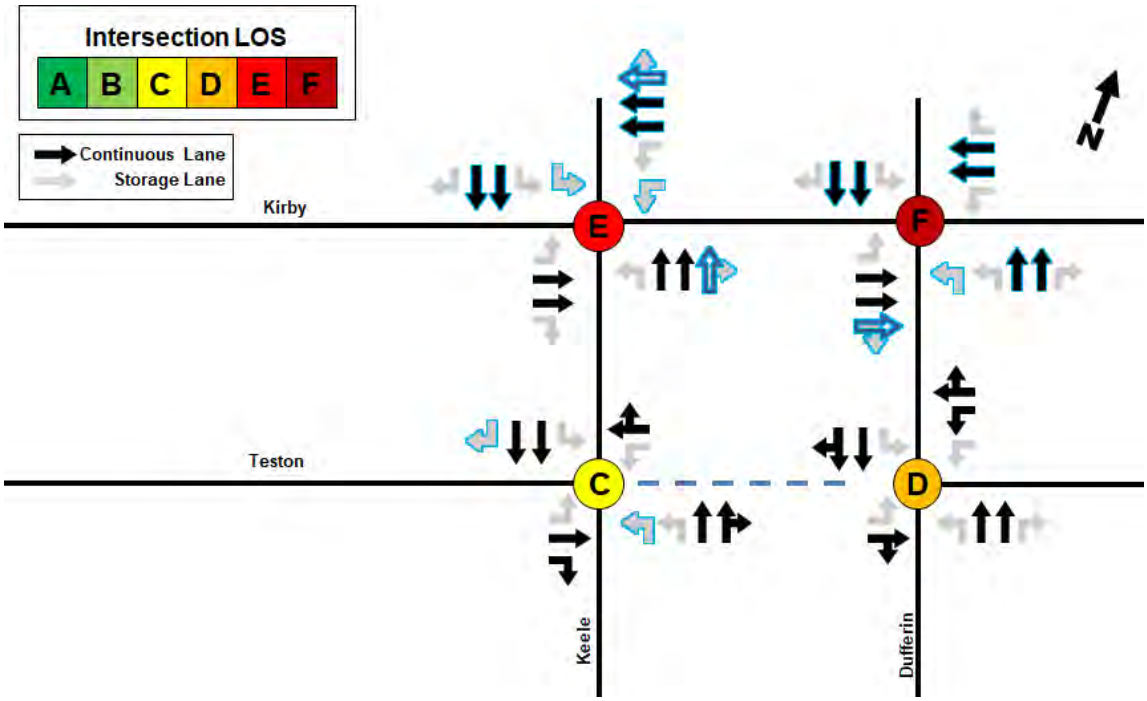


Figure 10: Projected Traffic Volumes (2041) for Alternative 8M



Note: Lane arrows outlined in blue are new lanes from background study area road widenings.

Figure 11: Future Intersection Operational Performance (2041) for Alternative 8M

7.2.3 Intersection Capacity Analysis for Alternative 8M

2041 traffic analysis was completed for Alternative 8M to provide an assessment of the projected traffic volume condition at intersections along the proposed widening routes.

To improve network performance, localized intersection improvements (e.g., traffic signal improvements, channelization, etc.) were considered.

Figure 11 and **Table 7** displays the results of this analysis. Detailed Synchro reports are provided in **Appendix F**.

The results of traffic analysis indicate that the 2041 projected traffic volumes cannot be accommodated by Alternative 8M. Numerous failing (i.e., LOS F) turning movements were reported along with some locations reporting failing conditions for the whole intersection. The following **Table 7** provides a summary of intersections reporting the highest impacts to traffic operations within the study area.

Table 7: Critical Intersection Summary – 2041 Alternative 8M

Intersections	Movements	Delay (s)	LOS	v/c Ratio	95th Queue (m)
Teston / Keele	NBL	61	E	0.89	74
	SBT	36	D	0.89	168
	Overall	35	C	0.73	-
Teston / Dufferin	WBL	91	F	1.01	116
	WBT	49	D	0.86	181
	SBL	86	F	1.08	189
	SBTR	32	C	0.85	192
	Overall	51	D	0.96	-
Kirby / Keele	EBT	93	F	1.05	168
	WBL	121	F	1.10	129
	WBT	37	D	0.85	161
	SBL	60	E	0.87	88
	SBT	87	F	1.08	275
	Overall	68	E	1.04	-
Kirby / Dufferin	EBT	69	E	1.00	225
	WBT	141	F	1.19	330
	NBL	172	F	1.23	235
	SBT	117	F	1.12	284
	Overall	111	F	1.16	-

8. ALTERNATIVE 10

Alternative 10 includes a new 4-lane Teston Extension between Keele Street and Dufferin Street including new pedestrian/cycling facilities and transit service/routes on the corridor.

As shown in **Figure 12**, Alternative 10 includes York Region's 2041 EMME model with all planned/ proposed network improvements identified in the York Region's 2016 TMP (e.g., GTA West) including the Teston Road extension between Keele Street and Dufferin Street.

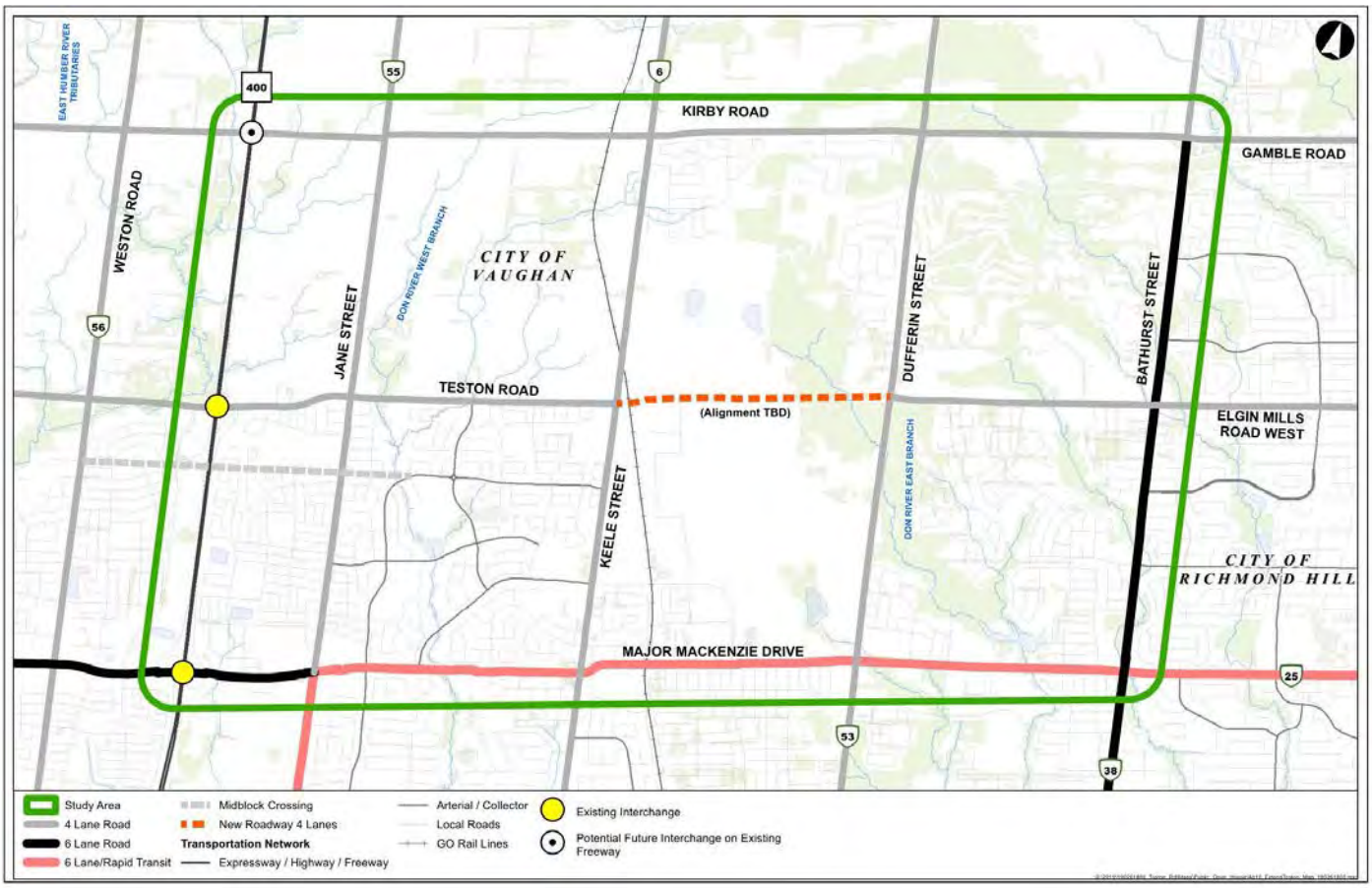


Figure 12: Alternative 10

8.1 Extending Teston Road between Keele Street and Dufferin Street

Teston Road (York Region Road 49) is an east-west arterial road with a 4-lane cross section (between Highway 400 and Keele Street) and 2-lanes (from Keele Street to Rodinea Road and from Dufferin Street to Bathurst Street) and a posted speed limit of 60 km/h. The posted speed limit is reduced to 50 km/h, east of Bathurst Street. There is a discontinuity along Teston Road between Keele Street and Dufferin Street.

Teston Road is currently urban with curbs without any cycling facilities along Teston Road between Highway 400 and Keele Street. Pedestrian facilities are only provided on the south side of Teston Road with a 1.5m concrete sidewalk with a landscaping boulevard west of Jane Street and a 3.0m multi-use pathway with a grassed boulevard east of Jane Street to Keele Street. Between Keele Street and Rodinea Drive, Teston Road has a rural cross-section with wide shoulders and ditches. Between Dufferin Street and Bathurst Street, a semi-urban cross-section is present with a curb and gutter, boulevard and sidewalk on the south side and a shoulder and ditch on the north side.

Currently there are no cycling facilities on Teston Road and cyclists share the travel lanes with vehicular traffic.

Based on York Region's recommended cycling network for 2041, separate facilities will be provided along Teston Road between Weston Road and Jane Street, and between Keele Street and Dufferin Street to protect cyclists from vehicular traffic.

York Region's TMP includes widening of the existing Teston Road to four lanes between Pine Valley Drive and Weston Road, and from Dufferin Street to Yonge Street. In addition, it is recommended to extend Teston Road between Keele Street and Dufferin Street as a four-lane roadway to accommodate additional traffic from anticipated developments.

Based on York Region's recommended transit network for 2041, Teston Road will be served by frequent transit service.

As mentioned above, Alternative 10 includes a new 4-lane Teston Extension between Keele Street and Dufferin Street Including new pedestrian/cycling facilities and transit service/routes on the corridor to accommodate the increased demand along the corridor due to background growth and new developments in the study area.

8.2 Traffic Analysis

A detailed traffic analysis was completed for Alternative 10 and the results are summarized below.

8.2.1 Link Analysis for Alternative 10

A link analysis was conducted for Alternative 10 using the 2041 traffic volumes reported from the EMME model during the morning peak hour. **Figure 13** illustrates the 2041 V/C ratios for each key roadway. The figure indicates that virtually all southbound movements along arterial roads exhibit over-capacity conditions, particularly south of Teston Road. All westbound

movements along Kirby Road, Teston Road and Major Mackenzie Drive function with a V/C ratio of 0.90 and less.

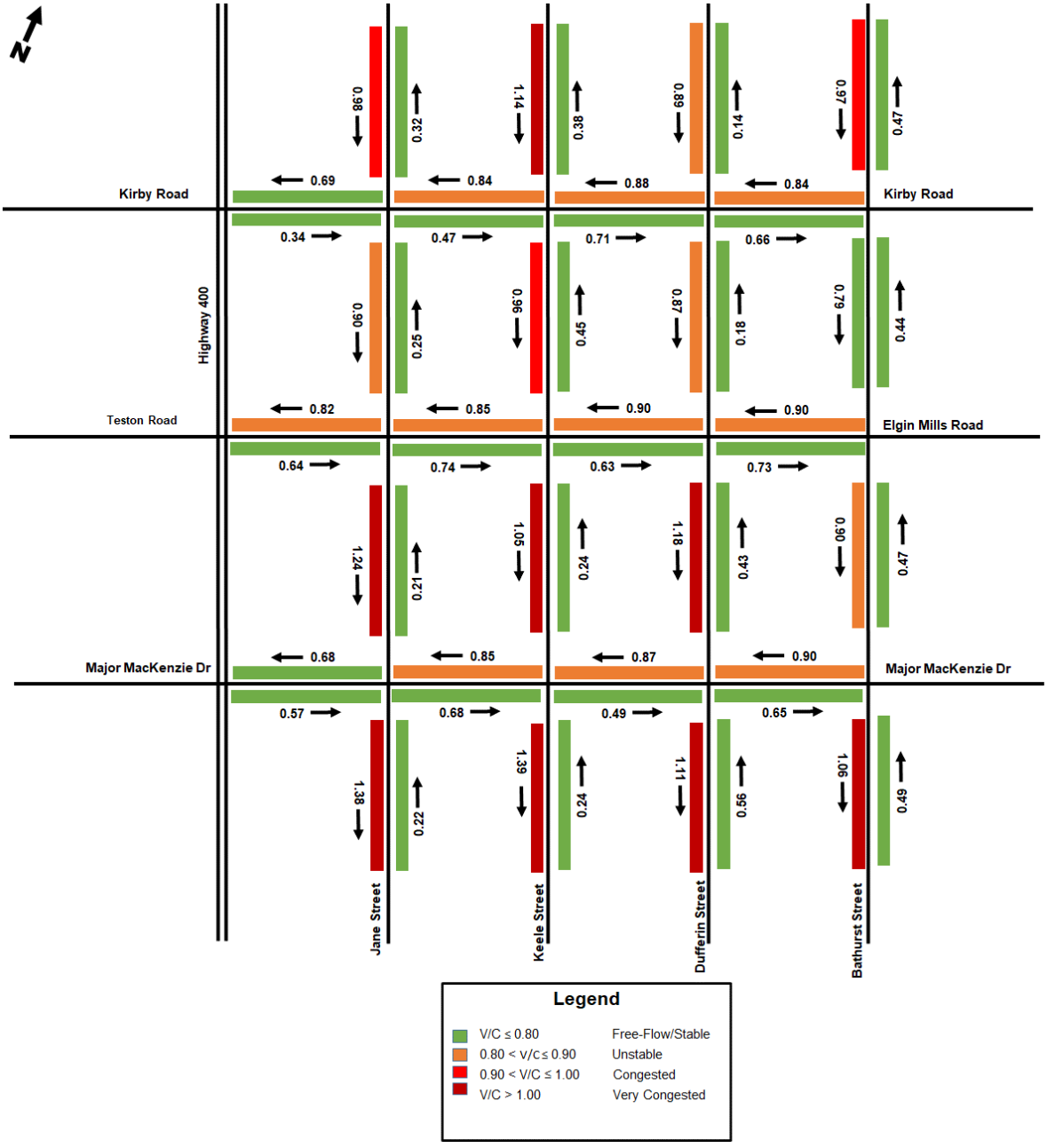


Figure 13: 2041 Link Analysis for Alternative 10 – AM Peak Hour

Table 8 illustrates the V/C ratio for each key roadway at the five screenlines in the study area for the year 2041. The overall V/C for Screenlines SL1 to SL4 exhibits values of 0.89 or less suggesting that the proposed capacity would accommodate future demand. Screenlines SL5 is over-capacity (i.e.,

V/C of 1.06) indicating that all southbound traffic flows south of Teston Road are expected to be very congested by the year 2041.

It is evident that by 2041 with the GTA West freeway in place and with the Kirby Road and Teston Road extensions available the area roads examined prove to be capable of accommodating primary peak hour peak direction demand flows.

A snapshot of the 2041 EMME subarea network for Alternative 10 is included in **Appendix G**.

Table 8: AM Peak Hour / Peak Direction Assigned Volumes and V/C (2041 EMME Model for Alternative 10)

Section	Volume	# Lanes (Per Direction)	Lane Capacity (Per Direction)	Total Capacity (Per Direction)	V/C
Screenline 1					
Major Mackenzie Dr	1,355	2	800	1,600	0.85
Teston Rd	1,522	2	900	1,800	0.85
Kirby Rd	1,503	2	900	1,800	0.84
Screenline Total	4,380	6		5,200	0.84
Screenline 2					
Major Mackenzie Dr	1,568	2	900	1,800	0.87
Teston Rd	1,637	2	900	1,800	0.91
Kirby Rd	1,585	2	900	1,800	0.88
Screenline Total	4,790	6		5,400	0.89
Screenline 3					
Major Mackenzie Dr	1,616	2	900	1,800	0.90
Teston Rd	1,611	2	900	1,800	0.90
Kirby Rd	1,518	2	900	1,800	0.84
Screenline Total	4,745	6		5,400	0.88
Screenline 4					
Jane St	1,805	2	1,000	2,000	0.90
Keele St	1,723	2	900	1,800	0.96
Dufferin St	1,747	2	1,000	20,00	0.87
Bathurst St	2,840	3	1,200	3,600	0.79
Screenline Total	8,115	9		9,400	0.86
Screenline 5					
Jane St	2,224	2	900	1,800	**1.24**
Keele St	1,675	2	800	1,600	**1.05**
Dufferin St	2,132	2	900	1,800	**1.18**
Bathurst St	2,698	3	1,000	3,000	0.90
Screenline Total	8,729	9		8,200	**1.06**

8.2.2 Projected Intersection Traffic Volumes (2041) for Alternative 10

As shown in **Figure 14,** projected turning movement volumes were developed for the 2041 Alternative 10 based on the EMME model.

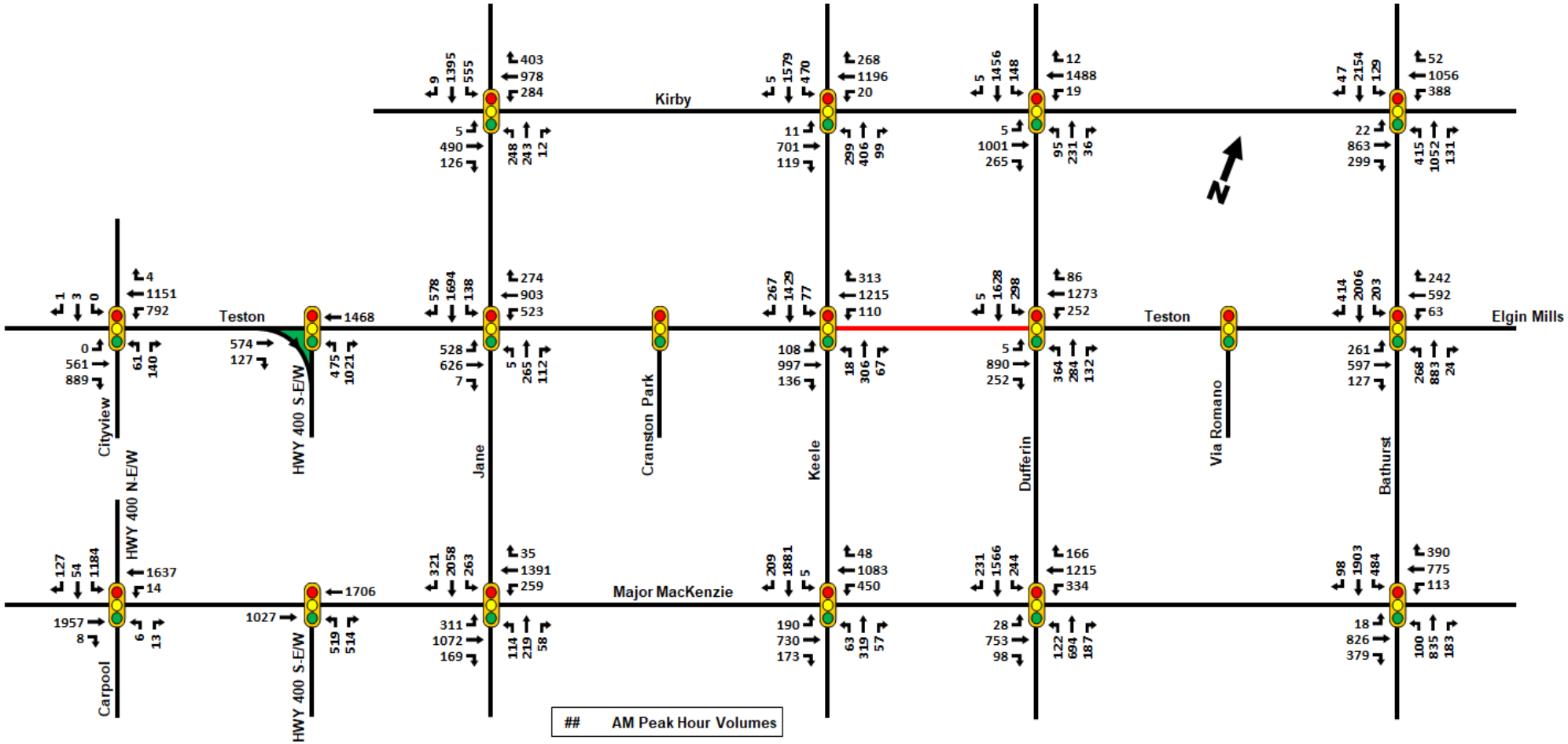
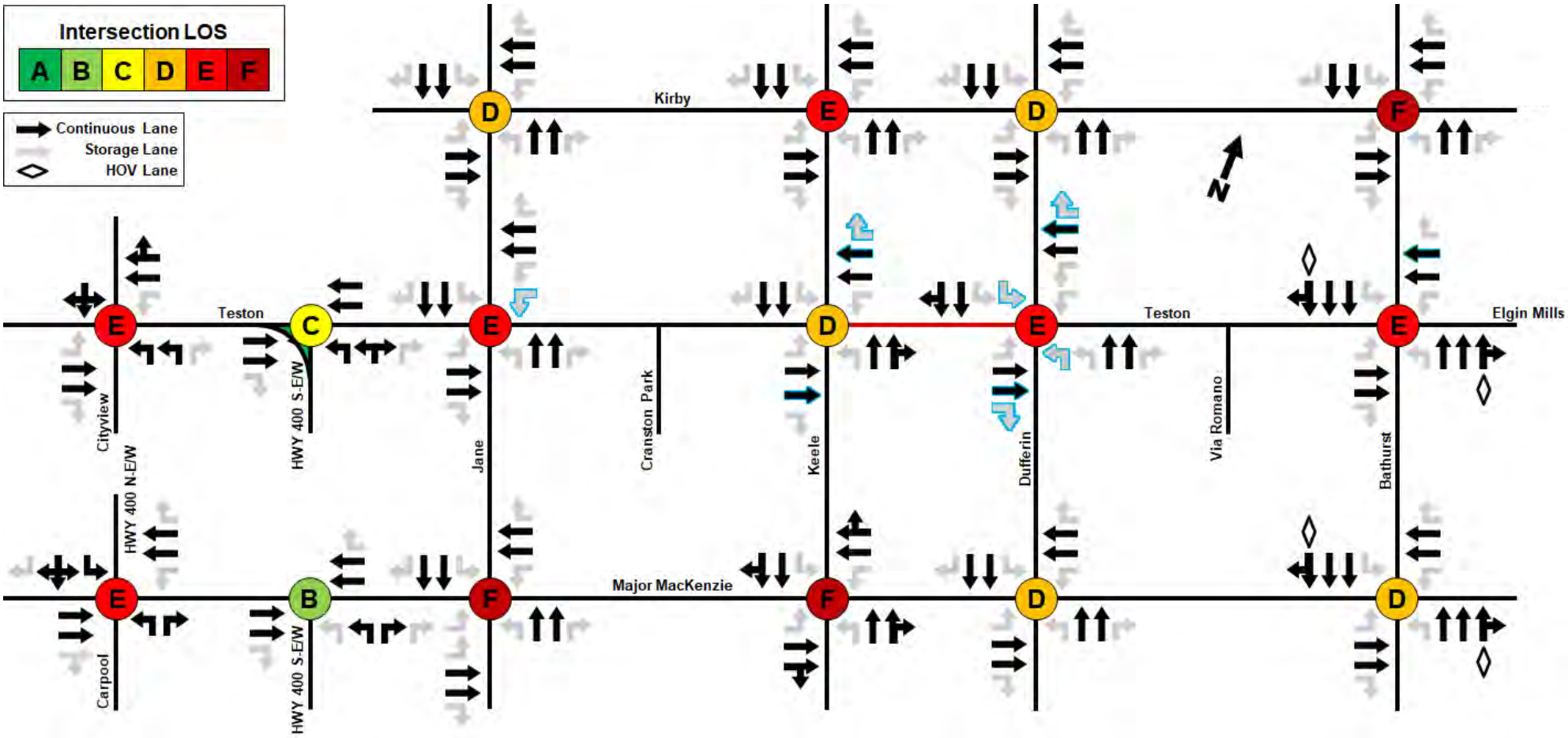


Figure 14: Projected Traffic Volumes (2041) for Alternative 10



Note: Lane arrows outlined in blue are new lanes from background study area road widenings.

Figure 15: Future Intersection Operational Performance (2041) for Alternative 10

8.2.3 Intersection Capacity Analysis for Alternative 10

Traffic analysis was completed for the 2041 Alternative 10 to provide an assessment of the projected traffic volume condition at study area intersections. To improve network performance, localized intersection improvements (e.g., traffic signal improvements, channelization, etc.) were considered.

Figure 15 shows the improvements in overall LOS at the following study area intersections comparing the Alternative 10 with Teston Road Extension and 2041 Do Nothing scenario:

- Kirby Road and Jane Street Intersection (improved from LOS E to D);
- Kirby Road and Keele Street Intersection (improved from LOS F to E);
- Kirby Road and Dufferin Street Intersection (improved from LOS E to D);
- Major Mackenzie Drive and Highway 400 S-E/W Ramp Terminal (improved from LOS C to B); and
- Major Mackenzie Drive and Dufferin Street Intersection (improved from LOS E to D).

The overall LOS at intersections along Teston Road is expected to remain unchanged with the exception of the Teston Road and Bathurst Street intersection that decreased from LOS D to E. The following **Table 9** provides a summary of intersections reporting the highest impacts to traffic operations within the study area. Detailed Synchro reports are provided in **Appendix H**.

Table 9: Critical Intersection Summary – 2041 Alternative 10

Intersections	Movements	Delay (s)	LOS	v/c Ratio	95th Queue (m)
Teston / Keele	WBT	56	E	0.97	207
	Overall	43	D	0.93	-
Teston / Dufferin	EBL	71	E	0.09	6
	EBT	56	E	0.82	155
	WBL	79	E	0.80	56
	WBT	66	E	0.97	266
	NBL	143	F	1.09	91
	SBL	67	E	0.67	58
	SBTR	106	F	1.12	321
	Overall	78	E	1.03	-
Major MacKenzie / Keele	EBL	101	F	0.98	88
	EBTR	98	F	1.04	186
	WBL	223	F	1.35	218
	WBTR	73	E	0.99	216
	SBTR	183	F	1.31	455
	Overall	131	F	1.17	-
Major MacKenzie / Dufferin	WBL	92	F	1.04	124
	SBT	76	E	1.04	286
	Overall	54	D	0.96	-
Kirby / Keele	WBT	78	E	1.01	235
	NBL	137	F	1.11	148
	SBT	63	E	1.00	286
	Overall	61	E	1.04	-
Kirby / Dufferin	WBT	71	E	1.03	267
	SBT	71	E	1.03	261
	Overall	54	D	0.99	-

9. EVALUATION OF ALTERNATIVES

Based on the findings of the traffic analysis of the short-listed alternatives, a detailed evaluation was completed to determine the preferred alternative. The detailed evaluation is provided in **Table 10.**

The qualitative and quantitative analysis presented in this report identifies Alternative 10 as the preferred alternative from a transportation planning and design perspective.

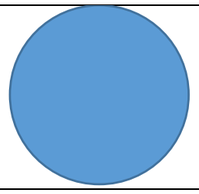
The next phase will include an examination of alternative alignments and cross-sections, structural alternatives for the GO Rail and Don River valley crossings and further evaluation of potential environmental impacts.

Several intersections along the Teston Road are projected to be at or over-capacity, and therefore, further intersection modifications such as lane configurations, right turn channelization, and intersection planning/timing should be explored in the next phase of the IEA process to further improve intersection LOS along the corridor.

Table 10: Evaluation of Alternatives from a Transportation Planning and Design Perspective

Factor	Sub-Factor and Measure	Alternative 1: Do Nothing – 2041 TMP Network, excl. Teston Road (Keele Street to Dufferin Street)	Alternative 6M: New Ped/Cycling Crossing and Widen Kirby to 6 Lanes (Bathurst Street to Hwy. 400) with 1 new HOV Lane/Direction	Alternative 8M: New Pedestrian/Cycling Crossing and Widen Kirby Road and Keele Street by 1 new General-Purpose Lane /Direction	Alternative 10: New 4-lane Teston Road Extension (incl. Pedestrian/Cycling facilities)
Transportation Planning and Design	**TDM/TSM** **Measure:** Makes effective and efficient use of the existing road and transit system using Transportation Demand Management (TDM) and Transportation System Management (TSM) strategies.	All the short-listed Alternatives include a range of TDM and TSM measures and strategies as part of York Region's 2041 TMP network, plans and policies as well as other applicable provincial/municipal plans and policies. While neither TDM nor TSM were selected as stand-alone Alternatives they are considered important elements of all short-listed Alternatives and will contribute to addressing the identified study area problems and opportunities.			
	Enhanced Modal Integration **Measure:** Improves mobility and accessibility through enhanced modal integration/choice for a more balanced transportation system.	**LEAST PREFERRED** All the short-listed Alternatives include a range of multi-modal measures and strategies as part of York Region's 2041 TMP network, plans and policies as well as other applicable provincial/municipal plans and policies. While neither Transit nor Active Transportation were selected as stand-alone Alternatives, they are considered very important elements of all short-listed Alternatives and will contribute to addressing the identified study area problems and opportunities.	**MOST PREFERRED** A widened Kirby Road corridor provides enhanced mobility and accessibility across the northern part of the study area for all modes of travel and directly enhances access to the proposed Kirby GO Transit station and Highway 400 HOV Lanes. A new Active Transportation crossing (bridge) of the Don River would significantly improve pedestrian/cycling mobility and accessibility through the mid-part of the study area.	**MODERATELY PREFERRED** A widened Kirby Road and Keele Street provides some enhanced mobility and accessibility across the northern part of the study area for all modes of travel – but less so than Alternative 6M. A new Active Transportation crossing (bridge) of the Don River would significantly improve pedestrian/cycling mobility and accessibility through the mid-part of the study area.	**MOST PREFERRED** A new 4-lane Teston Road extension provides enhanced mobility and accessibility across the mid-part of the study area for all modes of travel.
	Travel Demand **Measure:** Potential to accommodate 2041 peak hour peak direction east-west travel demand (vehicular traffic). Link (Corridor or Screenline) Volume to Capacity ratio (V/C) of York Region standard of 0.9 or better.	**LEAST PREFERRED** This alternative does not provide adequate capacity to address projected demand with both Kirby Road and MMD projected to be very congested between Dufferin Street and Keele Street (Screenline S2 at 1.15 V/C). Significant traffic diversion and out-of-way travel is expected to take place beyond the study area to King Vaughn Road and Rutherford Road.	**MODERATELY PREFERRED** This alternative does not provide adequate capacity to address projected demand with both Kirby Road and MMD projected to be congested to very congested between Dufferin Street and Keele Street (S2 at 1.01 V/C). Moderate traffic diversion and out-of-way travel is expected to take place beyond the Study Area to King Vaughn Road and Rutherford Road.	**LEAST PREFERRED** This alternative does not provide adequate capacity to address projected demand with both Kirby Road and MMD projected to be congested to very congested between Dufferin Street and Keele Street (S2 at 1.00 V/C). Traffic diversion and out-of-way travel is expected to take place beyond the Study Area to King Vaughn Road and Rutherford Road.	**MOST PREFERRED** This alternative provides adequate capacity to address projected demand with all three of Kirby Road, Teston Road and MMD projected to operate at or close to an acceptable level (S2 at V/C of 0.89). Little to no traffic diversion beyond the Study Area to the north or south.

Factor	Sub-Factor and Measure	Alternative 1: Do Nothing – 2041 TMP Network, excl. Teston Road (Keele Street to Dufferin Street)	Alternative 6M: New Ped/Cycling Crossing and Widen Kirby to 6 Lanes (Bathurst Street to Hwy. 400) with 1 new HOV Lane/Direction	Alternative 8M: New Pedestrian/Cycling Crossing and Widen Kirby Road and Keele Street by 1 new General-Purpose Lane /Direction	Alternative 10: New 4-lane Teston Road Extension (incl. Pedestrian/Cycling facilities)
	Discontinuity **Measure:** Assess the ability to address existing east-west travel discontinuity between Dufferin Street and Keele Street within the Study Area (vehicular traffic – autos, transit, goods movement, emergency vehicles).	**LEAST PREFERRED** This alternative does not address the existing east-west travel discontinuity for vehicular traffic in the road network between Dufferin Street and Keele Street within the Study Area.	**LEAST PREFERRED** This alternative does not address the existing east-west travel discontinuity for vehicular traffic in the road network between Dufferin Street and Keele Street within the Study Area.	**LEAST PREFERRED** This alternative does not address the existing east-west travel discontinuity for vehicular traffic in the road network between Dufferin Street and Keele Street within the Study Area.	**MOST PREFERRED** This alternative best addresses the existing east-west travel discontinuity for vehicular traffic in the road network.
	Reduced Travel Time **Measure:** Assessed based on the ability to reduce travel time for both auto traffic and pedestrian/cycling usage.	**LEAST PREFERRED** This alternative does not reduce travel time for any modes of travel and does not increase transportation network capacity and does not remove the existing travel discontinuity between Dufferin Street and Keele Street.	**MODERATELY PREFERRED** This alternative partially reduces travel time for all modes of travel through some increased transportation network capacity across the study area, however, levels of services at Kirby Road intersections will be decreased due to high volumes of left turn movements. This alternative removes the existing travel discontinuity between Dufferin Street and Keele Street for Active Transportation modes (Pedestrian/Cycling) only.	**LEAST PREFERRED** This alternative partially reduces travel time for all modes of travel through some increased localized transportation network capacity, however, levels of services at Kirby Road intersections will be decreased due to high volumes of left turn movements. This alternative removes the existing travel discontinuity between Dufferin Street and Keele Street for Active Transportation modes (Pedestrian/Cycling) only.	**MOST PREFERRED** This alternative best reduces travel time for all modes of travel through increased transportation network capacity and removal of the existing travel discontinuity between Dufferin Street and Keele Street.
	Safety **Measure:** Contribution to increased safety for Traffic, Pedestrians, and cyclists. Increased access for Emergency Services.	**LEAST PREFERRED** This alternative does not contribute to increased safety for vehicular traffic, pedestrians and cyclists and does improve access for emergency services.	**MODERATELY PREFERRED** This alternative partially contributes to increased safety for (in particular) pedestrians and cyclists and only partially improves access for emergency vehicles (due to some increased transportation network capacity). Decreased level of service and increased left turn movements reduces safety at intersections.	**LEAST PREFERRED** This alternative partially contributes to increased safety for (in particular) pedestrians and cyclists and only partially improves access for emergency vehicles (due to some increased transportation network capacity). Decreased level of service and increased left turn movements reduces safety at intersections.	**MOST PREFERRED** This alternative best contributes to increased safety for all modes of travel and best improves access for emergency vehicles.

Factor	Sub-Factor and Measure	Alternative 1: Do Nothing – 2041 TMP Network, excl. Teston Road (Keele Street to Dufferin Street)	Alternative 6M: New Ped/Cycling Crossing and Widen Kirby to 6 Lanes (Bathurst Street to Hwy. 400) with 1 new HOV Lane/Direction	Alternative 8M: New Pedestrian/Cycling Crossing and Widen Kirby Road and Keele Street by 1 new General-Purpose Lane /Direction	Alternative 10: New 4-lane Teston Road Extension (incl. Pedestrian/Cycling facilities)
	Constructability **Measure:** Assessed on the complexity of construction, number of structures required (new or widened), and ability to comply with design criteria.	**MOST PREFERRED** All impacts from the Do Nothing alternative would occur in the other alternatives as well. Therefore, there are no additional impacts/ complexities associated with the Do Nothing alternative.	**MODERATELY PREFERRED** Kirby Road widening (including a new GO line grade-separated crossing) can be completed with typical construction staging methods. A new Active Transportation crossing (bridge) of the Don River and existing landfill(s) would have moderate complexity.	**MODERATELY PREFERRED** Kirby Road and Keele Street widening (including an existing GO line grade-separated crossing) can be completed with typical construction staging methods. A new Active Transportation crossing (bridge) of the Don River and existing landfill(s) would have moderate complexity.	**LEAST PREFERRED** A new arterial roadway crossing (bridge) of the Don River and existing landfill(s) and new grade-separated GO line crossing would have relatively high construction complexity.
Transportation Summary		**LEAST PREFERRED** The Do Nothing alternative is provided for comparison. It is the least preferred option in all Transportation factors as it does not address any problems or opportunities.	**MODERATELY PREFERRED** This alternative does benefit the transportation network to some degree and provides improved mobility across the northern part of the study area. However, it falls short of addressing all transportation issues and further exacerbates problems at the Kirby Road intersections.	**LEAST PREFERRED** This alternative does benefit the transportation network to some degree however it falls short of addressing all transportation issues and further exacerbates problems at the Kirby Road intersections.	**MOST PREFERRED** While there is considerably more complexity to construct this alternative, it is the most preferred alternative in all other factors as it provides the most benefit to the transportation network and addressing problems and opportunities.
					

APPENDIX A: 2041 Snapshot of EMME Subarea Network for Alternative 1 Future Do Nothing Option


2041 Auto and Transit Assigned Trips with GTA West Freeway (Do-Nothing Option)
2000
4000
6000
8000
10000
Scale: 500
Made with Emme. Map tiles ©MapTiler ©OpenStreetMap contributors

2041 Link Volume to Capacity Ratio for Do Nothing Option

Arterial Road	Travel Direction	Section	2041# of Lanes	2041 Lane Capacity	Total Capacity	2041 EMME Assigned Volumes	2041 v/c
Teston Road	Eastbound	Hwy 400 to Jane St	2	900	1,800	923	0.51
		Jane St to Keele St	2	900	1,800	861	0.48
		Keele St to Dufferin St	2	900	1,800	Missing Link	
		Dufferin St to Bathurst St	2	900	1,800	1,035	0.58
	Westbound	Hwy 400 to Jane St	2	900	1,800	1,370	0.76
		Jane St to Keele St	2	900	1,800	1,217	0.68
		Keele St to Dufferin St	2	900	1,800	Missing Link	
		Dufferin St to Bathurst St	2	900	1,800	1,406	0.78
Kirby Road	Eastbound	Hwy 400 to Jane St	2	900	1,800	762	0.42
		Jane St to Keele St	2	900	1,800	896	0.50
		Keele St to Dufferin St	2	900	1,800	1,694	0.94
		Dufferin St to Bathurst St	2	900	1,800	1,345	0.75
	Westbound	Hwy 400 to Jane St	2	900	1,800	1,353	0.75
		Jane St to Keele St	2	900	1,800	1,497	0.83
		Keele St to Dufferin St	2	900	1,800	2,114	1.17
		Dufferin St to Bathurst St	2	900	1,800	1,489	0.83
Major Mackenzie Dr	Eastbound	Hwy 400 to Jane St	3	900	2,700	1,560	0.58
		Jane St to Keele St	2	800	1,600	1,282	0.80
		Keele St to Dufferin St	2	900	1,800	1,284	0.71
		Dufferin St to Bathurst St	2	900	1,800	1,169	0.65
	Westbound	Hwy 400 to Jane St	3	900	2,700	1,773	0.66
		Jane St to Keele St	2	800	1,600	1,439	0.90
		Keele St to Dufferin St	2	900	1,800	2,039	1.13
		Dufferin St to Bathurst St	2	900	1,800	1,823	1.01
Jane Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	357	0.20
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	299	0.17
		Teston Rd to Kirby Rd	2	1,000	2,000	550	0.28
		Kirby Rd to King Vaughan Rd	2	1,000	2,000	644	0.32
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2479	1.38
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2112	1.17
		Teston Rd to Kirby Rd	2	1,000	2,000	1901	0.95
		Kirby Rd to King Vaughan Rd	2	1,000	2,000	1995	1.00
Keele Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	460	0.26
		Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	836	0.52
		Teston Rd to Kirby Rd	2	900	1,800	672	0.37
		Kirby Rd to King Vaughan Rd	2	900	1,800	696	0.39
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2499	1.39
		Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	1728	1.08
		Teston Rd to Kirby Rd	2	900	1,800	1748	0.97
		Kirby Rd to King Vaughan Rd	2	900	1,800	2081	1.16
Dufferin Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	1005	0.56
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	819	0.46
		Teston Rd to Kirby Rd	2	1,000	2,000	1159	0.58
		Kirby Rd to King Vaughan Rd	2	900	1,800	477	0.27
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2025	1.13
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2139	1.19
		Teston Rd to Kirby Rd	2	1,000	2,000	1914	0.96
		Kirby Rd to King Vaughan Rd	2	900	1,800	1509	0.84
Bathurst Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	1290	0.48
		Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	1206	0.40
		Teston Rd to Kirby Rd	3	1,200	3,600	1460	0.41
		Kirby Rd to King Vaughan Rd	2	1,200	2,400	1036	0.43
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	2859	1.06
		Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	2657	0.89
		Teston Rd to Kirby Rd	3	1,200	3,600	2942	0.82
		Kirby Rd to King Vaughan Rd	2	1,200	2,400	2293	0.96

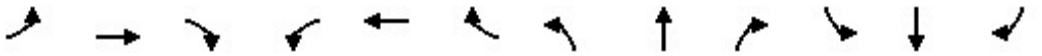
APPENDIX B: 2041 Synchro Results for Alternative 1 Future Do Nothing Option

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	880	528	944	854	4	30	0	183	0	3	1
Future Volume (vph)	0	880	528	944	854	4	30	0	183	0	3	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	1.0	5.0		5.0		5.0		1.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00		1.00	
Frpb, ped/bikes		1.00	0.99	1.00	1.00		1.00		1.00		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		1.00		1.00		1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85		0.97	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00		1.00	
Satd. Flow (prot)		3318	1464	1630	3258		2603		1420		1856	
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00		1.00	
Satd. Flow (perm)		3318	1464	1630	3258		2603		1420		1856	
Peak-hour factor, PHF	0.97	0.97	0.97	1.00	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	907	544	944	880	4	31	0	189	0	3	1
RTOR Reduction (vph)	0	0	328	0	0	0	0	0	171	0	1	0
Lane Group Flow (vph)	0	907	216	944	884	0	31	0	18	0	3	0
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	10%	10%	12%	12%	0%	36%	0%	15%	0%	0%	0%
Turn Type	Perm	NA	Perm	Prot	NA		Prot		Perm		NA	
Protected Phases		6		5	2		8				7	
Permitted Phases	6		6						8	7		
Actuated Green, G (s)		33.1	33.1	56.2	93.3		10.8		10.8		1.3	
Effective Green, g (s)		35.1	35.1	59.2	95.3		11.8		11.8		5.3	
Actuated g/C Ratio		0.28	0.28	0.48	0.77		0.10		0.10		0.04	
Clearance Time (s)		7.0	7.0	4.0	7.0		6.0		6.0		5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0		3.0	
Lane Grp Cap (vph)		943	416	781	2516		248		135		79	
v/s Ratio Prot		c0.27		c0.58	0.27		0.01				c0.00	
v/s Ratio Perm			0.15						c0.01			
v/c Ratio		0.96	0.52	1.21	0.35		0.12		0.13		0.04	
Uniform Delay, d1		43.5	37.1	32.1	4.4		51.1		51.1		56.6	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00		1.00	
Incremental Delay, d2		21.4	4.6	105.8	0.4		0.2		0.5		0.2	
Delay (s)		64.9	41.7	137.9	4.8		51.3		51.6		56.8	
Level of Service		E	D	F	A		D		D		E	
Approach Delay (s)		56.2			73.5			51.5			56.8	
Approach LOS		E			E			D			E	

Intersection Summary			
HCM 2000 Control Delay	64.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	123.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	402	130	0	1467	262	1158
Future Volume (vph)	402	130	0	1467	262	1158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0		5.0	5.0	5.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.91
Frt	1.00	0.85		1.00	0.90	0.85
Flt Protected	1.00	1.00		1.00	0.98	1.00
Satd. Flow (prot)	3411	1526		3411	3075	1389
Flt Permitted	1.00	1.00		1.00	0.98	1.00
Satd. Flow (perm)	3411	1526		3411	3075	1389
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	414	134	0	1512	270	1194
RTOR Reduction (vph)	0	0	0	0	277	277
Lane Group Flow (vph)	414	134	0	1512	590	320
Heavy Vehicles (%)	7%	7%	0%	7%	7%	7%
Turn Type	NA	Free		NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases		Free				8
Actuated Green, G (s)	47.3	86.4		47.3	24.1	24.1
Effective Green, g (s)	49.8	86.4		49.8	26.6	26.6
Actuated g/C Ratio	0.58	1.00		0.58	0.31	0.31
Clearance Time (s)	7.5			7.5	7.5	7.5
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Lane Grp Cap (vph)	1966	1526		1966	946	427
v/s Ratio Prot	0.12			c0.44	0.19	
v/s Ratio Perm		0.09				c0.23
v/c Ratio	0.21	0.09		0.77	0.62	0.75
Uniform Delay, d1	8.8	0.0		13.9	25.6	26.9
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		3.0	1.3	7.1
Delay (s)	9.1	0.1		16.9	26.9	34.0
Level of Service	A	A		B	C	C
Approach Delay (s)	6.9			16.9	29.8	
Approach LOS	A			B	C	

Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	86.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	629	210	321	1266	14	147	78	74	220	1430	671
Future Volume (vph)	84	629	210	321	1266	14	147	78	74	220	1430	671
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1772	3544	1547	1807	3510	1126	1825	3288	1555	1772	3614	1597
Flt Permitted	0.10	1.00	1.00	0.21	1.00	1.00	0.07	1.00	1.00	0.70	1.00	1.00
Satd. Flow (perm)	182	3544	1547	399	3510	1126	125	3288	1555	1310	3614	1597
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	1.00	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	87	648	216	331	1266	14	152	80	76	227	1474	692
RTOR Reduction (vph)	0	0	94	0	0	9	0	0	39	0	0	89
Lane Group Flow (vph)	87	648	122	331	1266	5	152	80	37	227	1474	603
Confl. Peds. (#/hr)			2	2								
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	3%	3%	4%	1%	4%	45%	0%	11%	5%	3%	1%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8		1	6			2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	44.9	37.9	37.9	60.5	49.5	49.5	68.5	68.5	68.5	57.5	57.5	57.5
Effective Green, g (s)	50.9	41.4	41.4	63.5	53.0	53.0	71.5	71.0	71.0	60.0	60.0	60.0
Actuated g/C Ratio	0.35	0.29	0.29	0.44	0.37	0.37	0.49	0.49	0.49	0.41	0.41	0.41
Clearance Time (s)	4.0	8.5	8.5	4.0	8.5	8.5	4.0	7.5	7.5	7.5	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	173	1011	441	384	1282	411	178	1609	761	542	1495	660
v/s Ratio Prot	0.03	0.18		c0.13	c0.36		c0.06	0.02			c0.41	
v/s Ratio Perm	0.14		0.08	0.25		0.00	0.36		0.02	0.17		0.38
v/c Ratio	0.50	0.64	0.28	0.86	0.99	0.01	0.85	0.05	0.05	0.42	0.99	0.91
Uniform Delay, d1	37.0	45.3	40.2	30.5	45.7	29.3	38.8	19.4	19.3	30.1	42.1	40.1
Progression 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
Incremental Delay, d2	2.3	1.4	0.3	17.7	21.9	0.0	30.6	0.1	0.1	2.4	20.2	19.3
Delay (s)	39.3	46.7	40.5	48.2	67.6	29.3	69.4	19.4	19.5	32.5	62.2	59.3
Level of Service	D	D	D	D	E	C	E	B	B	C	E	E
Approach Delay (s)		44.6			63.3			44.1			58.6	
Approach LOS		D			E			D			E	

Intersection Summary			
HCM 2000 Control Delay	56.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	115.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	594	56	63	1576	138	55
Future Volume (vph)	594	56	63	1576	138	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3444	1541	1772	3510	1807	1526
Flt Permitted	1.00	1.00	0.42	1.00	0.95	1.00
Satd. Flow (perm)	3444	1541	779	3510	1807	1526
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	612	58	65	1625	142	57
RTOR Reduction (vph)	0	15	0	0	0	48
Lane Group Flow (vph)	612	43	65	1625	142	9
Heavy Vehicles (%)	6%	6%	3%	4%	1%	7%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	6			2	8	
Permitted Phases		6	2			8
Actuated Green, G (s)	66.0	66.0	66.0	66.0	12.8	12.8
Effective Green, g (s)	68.5	68.5	68.5	68.5	14.8	14.8
Actuated g/C Ratio	0.73	0.73	0.73	0.73	0.16	0.16
Clearance Time (s)	7.5	7.5	7.5	7.5	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2528	1131	571	2577	286	242
v/s Ratio Prot	0.18			c0.46	c0.08	
v/s Ratio Perm		0.03	0.08			0.01
v/c Ratio	0.24	0.04	0.11	0.63	0.50	0.04
Uniform Delay, d1	4.0	3.4	3.6	6.1	35.8	33.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	0.4	1.2	1.4	0.1
Delay (s)	4.2	3.5	4.0	7.3	37.2	33.3
Level of Service	A	A	A	A	D	C
Approach Delay (s)	4.2			7.2	36.1	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	93.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	238	107	517	47	34	5	318	401	118	35	1154	782
Future Volume (vph)	238	107	517	47	34	5	318	401	118	35	1154	782
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0		1.0	5.0		5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	0.99		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1738	1731	1533	1207	1560		1601	3050		1765	3544	1601
Flt Permitted	0.71	1.00	1.00	0.69	1.00		0.10	1.00		0.45	1.00	1.00
Satd. Flow (perm)	1298	1731	1533	872	1560		169	3050		842	3544	1601
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	1.00	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	245	110	533	48	35	5	318	413	122	36	1190	806
RTOR Reduction (vph)	0	0	276	0	4	0	0	25	0	0	0	478
Lane Group Flow (vph)	245	110	257	48	36	0	318	510	0	36	1190	328
Confl. Peds. (#/hr)			2	2					4	4		
Heavy Vehicles (%)	5%	11%	5%	51%	21%	20%	14%	8%	38%	3%	3%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		1	6			2	
Permitted Phases	4		4	8			6			2		2
Actuated Green, G (s)	39.1	31.5	31.5	35.7	29.8		54.4	54.4		35.8	35.8	35.8
Effective Green, g (s)	44.4	34.0	34.0	41.7	32.3		57.4	56.9		38.3	38.3	38.3
Actuated g/C Ratio	0.40	0.31	0.31	0.38	0.29		0.52	0.51		0.35	0.35	0.35
Clearance Time (s)	4.0	7.5	7.5	4.0	7.5		4.0	7.5		7.5	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	562	531	470	355	454		315	1566		291	1225	553
v/s Ratio Prot	c0.04	0.06		0.01	0.02		c0.16	0.17			c0.34	
v/s Ratio Perm	0.13		c0.17	0.04			0.36			0.04		0.21
v/c Ratio	0.44	0.21	0.55	0.14	0.08		1.01	0.33		0.12	0.97	0.59
Uniform Delay, d1	23.2	28.4	32.0	22.4	28.5		34.1	15.7		24.8	35.7	29.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.9	4.5	0.2	0.3		53.1	0.6		0.9	19.7	4.6
Delay (s)	23.7	29.3	36.5	22.6	28.8		87.2	16.3		25.7	55.4	34.5
Level of Service	C	C	D	C	C		F	B		C	E	C
Approach Delay (s)		32.1			25.4			42.7			46.6	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	41.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	2	14	1004	13	313	7	445	367	508	1563	6
Future Volume (vph)	1	2	14	1004	13	313	7	445	367	508	1563	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0		1.0	5.0		5.0	5.0	1.0	1.0	5.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.87		1.00	0.86		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	1669		3404	1461		1825	3259	1449	1659	3348	
Flt Permitted	0.56	1.00		0.95	1.00		0.12	1.00	1.00	0.31	1.00	
Satd. Flow (perm)	1073	1669		3404	1461		222	3259	1449	535	3348	
Peak-hour factor, PHF	0.97	0.97	0.97	1.00	0.97	0.97	0.97	0.97	0.97	1.00	1.00	0.97
Adj. Flow (vph)	1	2	14	1004	13	323	7	459	378	508	1563	6
RTOR Reduction (vph)	0	7	0	0	177	0	0	0	185	0	0	0
Lane Group Flow (vph)	1	9	0	1004	159	0	7	459	193	508	1569	0
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	0%	0%	4%	0%	13%	0%	12%	12%	10%	9%	0%
Turn Type	pm+pt	NA		Prot	NA		Perm	NA	pm+ov	pm+pt	NA	
Protected Phases	7	4		3	8			6	3	5	2	
Permitted Phases	4						6		6	2		
Actuated Green, G (s)	30.6	29.2		37.0	64.8		32.6	32.6	69.6	64.0	64.0	
Effective Green, g (s)	36.6	31.2		40.0	66.8		34.6	34.6	75.6	67.0	66.0	
Actuated g/C Ratio	0.25	0.21		0.27	0.45		0.23	0.23	0.51	0.45	0.45	
Clearance Time (s)	4.0	7.0		4.0	7.0		7.0	7.0	4.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		6.0	6.0	3.0	6.0	3.0	
Lane Grp Cap (vph)	287	351		918	658		51	760	739	472	1491	
v/s Ratio Prot	0.00	0.01		c0.29	c0.11			0.14	0.07	c0.22	c0.47	
v/s Ratio Perm	0.00						0.03		0.06	0.27		
v/c Ratio	0.00	0.03		1.09	0.24		0.14	0.60	0.26	1.08	1.05	
Uniform Delay, d1	42.0	46.4		54.1	25.1		45.0	50.7	20.5	33.5	41.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.1		58.6	0.9		5.5	3.5	0.2	63.4	38.4	
Delay (s)	42.0	46.6		112.7	25.9		50.5	54.2	20.7	97.0	79.5	
Level of Service	D	D		F	C		D	D	C	F	E	
Approach Delay (s)		46.3			91.0			39.2			83.8	
Approach LOS		D			F			D			F	

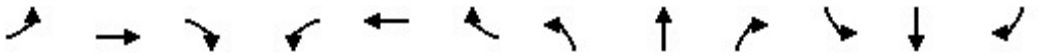
Intersection Summary			
HCM 2000 Control Delay	77.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	148.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	739	179	81	1021	93	93
Future Volume (vph)	739	179	81	1021	93	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3444	1480	1789	3579	1738	1581
Flt Permitted	1.00	1.00	0.36	1.00	0.95	1.00
Satd. Flow (perm)	3444	1480	674	3579	1738	1581
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	762	185	84	1053	96	96
RTOR Reduction (vph)	0	65	0	0	0	80
Lane Group Flow (vph)	762	120	84	1053	96	16
Confl. Peds. (#/hr)		1	1		1	1
Heavy Vehicles (%)	6%	8%	2%	2%	5%	2%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	6			2	8	
Permitted Phases		6	2			8
Actuated Green, G (s)	33.1	33.1	33.1	33.1	8.1	8.1
Effective Green, g (s)	35.6	35.6	35.6	35.6	9.1	9.1
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.17	0.17
Clearance Time (s)	7.5	7.5	7.5	7.5	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2241	963	438	2329	289	263
v/s Ratio Prot	0.22			c0.29	c0.06	
v/s Ratio Perm		0.08	0.12			0.01
v/c Ratio	0.34	0.13	0.19	0.45	0.33	0.06
Uniform Delay, d1	4.3	3.6	3.8	4.7	20.1	19.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.3	1.0	0.6	0.7	0.1
Delay (s)	4.7	3.9	4.8	5.4	20.8	19.3
Level of Service	A	A	A	A	C	B
Approach Delay (s)	4.5			5.3	20.0	
Approach LOS	A			A	C	

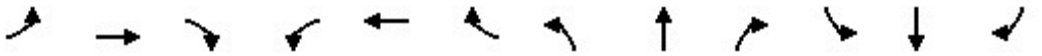
Intersection Summary			
HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	54.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	206	471	41	265	527	77	39	816	146	265	1973	416
Future Volume (vph)	206	471	41	265	527	77	39	816	146	265	1973	416
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1738	3544	1331	1772	1847	1387	1644	3476	1522	1771	3579	1586
Flt Permitted	0.10	1.00	1.00	0.32	1.00	1.00	0.06	1.00	1.00	0.23	1.00	1.00
Satd. Flow (perm)	191	3544	1331	604	1847	1387	107	3476	1522	431	3579	1586
Peak-hour factor, PHF	0.97	0.97	0.97	1.00	1.00	0.97	0.97	0.97	0.97	0.97	1.00	0.97
Adj. Flow (vph)	212	486	42	265	527	79	40	841	151	273	1973	429
RTOR Reduction (vph)	0	0	30	0	0	57	0	0	81	0	0	123
Lane Group Flow (vph)	212	486	12	265	527	22	40	841	70	273	1973	306
Confl. Peds. (#/hr)	16		1	1		16	5		14	14		5
Confl. Bikes (#/hr)			1			1			1			2
Heavy Vehicles (%)	5%	3%	21%	3%	4%	14%	11%	5%	4%	3%	2%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8			6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	45.0	35.4	35.4	46.2	36.0	36.0	61.9	61.9	61.9	74.4	74.4	74.4
Effective Green, g (s)	51.0	38.4	38.4	52.2	39.0	39.0	64.9	64.9	64.9	77.4	77.4	77.4
Actuated g/C Ratio	0.36	0.27	0.27	0.37	0.28	0.28	0.46	0.46	0.46	0.55	0.55	0.55
Clearance Time (s)	4.0	8.0	8.0	4.0	8.0	8.0	8.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	6.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	208	972	365	335	514	386	49	1611	705	348	1978	876
v/s Ratio Prot	c0.09	0.14		c0.07	c0.29			0.24		0.06	c0.55	
v/s Ratio Perm	0.28		0.01	0.22		0.02	0.37		0.05	0.37		0.19
v/c Ratio	1.02	0.50	0.03	0.79	1.03	0.06	0.82	0.52	0.10	0.78	1.00	0.35
Uniform Delay, d1	39.2	42.7	37.2	34.9	50.5	37.0	32.4	26.6	21.1	19.2	31.2	17.4
Progression 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
Incremental Delay, d2	67.5	0.4	0.0	12.0	46.3	0.2	82.0	1.2	0.3	11.0	19.6	1.1
Delay (s)	106.7	43.1	37.2	46.9	96.8	37.2	114.4	27.8	21.4	30.2	50.9	18.5
Level of Service	F	D	D	D	F	D	F	C	C	C	D	B
Approach Delay (s)		61.0			76.2			30.2			43.6	
Approach LOS		E			E			C			D	

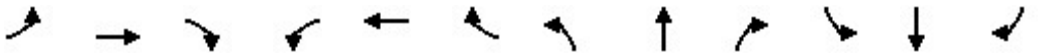
Intersection Summary			
HCM 2000 Control Delay	48.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	135.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1983	8	14	1670	0	6	0	13	856	54	347
Future Volume (vph)	0	1983	8	14	1670	0	6	0	13	856	54	347
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		1.0	5.0		5.0		5.0	5.0	5.0	5.0
Lane Util. Factor		0.91		1.00	0.95		1.00		1.00	0.95	0.91	0.95
Frpb, ped/bikes		1.00		1.00	1.00		1.00		1.00	1.00	1.00	0.99
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00	1.00	1.00	1.00
Frt		1.00		1.00	1.00		1.00		0.85	1.00	0.99	0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95	0.96	1.00
Satd. Flow (prot)		4852		1372	3349		1371		1247	1651	1522	1085
Flt Permitted		1.00		0.06	1.00		0.47		1.00	0.95	0.96	1.00
Satd. Flow (perm)		4852		82	3349		679		1247	1651	1522	1085
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	2044	8	14	1722	0	6	0	13	882	56	358
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	12	0	1	81
Lane Group Flow (vph)	0	2052	0	14	1722	0	6	0	1	494	475	245
Confl. Peds. (#/hr)			4	4			1					1
Heavy Vehicles (%)	0%	8%	10%	33%	9%	0%	33%	0%	31%	5%	20%	41%
Turn Type		NA		pm+pt	NA	Perm	Perm		Perm	Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases				6		6	8		8	4		4
Actuated Green, G (s)		66.7		73.5	73.5		6.0		6.0	49.0	49.0	49.0
Effective Green, g (s)		68.7		76.5	75.5		8.5		8.5	51.0	51.0	51.0
Actuated g/C Ratio		0.46		0.51	0.50		0.06		0.06	0.34	0.34	0.34
Clearance Time (s)		7.0		4.0	7.0		7.5		7.5	7.0	7.0	7.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2222		91	1685		38		70	561	517	368
v/s Ratio Prot		0.42		0.01	c0.51							
v/s Ratio Perm				0.07			c0.01		0.00	0.30	0.31	0.23
v/c Ratio		0.92		0.15	1.02		0.16		0.01	0.88	0.92	0.67
Uniform Delay, d1		38.2		28.4	37.2		67.3		66.8	46.6	47.5	42.2
Progression Factor		1.00		1.00	1.00		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		7.9		0.8	27.6		1.9		0.1	15.0	21.2	4.5
Delay (s)		46.1		29.2	64.9		69.3		66.8	61.6	68.7	46.7
Level of Service		D		C	E		E		E	E	E	D
Approach Delay (s)		46.1			64.6			67.6			60.5	
Approach LOS		D			E			E			E	

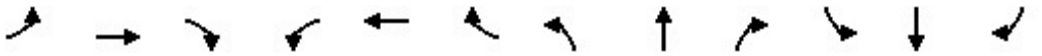
Intersection Summary			
HCM 2000 Control Delay	56.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1026	0	0	1668	0	483	0	560	0	0	0
Future Volume (vph)	0	1026	0	0	1668	0	483	0	560	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0		5.0			
Lane Util. Factor		0.95			0.95		0.97		0.88			
Frt		1.00			1.00		1.00		0.85			
Flt Protected		1.00			1.00		0.95		1.00			
Satd. Flow (prot)		3411			3444		3190		2566			
Flt Permitted		1.00			1.00		0.95		1.00			
Satd. Flow (perm)		3411			3444		3190		2566			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1058	0	0	1720	0	498	0	577	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	181	0	0	0
Lane Group Flow (vph)	0	1058	0	0	1720	0	498	0	396	0	0	0
Heavy Vehicles (%)	0%	7%	0%	0%	6%	0%	11%	0%	12%	0%	0%	0%
Turn Type		NA	Perm		NA	Perm	Perm		Perm			
Protected Phases		2			6							
Permitted Phases			2			6	8		8			
Actuated Green, G (s)		114.3			114.3		31.7		31.7			
Effective Green, g (s)		116.8			116.8		33.2		33.2			
Actuated g/C Ratio		0.73			0.73		0.21		0.21			
Clearance Time (s)		7.5			7.5		6.5		6.5			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2490			2514		661		532			
v/s Ratio Prot		0.31			c0.50							
v/s Ratio Perm							c0.16		0.15			
v/c Ratio		0.42			0.68		0.75		0.74			
Uniform Delay, d1		8.5			11.7		59.6		59.4			
Progression Factor		1.00			0.70		1.00		1.00			
Incremental Delay, d2		0.5			0.1		4.9		5.6			
Delay (s)		9.0			8.2		64.4		65.0			
Level of Service		A			A		E		E			
Approach Delay (s)		9.0			8.2			64.7			0.0	
Approach LOS		A			A			E			A	

Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	133	1188	238	225	1470	26	98	196	64	135	1620	908
Future Volume (vph)	133	1188	238	225	1470	26	98	196	64	135	1620	908
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3404	3476	1564	1755	3579	1305	1722	3380	1427	1676	3579	1578
Flt Permitted	0.95	1.00	1.00	0.07	1.00	1.00	0.06	1.00	1.00	0.62	1.00	1.00
Satd. Flow (perm)	3404	3476	1564	130	3579	1305	107	3380	1427	1090	3579	1578
Peak-hour factor, PHF	0.97	1.00	0.97	1.00	1.00	0.97	0.97	0.97	0.97	0.97	1.00	1.00
Adj. Flow (vph)	137	1188	245	225	1470	27	101	202	66	139	1620	908
RTOR Reduction (vph)	0	0	70	0	0	0	0	0	38	0	0	83
Lane Group Flow (vph)	137	1188	175	225	1470	27	101	202	28	139	1620	825
Confl. Peds. (#/hr)	4		1	1		4	2		14	14		2
Heavy Vehicles (%)	4%	5%	3%	4%	2%	23%	6%	8%	11%	8%	2%	2%
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6	8		8	4		4
Actuated Green, G (s)	7.0	53.0	53.0	67.0	56.0	56.0	72.0	65.0	65.0	72.0	65.0	65.0
Effective Green, g (s)	11.0	56.0	56.0	71.0	59.0	59.0	78.0	68.0	68.0	78.0	68.0	68.0
Actuated g/C Ratio	0.07	0.35	0.35	0.44	0.37	0.37	0.49	0.42	0.42	0.49	0.42	0.42
Clearance Time (s)	5.0	8.0	8.0	4.0	8.0	8.0	4.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	234	1216	547	199	1319	481	153	1436	606	568	1521	670
v/s Ratio Prot	0.04	0.34		c0.10	c0.41		c0.04	0.06		0.02	0.45	
v/s Ratio Perm			0.11	0.40		0.02	0.28		0.02	0.10		c0.52
v/c Ratio	0.59	0.98	0.32	1.13	1.11	0.06	0.66	0.14	0.05	0.24	1.07	1.23
Uniform Delay, d1	72.3	51.4	38.1	50.0	50.5	32.6	35.9	28.1	27.0	22.9	46.0	46.0
Progression Factor	1.06	0.93	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.3	19.2	1.3	103.3	62.5	0.2	10.2	0.0	0.0	0.2	42.6	117.0
Delay (s)	80.2	67.1	37.2	153.4	113.0	32.8	46.1	28.2	27.0	23.1	88.6	163.0
Level of Service	F	E	D	F	F	C	D	C	C	C	F	F
Approach Delay (s)		63.6			117.0			32.9			110.5	
Approach LOS		E			F			C			F	

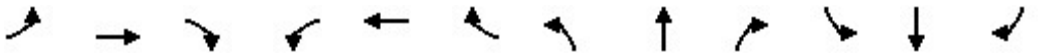
Intersection Summary			
HCM 2000 Control Delay	96.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	114.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	1098	129	151	1712	47	96	256	106	348	1679	169
Future Volume (vph)	55	1098	129	151	1712	47	96	256	106	348	1679	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0		1.0	5.0		1.0	5.0		1.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1738	3510		1789	3563		1738	3299		1800	3505	
Flt Permitted	0.06	1.00		0.06	1.00		0.08	1.00		0.43	1.00	
Satd. Flow (perm)	115	3510		116	3563		146	3299		814	3505	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	1.00	0.97	0.97	0.97	0.97	0.97	1.00	0.97
Adj. Flow (vph)	57	1132	133	156	1712	48	99	264	109	359	1679	174
RTOR Reduction (vph)	0	5	0	0	1	0	0	28	0	0	5	0
Lane Group Flow (vph)	57	1260	0	156	1759	0	99	345	0	359	1848	0
Confl. Peds. (#/hr)	15		7	7		15	20		13	13		20
Heavy Vehicles (%)	5%	2%	3%	2%	2%	0%	5%	6%	2%	1%	2%	5%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	66.4	60.8		71.2	63.2		54.0	47.0		74.0	63.0	
Effective Green, g (s)	72.4	62.8		75.8	65.2		60.0	49.0		77.0	65.0	
Actuated g/C Ratio	0.45	0.39		0.47	0.41		0.37	0.30		0.48	0.40	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	138	1370		169	1444		153	1005		549	1416	
v/s Ratio Prot	0.02	0.36		c0.06	c0.49		0.04	0.10		c0.11	c0.53	
v/s Ratio Perm	0.16			0.37			0.20			0.21		
v/c Ratio	0.41	0.92		0.92	1.22		0.65	0.34		0.65	1.31	
Uniform Delay, d1	36.6	46.6		45.6	47.8		40.5	43.4		27.7	47.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.0	11.4		47.2	104.6		9.1	0.9		2.8	142.6	
Delay (s)	38.6	58.0		92.8	152.4		49.5	44.3		30.5	190.5	
Level of Service	D	E		F	F		D	D		C	F	
Approach Delay (s)		57.2			147.6			45.4			164.5	
Approach LOS		E			F			D			F	

Intersection Summary			
HCM 2000 Control Delay	125.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	160.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	127.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	921	209	259	1548	21	253	559	190	41	1458	556
Future Volume (vph)	154	921	209	259	1548	21	253	559	190	41	1458	556
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1755	3579	1544	1807	3579	1518	1807	3510	1542	1771	3614	1574
Flt Permitted	0.08	1.00	1.00	0.12	1.00	1.00	0.08	1.00	1.00	0.34	1.00	1.00
Satd. Flow (perm)	146	3579	1544	230	3579	1518	143	3510	1542	635	3614	1574
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	1.00	0.97	1.00	0.97	0.97	0.97	1.00	0.97
Adj. Flow (vph)	159	949	215	267	1548	22	253	576	196	42	1458	573
RTOR Reduction (vph)	0	0	91	0	0	13	0	0	122	0	0	82
Lane Group Flow (vph)	159	949	124	267	1548	9	253	576	74	42	1458	491
Confl. Peds. (#/hr)	4		4	4		4	4		5	5		4
Heavy Vehicles (%)	4%	2%	4%	1%	2%	6%	1%	4%	4%	3%	1%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	54.5	47.5	47.5	65.5	54.5	54.5	57.7	50.7	50.7	54.9	49.3	49.3
Effective Green, g (s)	60.5	50.0	50.0	68.5	57.0	57.0	63.3	53.2	53.2	60.9	51.8	51.8
Actuated g/C Ratio	0.43	0.36	0.36	0.49	0.40	0.40	0.45	0.38	0.38	0.43	0.37	0.37
Clearance Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	177	1270	548	302	1448	614	182	1326	582	344	1329	579
v/s Ratio Prot	c0.06	0.27		c0.11	c0.43		c0.10	0.16		0.01	c0.40	
v/s Ratio Perm	0.32		0.08	0.32		0.01	0.53		0.05	0.05		0.31
v/c Ratio	0.90	0.75	0.23	0.88	1.07	0.01	1.39	0.43	0.13	0.12	1.10	0.85
Uniform Delay, d1	36.1	39.9	31.8	32.3	41.9	25.1	40.3	32.6	28.6	23.7	44.5	40.9
Progression 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
Incremental Delay, d2	39.7	4.0	1.0	24.9	44.5	0.0	205.6	0.2	0.1	0.2	55.7	11.2
Delay (s)	75.8	43.9	32.8	57.2	86.4	25.1	245.9	32.8	28.7	23.9	100.2	52.1
Level of Service	E	D	C	E	F	C	F	C	C	C	F	D
Approach Delay (s)		45.9			81.4			84.6			85.3	
Approach LOS		D			F			F			F	

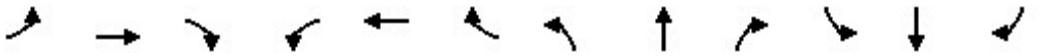
Intersection Summary			
HCM 2000 Control Delay	75.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	140.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	120.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	928	88	178	1018	92	114	703	301	314	1703	497
Future Volume (vph)	163	928	88	178	1018	92	114	703	301	314	1703	497
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	4.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1722	3476	1585	1807	3544	1565	1807	3510	1551	1824	3614	1600
Flt Permitted	0.10	1.00	1.00	0.10	1.00	1.00	0.07	1.00	1.00	0.26	1.00	1.00
Satd. Flow (perm)	173	3476	1585	181	3544	1565	131	3510	1551	499	3614	1600
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	1.00	0.97	0.97	0.97	0.97	0.97	1.00	0.97
Adj. Flow (vph)	168	957	91	184	1018	95	118	725	310	324	1703	512
RTOR Reduction (vph)	0	0	0	0	0	67	0	0	113	0	0	95
Lane Group Flow (vph)	168	957	91	184	1018	28	118	725	197	324	1703	417
Confl. Peds. (#/hr)	1					1	7		8	8		7
Heavy Vehicles (%)	6%	5%	3%	1%	3%	3%	1%	4%	3%	0%	1%	0%
Turn Type	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		Free	6		6	8		8	4		4
Actuated Green, G (s)	46.0	39.0	140.0	46.0	39.0	39.0	62.1	55.1	55.1	76.0	65.0	65.0
Effective Green, g (s)	52.0	41.0	140.0	52.0	41.0	41.0	68.1	57.1	57.1	79.0	67.0	67.0
Actuated g/C Ratio	0.37	0.29	1.00	0.37	0.29	0.29	0.49	0.41	0.41	0.56	0.48	0.48
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	174	1017	1585	183	1037	458	183	1431	632	469	1729	765
v/s Ratio Prot	0.07	0.28		c0.07	c0.29		0.05	0.21		c0.10	c0.47	
v/s Ratio Perm	0.29		0.06	0.30		0.02	0.27		0.13	0.29		0.26
v/c Ratio	0.97	0.94	0.06	1.01	0.98	0.06	0.64	0.51	0.31	0.69	0.98	0.55
Uniform Delay, d1	36.2	48.3	0.0	36.1	49.1	35.6	30.9	30.9	28.1	18.3	36.0	25.8
Progression 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
Incremental Delay, d2	57.6	17.2	0.1	68.0	23.9	0.3	7.6	0.3	0.3	4.4	18.0	0.8
Delay (s)	93.7	65.5	0.1	104.1	73.0	35.9	38.5	31.2	28.4	22.7	54.0	26.5
Level of Service	F	E	A	F	E	D	D	C	C	C	D	C
Approach Delay (s)		64.5			74.7			31.2			44.5	
Approach LOS		E			E			C			D	

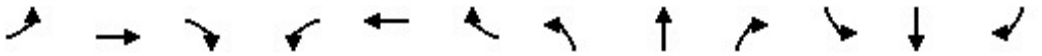
Intersection Summary			
HCM 2000 Control Delay	52.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	105.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group



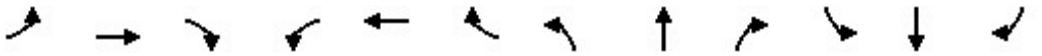
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	239	409	113	823	823	56	16	407	126	31	1779	184
Future Volume (vph)	239	409	113	823	823	56	16	407	126	31	1779	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1615	3579	1541	1738	3614	1484	1460	3318	1471	1825	3544	1585
Flt Permitted	0.32	1.00	1.00	0.29	1.00	1.00	0.08	1.00	1.00	0.49	1.00	1.00
Satd. Flow (perm)	551	3579	1541	523	3614	1484	129	3318	1471	942	3544	1585
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	239	409	113	823	823	56	16	407	126	31	1779	184
RTOR Reduction (vph)	0	0	100	0	0	40	0	0	0	0	0	0
Lane Group Flow (vph)	239	409	13	823	823	16	16	407	126	31	1779	184
Heavy Vehicles (%)	13%	2%	6%	5%	1%	10%	25%	10%	11%	0%	3%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	20.0	10.0	10.0	41.0	27.0	27.0	44.0	44.0	44.0	44.0	44.0	44.0
Effective Green, g (s)	26.0	11.5	11.5	44.0	28.5	28.5	47.5	47.5	47.5	47.5	47.5	47.5
Actuated g/C Ratio	0.26	0.12	0.12	0.44	0.28	0.28	0.48	0.48	0.48	0.48	0.48	0.48
Clearance Time (s)	4.0	6.5	6.5	4.0	6.5	6.5	8.5	8.5	8.5	8.5	8.5	8.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	281	411	177	594	1029	422	61	1576	698	447	1683	752
v/s Ratio Prot	0.11	c0.11		c0.42	0.23			0.12			c0.50	
v/s Ratio Perm	0.11		0.01	0.19		0.01	0.12		0.09	0.03		0.12
v/c Ratio	0.85	1.00	0.07	1.39	0.80	0.04	0.26	0.26	0.18	0.07	1.06	0.24
Uniform Delay, d1	32.1	44.2	39.5	25.9	33.1	25.8	15.7	15.7	15.1	14.3	26.2	15.6
Progression 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
Incremental Delay, d2	21.1	42.8	0.2	183.8	4.4	0.0	2.3	0.1	0.1	0.1	38.8	0.2
Delay (s)	53.2	87.1	39.7	209.6	37.5	25.9	18.0	15.8	15.2	14.3	65.0	15.8
Level of Service	D	F	D	F	D	C	B	B	B	B	E	B
Approach Delay (s)		69.4			120.4			15.7			59.7	
Approach LOS		E			F			B			E	

Intersection Summary			
HCM 2000 Control Delay	77.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	117.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



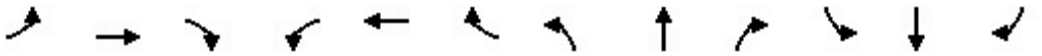
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	468	247	1014	663	193	61	503	109	23	1931	127
Future Volume (vph)	180	468	247	1014	663	193	61	503	109	23	1931	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1705	3579	1445	1789	3579	1519	1508	3380	1477	1382	3579	1500
Flt Permitted	0.40	1.00	1.00	0.28	1.00	1.00	0.06	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	717	3579	1445	522	3579	1519	96	3380	1477	591	3579	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	180	468	247	1014	663	193	61	503	109	23	1931	127
RTOR Reduction (vph)	0	0	50	0	0	101	0	0	59	0	0	33
Lane Group Flow (vph)	180	468	197	1014	663	92	61	503	50	23	1931	94
Confl. Peds. (#/hr)	1					1	3		1	1		3
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	7%	2%	13%	2%	2%	6%	21%	8%	9%	32%	2%	7%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	29.0	29.0	29.0	67.0	67.0	67.0	63.5	63.5	63.5	63.5	63.5	63.5
Effective Green, g (s)	31.0	31.0	31.0	70.0	69.0	69.0	66.0	66.0	66.0	66.0	66.0	66.0
Actuated g/C Ratio	0.21	0.21	0.21	0.48	0.48	0.48	0.46	0.46	0.46	0.46	0.46	0.46
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	7.5	7.5	7.5	7.5	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	153	765	308	575	1703	722	43	1538	672	269	1629	682
v/s Ratio Prot		0.13		c0.45	0.19			0.15			0.54	
v/s Ratio Perm	c0.25		0.14	0.40		0.06	c0.63		0.03	0.04		0.06
v/c Ratio	1.18	0.61	0.64	1.76	0.39	0.13	1.42	0.33	0.07	0.09	1.19	0.14
Uniform Delay, d1	57.0	51.6	51.9	32.7	24.4	21.2	39.5	25.3	22.3	22.4	39.5	23.0
Progression 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
Incremental Delay, d2	128.1	1.5	4.3	350.6	0.1	0.1	282.8	0.1	0.0	0.1	90.0	0.1
Delay (s)	185.1	53.0	56.2	383.4	24.6	21.3	322.3	25.4	22.3	22.5	129.5	23.1
Level of Service	F	D	E	F	C	C	F	C	C	C	F	C
Approach Delay (s)		80.4			218.8			51.8			121.8	
Approach LOS		F			F			D			F	

Intersection Summary			
HCM 2000 Control Delay	139.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	136.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	1217	358	34	1405	106	506	580	43	100	969	441
Future Volume (vph)	143	1217	358	34	1405	106	506	580	43	100	969	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	6.5	5.0	6.5	1.0	5.0	8.0	8.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	3650	1601	1825	3650	1633	1789	3579	1633	1825	3579	1601
Flt Permitted	0.08	1.00	1.00	0.09	1.00	1.00	0.11	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	155	3650	1601	174	3650	1633	209	3579	1633	818	3579	1601
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	1.00	0.97	1.00	0.97	0.97	0.97	1.00	0.97
Adj. Flow (vph)	147	1255	369	35	1405	109	506	598	44	103	969	455
RTOR Reduction (vph)	0	0	117	0	0	72	0	0	24	0	0	91
Lane Group Flow (vph)	147	1255	252	35	1405	37	506	598	20	103	969	364
Heavy Vehicles (%)	2%	0%	2%	0%	0%	0%	2%	2%	0%	0%	2%	2%
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	55.5	55.5	55.5	44.5	44.5	44.5	60.0	60.0	60.0	32.0	32.0	32.0
Effective Green, g (s)	58.5	57.0	57.0	44.5	46.0	44.5	63.0	63.0	60.0	32.0	35.0	35.0
Actuated g/C Ratio	0.45	0.44	0.44	0.34	0.35	0.34	0.48	0.48	0.46	0.25	0.27	0.27
Clearance Time (s)	4.0	6.5	6.5	6.5	6.5	6.5	4.0	8.0	8.0	8.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	195	1600	701	59	1291	558	429	1734	753	201	963	431
v/s Ratio Prot	0.06	c0.34			c0.38		c0.24	0.17			c0.27	
v/s Ratio Perm	0.28		0.16	0.20		0.02	0.33		0.01	0.13		0.23
v/c Ratio	0.75	0.78	0.36	0.59	1.09	0.07	1.18	0.34	0.03	0.51	1.01	0.84
Uniform Delay, d1	29.7	31.2	24.3	35.3	42.0	28.8	40.3	20.7	19.1	42.3	47.5	44.9
Progression 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
Incremental Delay, d2	15.2	2.6	0.3	15.0	52.7	0.1	102.5	0.5	0.1	9.0	30.5	18.0
Delay (s)	44.9	33.8	24.6	50.3	94.7	28.8	142.8	21.3	19.1	51.3	78.0	62.9
Level of Service	D	C	C	D	F	C	F	C	B	D	E	E
Approach Delay (s)		32.8			89.1			74.8			71.7	
Approach LOS		C			F			E			E	

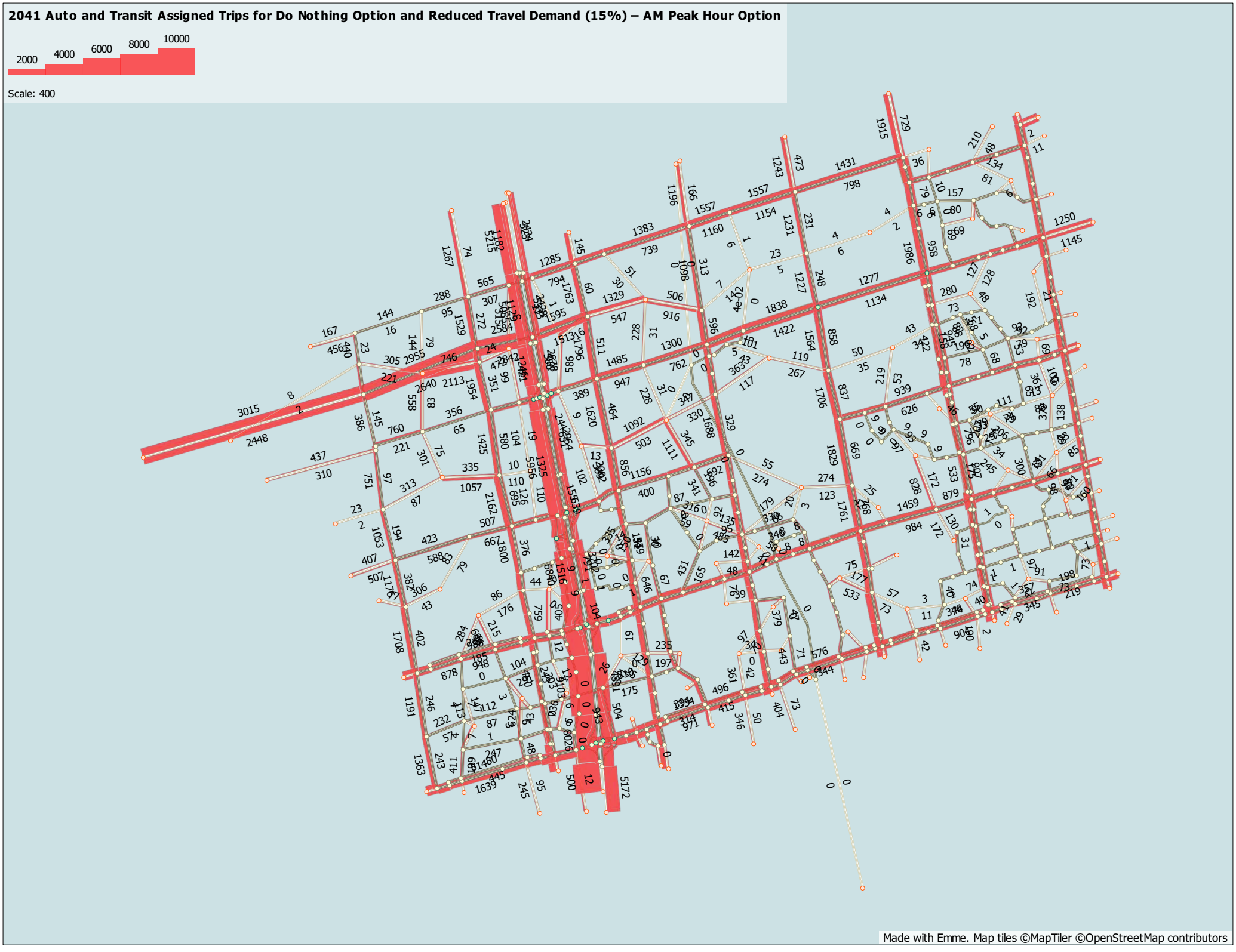
Intersection Summary			
HCM 2000 Control Delay	65.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	116.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	921	431	413	1081	41	477	865	231	215	2116	24
Future Volume (vph)	24	921	431	413	1081	41	477	865	231	215	2116	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3650	1633	1789	3650	1601	1825	3579	1601	1789	3579	1633
Flt Permitted	0.12	1.00	1.00	0.11	1.00	1.00	0.06	1.00	1.00	0.24	1.00	1.00
Satd. Flow (perm)	233	3650	1633	215	3650	1601	116	3579	1601	446	3579	1633
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	24	921	431	413	1081	41	477	865	231	215	2116	24
RTOR Reduction (vph)	0	0	119	0	0	27	0	0	121	0	0	13
Lane Group Flow (vph)	24	921	312	413	1081	14	477	865	110	215	2116	11
Heavy Vehicles (%)	0%	0%	0%	2%	0%	2%	0%	2%	2%	2%	2%	0%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	31.0	31.0	31.0	46.0	46.0	46.0	77.2	64.2	64.2	73.8	62.5	62.5
Effective Green, g (s)	33.0	33.0	33.0	49.0	48.0	48.0	82.5	66.7	66.7	79.8	65.0	65.0
Actuated g/C Ratio	0.24	0.24	0.24	0.35	0.34	0.34	0.59	0.48	0.48	0.57	0.46	0.46
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	54	860	384	232	1251	548	263	1705	762	391	1661	758
v/s Ratio Prot		c0.25		c0.18	0.30		c0.21	0.24		0.06	c0.59	
v/s Ratio Perm	0.10		0.19	0.44		0.01	0.86		0.07	0.26		0.01
v/c Ratio	0.44	1.07	0.81	1.78	0.86	0.03	1.81	0.51	0.14	0.55	1.27	0.01
Uniform Delay, d1	45.7	53.5	50.6	39.8	43.0	30.5	47.9	25.3	20.6	16.5	37.5	20.2
Progression 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
Incremental Delay, d2	5.7	51.5	12.3	368.0	6.4	0.0	380.8	1.1	0.4	1.6	128.1	0.0
Delay (s)	51.4	105.0	62.9	407.8	49.4	30.5	428.7	26.4	21.0	18.1	165.6	20.3
Level of Service	D	F	E	F	D	C	F	C	C	B	F	C
Approach Delay (s)		90.9			145.3			147.6			150.7	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	136.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	148.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX C: 2041 Snapshot of EMME Subarea Network for Future Do Nothing Option and 2041 Reduced Travel Demand


2041 Auto and Transit Assigned Trips for Do Nothing Option and Reduced Travel Demand (15%) – AM Peak Hour Option
2000
4000
6000
8000
10000
Scale: 400
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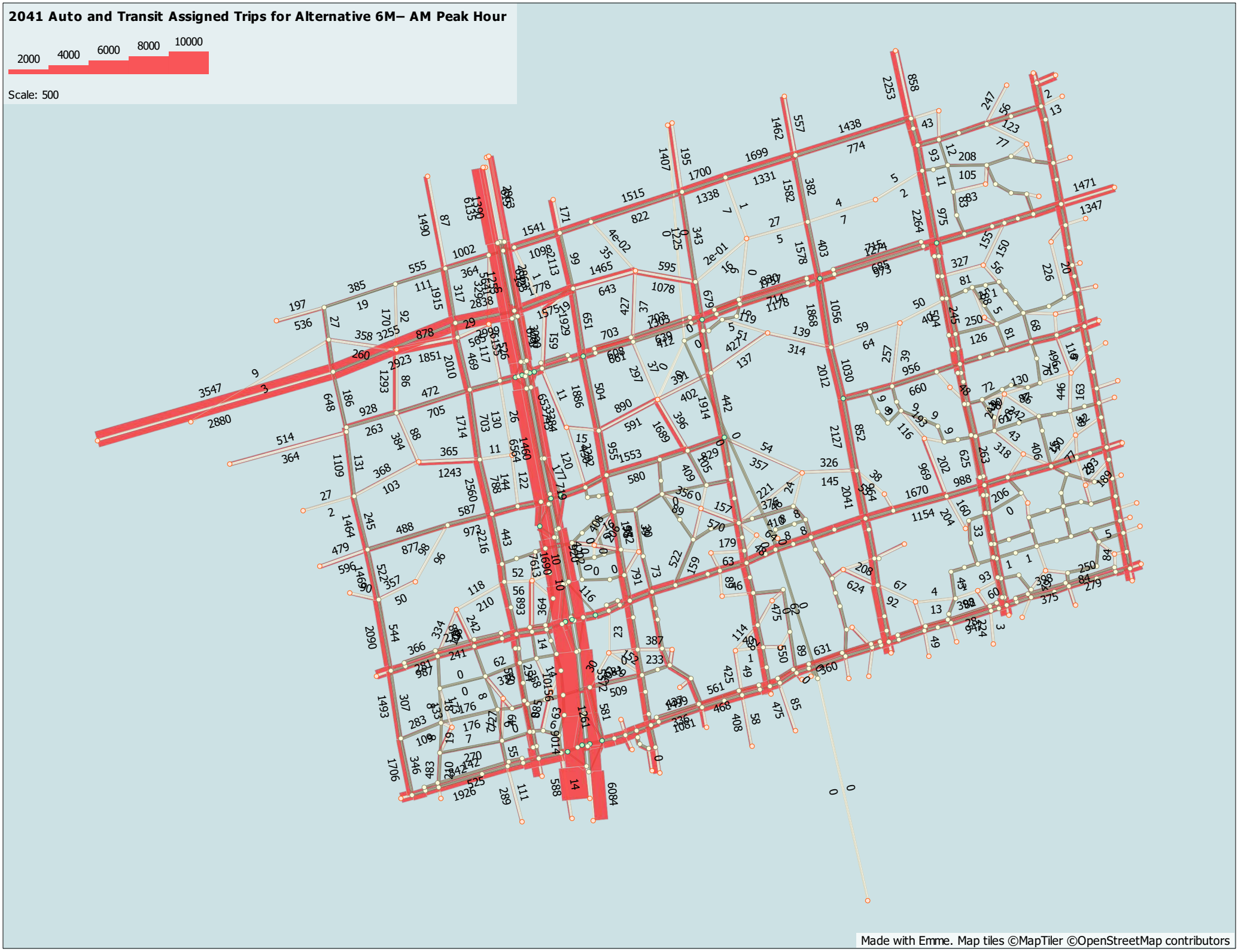
2041 Link Volume to Capacity Ratio for Do Nothing Option and Reduced Travel Demand (15%) – AM Peak Hour Option

Arterial Road	Travel Direction	Section	2041# of Lanes	2041 Lane Capacity	Total Capacity	2041 EMME Assigned Volumes	2041 v/c
Teston Road	Eastbound	Hwy 400 to Jane St	2	900	1,800	720	0.40
		Jane St to Keele St	2	900	1,800	692	0.38
		Keele St to Dufferin St	2	900	1,800	Missing Link	
		Dufferin St to Bathurst St	2	900	1,800	842	0.47
	Westbound	Hwy 400 to Jane St	2	900	1,800	1,220	0.68
		Jane St to Keele St	2	900	1,800	1,041	0.58
		Keele St to Dufferin St	2	900	1,800	Missing Link	
		Dufferin St to Bathurst St	2	900	1,800	1,133	0.63
Kirby Road	Eastbound	Hwy 400 to Jane St	2	900	1,800	389	0.22
		Jane St to Keele St	2	900	1,800	762	0.42
		Keele St to Dufferin St	2	900	1,800	1,422	0.79
		Dufferin St to Bathurst St	2	900	1,800	1,134	0.63
	Westbound	Hwy 400 to Jane St	2	900	1,800	1,055	0.59
		Jane St to Keele St	2	900	1,800	1,300	0.72
		Keele St to Dufferin St	2	900	1,800	1,838	1.02
		Dufferin St to Bathurst St	2	900	1,800	1,277	0.71
Major Mackenzie Dr	Eastbound	Hwy 400 to Jane St	3	900	2,700	1,648	0.61
		Jane St to Keele St	2	800	1,600	1,125	0.70
		Keele St to Dufferin St	2	900	1,800	1,116	0.62
		Dufferin St to Bathurst St	2	900	1,800	1,009	0.56
	Westbound	Hwy 400 to Jane St	3	900	2,700	1,768	0.65
		Jane St to Keele St	2	800	1,600	1,262	0.79
		Keele St to Dufferin St	2	900	1,800	1,740	0.97
		Dufferin St to Bathurst St	2	900	1,800	1,551	0.86
Jane Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	304	0.17
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	261	0.15
		Teston Rd to Kirby Rd	2	1,000	2,000	464	0.23
		Kirby Rd to King Vaughan Rd	2	1,000	2,000	511	0.26
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2052	1.14
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	1663	0.92
		Teston Rd to Kirby Rd	2	1,000	2,000	1620	0.81
		Kirby Rd to King Vaughan Rd	2	1,000	2,000	1796	0.90
Keele Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	391	0.22
		Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	636	0.40
		Teston Rd to Kirby Rd	2	900	1,800	639	0.36
		Kirby Rd to King Vaughan Rd	2	900	1,800	596	0.33
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2110	1.17
		Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	1427	0.89
		Teston Rd to Kirby Rd	2	900	1,800	1528	0.85
		Kirby Rd to King Vaughan Rd	2	900	1,800	1785	0.99
Dufferin Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	821	0.46
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	669	0.37
		Teston Rd to Kirby Rd	2	1,000	2,000	858	0.43
		Kirby Rd to King Vaughan Rd	2	900	1,800	248	0.14
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	1732	0.96
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	1829	1.02
		Teston Rd to Kirby Rd	2	1,000	2,000	1564	0.78
		Kirby Rd to King Vaughan Rd	2	900	1,800	1227	0.68
Bathurst Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	1091	0.40
		Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	1061	0.35
		Teston Rd to Kirby Rd	3	1,200	3,600	1309	0.36
		Kirby Rd to King Vaughan Rd	2	1,200	2,400	958	0.40
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	2572	0.95
		Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	2279	0.76
		Teston Rd to Kirby Rd	3	1,200	3,600	2495	0.69
		Kirby Rd to King Vaughan Rd	2	1,200	2,400	1986	0.83

APPENDIX D: 2041 Snapshot of EMME Subarea Network for Alternative 6M


2041 Auto and Transit Assigned Trips for Alternative 6M– AM Peak Hour
2000
4000
6000
8000
10000
Scale: 500
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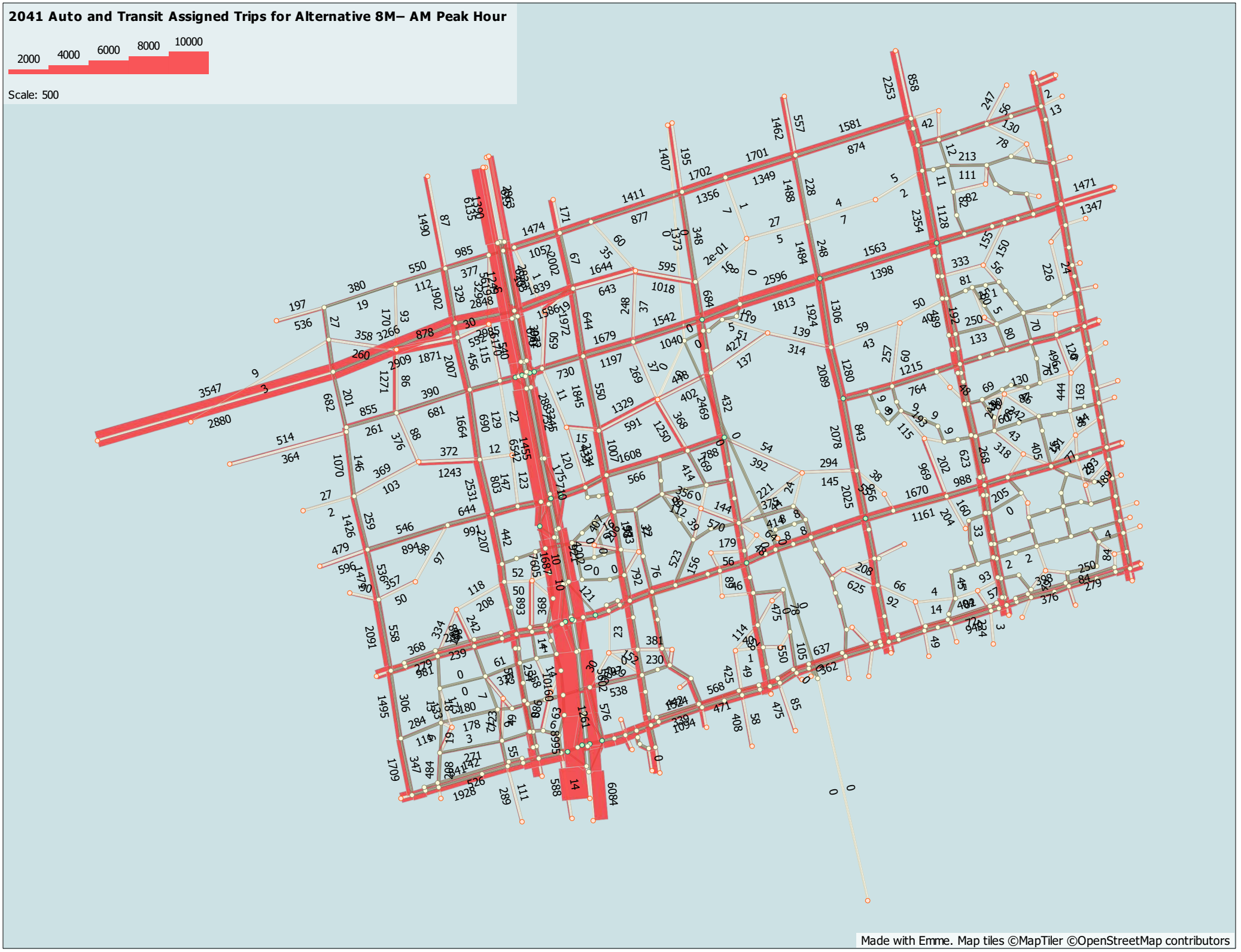
2041 Link Volume to Capacity for Alternative 6M

Travel Direction	Section	2041# of Lanes	2041 Lane Capacity	Total Capacity	2041 EMME Assigned Volumes	2041 v/c
Eastbound	Hwy 400 to Jane St	2	900	1,800	889	0.49
	Jane St to Keele St	2	900	1,800	829	0.46
	Keele St to Dufferin St	2	900	1,800	Missing Link	
	Dufferin St to Bathurst St	2	900	1,800	897	0.50
Westbound	Hwy 400 to Jane St	2	900	1,800	1,350	0.75
	Jane St to Keele St	2	900	1,800	1,053	0.59
	Keele St to Dufferin St	2	900	1,800	Missing Link	
	Dufferin St to Bathurst St	2	900	1,800	1,191	0.66
Eastbound	Hwy 400 to Jane St	3 (1HOV)	900	2,700	836	0.31
	Jane St to Keele St	3 (1HOV)	900	2,700	1,051	0.39
	Keele St to Dufferin St	3 (1HOV)	900	2,700	1,892	0.70
	Dufferin St to Bathurst St	3 (1HOV)	900	2,700	1,657	0.61
Westbound	Hwy 400 to Jane St	3 (1HOV)	900	2,700	1,819	0.67
	Jane St to Keele St	3 (1HOV)	900	2,700	2,006	0.74
	Keele St to Dufferin St	3 (1HOV)	900	2,700	2,588	0.96
	Dufferin St to Bathurst St	3 (1HOV)	900	2,700	1,990	0.74
Eastbound	Hwy 400 to Jane St	3	900	2,700	1,540	0.57
	Jane St to Keele St	2	800	1,600	1,236	0.77
	Keele St to Dufferin St	2	900	1,800	1,249	0.69
	Dufferin St to Bathurst St	2	900	1,800	1,178	0.65
Westbound	Hwy 400 to Jane St	3	900	2,700	1,746	0.65
	Jane St to Keele St	2	800	1,600	1,388	0.87
	Keele St to Dufferin St	2	900	1,800	1,936	1.08
	Dufferin St to Bathurst St	2	900	1,800	1,770	0.98
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	364	0.20
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	303	0.17
	Teston Rd to Kirby Rd	2	1,000	2,000	504	0.25
	Kirby Rd to King Vaughan Rd	2	1,000	2,000	651	0.33
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2483	1.38
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2152	1.20
	Teston Rd to Kirby Rd	2	1,000	2,000	1886	0.94
	Kirby Rd to King Vaughan Rd	2	1,000	2,000	1929	0.96
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	458	0.25
	Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	791	0.49
	Teston Rd to Kirby Rd	2	900	1,800	820	0.46
	Kirby Rd to King Vaughan Rd	2	900	1,800	679	0.38
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2508	1.39
	Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	1735	1.08
	Teston Rd to Kirby Rd	2	900	1,800	1722	0.96
	Kirby Rd to King Vaughan Rd	2	900	1,800	2028	1.13
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	1072	0.60
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	852	0.47
	Teston Rd to Kirby Rd	2	1,000	2,000	1056	0.53
	Kirby Rd to King Vaughan Rd	2	900	1,800	403	0.22
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2054	1.14
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2127	1.18
	Teston Rd to Kirby Rd	2	1,000	2,000	1868	0.93
	Kirby Rd to King Vaughan Rd	2	900	1,800	1578	0.88
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	1307	0.48
	Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	1261	0.42
	Teston Rd to Kirby Rd	3	1,200	3,600	1746	0.49
	Kirby Rd to King Vaughan Rd	2	1,200	2,400	975	0.41
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	2858	1.06
	Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	2649	0.88
	Teston Rd to Kirby Rd	3	1,200	3,600	3038	0.84
	Kirby Rd to King Vaughan Rd	2	1,200	2,400	2264	0.94

APPENDIX E: 2041 Snapshot of EMME Subarea Network for Alternative 8M


2041 Auto and Transit Assigned Trips for Alternative 8M– AM Peak Hour
2000
4000
6000
8000
10000
Scale: 500
Made with Emme. Map tiles ©MapTiler ©OpenStreetMap contributors

2041 Link Volume to Capacity Ratio for Alternative 8M

Arterial Road	Travel Direction	Section	2041# of Lanes	2041 Lane Capacity	Total Capacity	2041 EMME Assigned Volumes	2041 v/c
Teston Road	Eastbound	Hwy 400 to Jane St	2	900	1,800	929	0.52
		Jane St to Keele St	2	900	1,800	788	0.44
		Keele St to Dufferin St	2	900	1,800	Missing Link	
		Dufferin St to Bathurst St	2	900	1,800	1,023	0.57
	Westbound	Hwy 400 to Jane St	2	900	1,800	1,443	0.80
		Jane St to Keele St	2	900	1,800	1,418	0.79
		Keele St to Dufferin St	2	900	1,800	Missing Link	
		Dufferin St to Bathurst St	2	900	1,800	1,449	0.81
Kirby Road	Eastbound	Hwy 400 to Jane St	2	900	1,800	730	0.41
		Jane St to Keele St	2	900	1,800	1,040	0.58
		Keele St to Dufferin St	3	900	2,700	1,813	0.67
		Dufferin St to Bathurst St	2	900	1,800	1,398	0.78
	Westbound	Hwy 400 to Jane St	2	900	1,800	1,245	0.69
		Jane St to Keele St	2	900	1,800	1,542	0.86
		Keele St to Dufferin St	3	900	2,700	2,596	0.96
		Dufferin St to Bathurst St	2	900	1,800	1,563	0.87
Major Mackenzie Dr	Eastbound	Hwy 400 to Jane St	3	900	2,700	1,593	0.59
		Jane St to Keele St	2	800	1,600	1,264	0.79
		Keele St to Dufferin St	2	900	1,800	1,288	0.72
		Dufferin St to Bathurst St	2	900	1,800	1,185	0.66
	Westbound	Hwy 400 to Jane St	3	900	2,700	1,803	0.67
		Jane St to Keele St	2	800	1,600	1,398	0.87
		Keele St to Dufferin St	2	900	1,800	1,926	1.07
		Dufferin St to Bathurst St	2	900	1,800	1,770	0.98
Jane Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	359	0.20
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	304	0.17
		Teston Rd to Kirby Rd	2	1,000	2,000	550	0.28
		Kirby Rd to King Vaughan Rd	2	1,000	2,000	644	0.32
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2480	1.38
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2159	1.20
		Teston Rd to Kirby Rd	2	1,000	2,000	1845	0.92
		Kirby Rd to King Vaughan Rd	2	1,000	2,000	1972	0.99
Keele Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	459	0.26
		Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	695	0.43
		Teston Rd to Kirby Rd	3	900	2,700	810	0.30
		Kirby Rd to King Vaughan Rd	2	900	1,800	684	0.38
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2511	1.40
		Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	1766	1.10
		Teston Rd to Kirby Rd	3	900	2,700	2373	0.88
		Kirby Rd to King Vaughan Rd	2	900	1,800	2116	1.18
Dufferin Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	1017	0.57
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	843	0.47
		Teston Rd to Kirby Rd	2	1,000	2,000	1306	0.65
		Kirby Rd to King Vaughan Rd	2	900	1,800	248	0.14
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2033	1.13
		Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2078	1.15
		Teston Rd to Kirby Rd	2	1,000	2,000	1924	0.96
		Kirby Rd to King Vaughan Rd	2	900	1,800	1484	0.82
Bathurst Street	Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	1321	0.49
		Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	1276	0.43
		Teston Rd to Kirby Rd	3	1,200	3,600	1481	0.41
		Kirby Rd to King Vaughan Rd	2	1,200	2,400	1128	0.47
	Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	2854	1.06
		Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	2643	0.88
		Teston Rd to Kirby Rd	3	1,200	3,600	2924	0.81
		Kirby Rd to King Vaughan Rd	2	1,200	2,400	2354	0.98

APPENDIX F: 2041 Synchro Results for Alternative 8M

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	107	370	47	34	5	448	228	118	35	1369	912
Future Volume (vph)	183	107	370	47	34	5	448	228	118	35	1369	912
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0	5.0	4.5	5.0		1.0	5.0		5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	0.99		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1738	1731	1533	1206	1559		3106	2902		1764	3544	1601
Flt Permitted	0.73	1.00	1.00	0.69	1.00		0.95	1.00		0.54	1.00	1.00
Satd. Flow (perm)	1339	1731	1533	874	1559		3106	2902		1010	3544	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	183	107	370	47	34	5	448	228	118	35	1369	912
RTOR Reduction (vph)	0	0	195	0	4	0	0	47	0	0	0	366
Lane Group Flow (vph)	183	107	175	47	36	0	448	299	0	35	1369	547
Confl. Peds. (#/hr)			2	2					4	4		
Heavy Vehicles (%)	5%	11%	5%	51%	21%	20%	14%	8%	38%	3%	3%	2%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Perm	NA	Perm
Protected Phases		4			8		1	6			2	
Permitted Phases	4		4	8						2		2
Actuated Green, G (s)	29.0	29.0	29.0	29.0	29.0		14.0	61.0		43.0	43.0	43.0
Effective Green, g (s)	32.0	31.5	31.5	32.0	31.5		17.0	63.5		45.5	45.5	45.5
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.30		0.16	0.60		0.43	0.43	0.43
Clearance Time (s)	7.5	7.5	7.5	7.5	7.5		4.0	7.5		7.5	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	408	519	459	266	467		502	1755		437	1535	693
v/s Ratio Prot		0.06			0.02		c0.14	0.10			c0.39	
v/s Ratio Perm	c0.14		0.11	0.05						0.03		0.34
v/c Ratio	0.45	0.21	0.38	0.18	0.08		0.89	0.17		0.08	0.89	0.79
Uniform Delay, d1	29.4	27.4	29.0	26.8	26.3		43.1	9.1		17.5	27.5	25.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.5	0.9	2.4	1.4	0.3		17.9	0.2		0.4	8.3	8.9
Delay (s)	32.9	28.3	31.4	28.3	26.6		61.0	9.4		17.8	35.7	34.5
Level of Service	C	C	C	C	C		E	A		B	D	C
Approach Delay (s)		31.3			27.5			38.5			35.0	
Approach LOS		C			C			D			C	

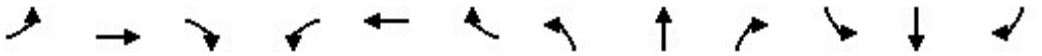
Intersection Summary			
HCM 2000 Control Delay	34.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	2	14	606	13	836	7	437	391	624	1458	6
Future Volume (vph)	1	2	14	606	13	836	7	437	391	624	1458	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		1.0	5.0		5.0	5.0	1.0	1.0	5.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.87		1.00	0.85		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	1669		3404	1452		1825	3259	1447	1659	3348	
Flt Permitted	0.14	1.00		0.95	1.00		0.13	1.00	1.00	0.36	1.00	
Satd. Flow (perm)	265	1669		3404	1452		246	3259	1447	632	3348	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	2	14	606	13	836	7	437	391	624	1458	6
RTOR Reduction (vph)	0	11	0	0	341	0	0	0	216	0	0	0
Lane Group Flow (vph)	1	5	0	606	508	0	7	437	175	624	1464	0
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	0%	0%	4%	0%	13%	0%	12%	12%	10%	9%	0%
Turn Type	Perm	NA		Prot	NA		Perm	NA	pm+ov	pm+pt	NA	
Protected Phases		4		3	8			6	3	5	2	
Permitted Phases	4						6		6	2		
Actuated Green, G (s)	26.0	26.0		19.0	49.0		30.8	30.8	49.8	62.0	62.0	
Effective Green, g (s)	29.0	28.0		22.0	51.0		32.8	32.8	55.8	65.0	64.0	
Actuated g/C Ratio	0.23	0.22		0.18	0.41		0.26	0.26	0.45	0.52	0.51	
Clearance Time (s)	7.0	7.0		4.0	7.0		7.0	7.0	4.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		6.0	6.0	3.0	6.0	3.0	
Lane Grp Cap (vph)	61	373		599	592		64	855	645	576	1714	
v/s Ratio Prot		0.00		c0.18	c0.35			0.13	0.05	c0.26	c0.44	
v/s Ratio Perm	0.00						0.03		0.07	0.30		
v/c Ratio	0.02	0.01		1.01	0.86		0.11	0.51	0.27	1.08	0.85	
Uniform Delay, d1	37.0	37.8		51.5	33.7		35.0	39.3	21.8	23.9	26.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.1		39.7	14.9		3.4	2.2	0.2	62.1	5.7	
Delay (s)	37.5	37.8		91.2	48.6		38.4	41.4	22.0	86.0	32.1	
Level of Service	D	D		F	D		D	D	C	F	C	
Approach Delay (s)		37.8			66.4			32.3			48.2	
Approach LOS		D			E			C			D	

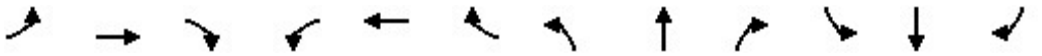
Intersection Summary			
HCM 2000 Control Delay	51.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	130.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	905	110	644	1428	357	99	310	394	507	1600	1
Future Volume (vph)	10	905	110	644	1428	357	99	310	394	507	1600	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	1.0	5.0		1.5	5.0		1.5	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.91		1.00	0.91		0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1706	3579	1445	3471	4935		1508	4390		2682	3579	1501
Flt Permitted	0.13	1.00	1.00	0.95	1.00		0.12	1.00		0.95	1.00	1.00
Satd. Flow (perm)	239	3579	1445	3471	4935		186	4390		2682	3579	1501
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	905	110	644	1428	357	99	310	394	507	1600	1
RTOR Reduction (vph)	0	0	84	0	34	0	0	182	0	0	0	1
Lane Group Flow (vph)	10	905	26	644	1751	0	99	522	0	507	1600	0
Confl. Peds. (#/hr)	1					1	3		1	1		3
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	7%	2%	13%	2%	2%	6%	21%	8%	9%	32%	2%	7%
Turn Type	Perm	NA	Perm	Prot	NA		pm+pt	NA		Prot	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4		4				2					6
Actuated Green, G (s)	28.0	28.0	28.0	18.0	50.0		39.0	31.6		24.8	49.0	49.0
Effective Green, g (s)	30.0	30.0	30.0	21.0	52.0		44.0	34.1		27.3	51.5	51.5
Actuated g/C Ratio	0.24	0.24	0.24	0.17	0.42		0.35	0.27		0.22	0.41	0.41
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0		4.0	7.5		4.0	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	57	859	347	583	2054		170	1198		586	1475	618
v/s Ratio Prot		c0.25		c0.19	0.35		0.05	0.12		c0.19	c0.45	
v/s Ratio Perm	0.04		0.02				0.16					0.00
v/c Ratio	0.18	1.05	0.08	1.10	0.85		0.58	0.44		0.87	1.08	0.00
Uniform Delay, d1	37.6	47.5	36.7	52.0	33.0		31.9	37.5		47.0	36.7	21.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.5	45.8	0.1	69.2	3.6		5.0	0.3		12.7	50.0	0.0
Delay (s)	39.1	93.2	36.8	121.2	36.6		36.9	37.7		59.7	86.7	21.6
Level of Service	D	F	D	F	D		D	D		E	F	C
Approach Delay (s)		86.7			59.0			37.6			80.2	
Approach LOS		F			E			D			F	

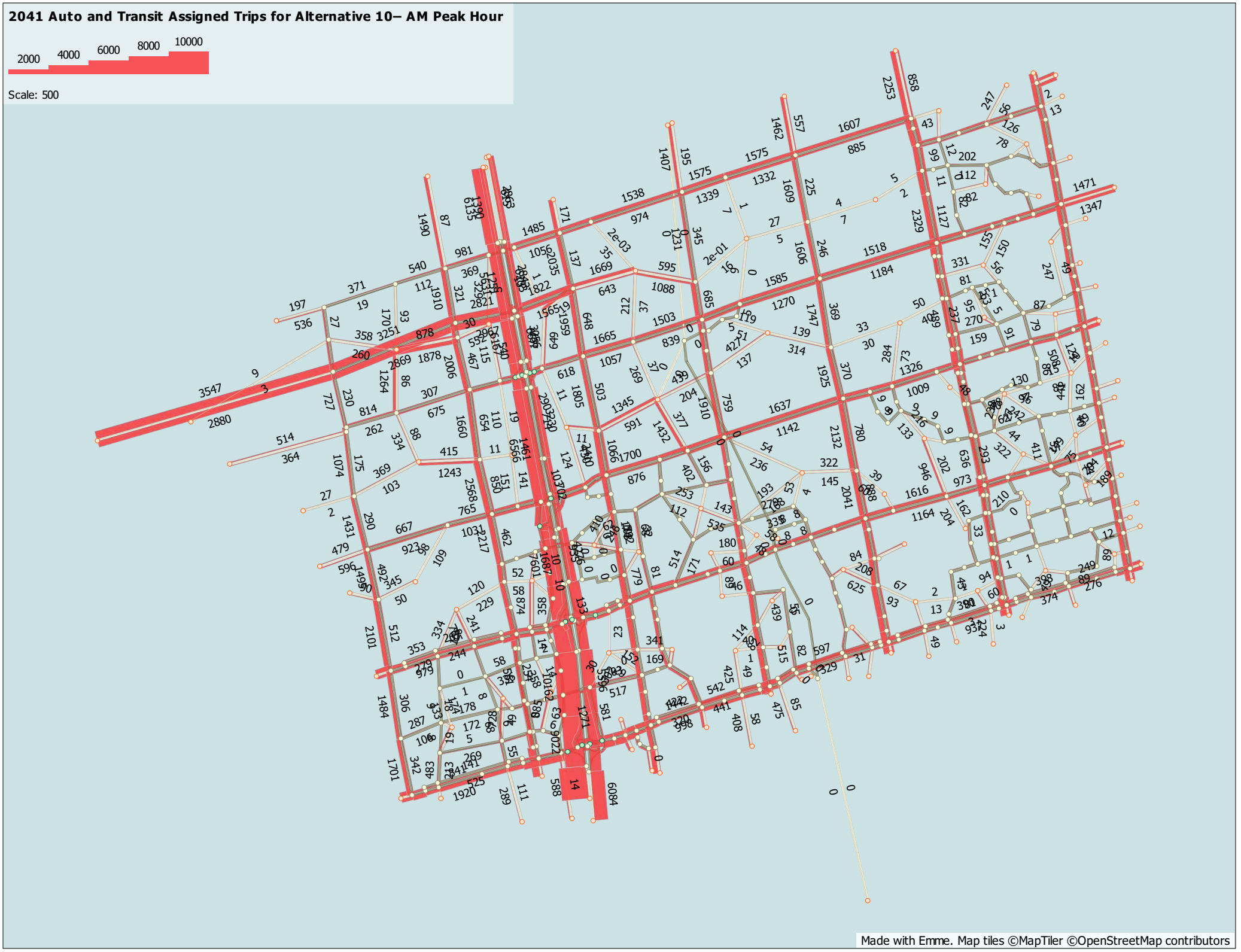
Intersection Summary			
HCM 2000 Control Delay	67.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	124.9	Sum of lost time (s)	12.5
Intersection Capacity Utilization	109.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	1244	558	18	1530	8	1026	237	36	111	1340	33
Future Volume (vph)	4	1244	558	18	1530	8	1026	237	36	111	1340	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.0		6.5	5.0	6.5	1.0	5.0	8.0	8.0	5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	4970		1825	3650	1633	3471	3579	1633	1825	3579	1601
Flt Permitted	0.07	1.00		0.08	1.00	1.00	0.95	1.00	1.00	0.60	1.00	1.00
Satd. Flow (perm)	138	4970		149	3650	1633	3471	3579	1633	1161	3579	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	1244	558	18	1530	8	1026	237	36	111	1340	33
RTOR Reduction (vph)	0	54	0	0	0	5	0	0	11	0	0	22
Lane Group Flow (vph)	4	1748	0	18	1530	3	1026	237	25	111	1340	11
Heavy Vehicles (%)	2%	0%	2%	0%	0%	0%	2%	2%	0%	0%	2%	2%
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8		8			2	6		6
Actuated Green, G (s)	51.5	51.5		51.5	51.5	51.5	33.0	84.0	84.0	47.0	47.0	47.0
Effective Green, g (s)	54.5	53.0		51.5	53.0	51.5	36.0	87.0	84.0	47.0	50.0	50.0
Actuated g/C Ratio	0.36	0.35		0.34	0.35	0.34	0.24	0.58	0.56	0.31	0.33	0.33
Clearance Time (s)	6.5	6.5		6.5	6.5	6.5	4.0	8.0	8.0	8.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	50	1756		51	1289	560	833	2075	914	363	1193	533
v/s Ratio Prot		0.35			c0.42		c0.30	0.07			c0.37	
v/s Ratio Perm	0.03			0.12		0.00			0.02	0.10		0.01
v/c Ratio	0.08	1.00		0.35	1.19	0.00	1.23	0.11	0.03	0.31	1.12	0.02
Uniform Delay, d1	31.3	48.4		36.8	48.5	32.4	57.0	14.2	14.7	39.1	50.0	33.6
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	20.2		4.2	92.2	0.0	114.7	0.1	0.1	2.2	66.9	0.1
Delay (s)	32.0	68.6		41.0	140.7	32.4	171.7	14.3	14.8	41.3	116.9	33.6
Level of Service	C	E		D	F	C	F	B	B	D	F	C
Approach Delay (s)		68.5			139.0			138.6			109.4	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	111.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	120.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX G: 2041 Snapshot of EMME Subarea Network for Alternative 10


2041 Auto and Transit Assigned Trips for Alternative 10– AM Peak Hour
2000
4000
6000
8000
10000
Scale: 500
Made with Emme. Map tiles ©MapTiler ©OpenStreetMap contributors

2041 Link Volume to Capacity Ratio for Alternative 10

Travel Direction	Section	2041# of Lanes	2041 Lane Capacity	Total Capacity	2041 EMME Assigned Volumes	2041 v/c
Eastbound	Hwy 400 to Jane St	2	900	1,800	1,160	0.64
	Jane St to Keele St	2	900	1,800	1,340	0.74
	Keele St to Dufferin St	2	900	1,800	1,142	0.63
	Dufferin St to Bathurst St	2	900	1,800	1,320	0.73
Westbound	Hwy 400 to Jane St	2	900	1,800	1,480	0.82
	Jane St to Keele St	2	900	1,800	1,522	0.85
	Keele St to Dufferin St	2	900	1,800	1,637	0.909
	Dufferin St to Bathurst St	2	900	1,800	1,611	0.90
Eastbound	Hwy 400 to Jane St	2	900	1,800	618	0.34
	Jane St to Keele St	2	900	1,800	839	0.47
	Keele St to Dufferin St	2	900	1,800	1,270	0.71
	Dufferin St to Bathurst St	2	900	1,800	1,184	0.66
Westbound	Hwy 400 to Jane St	2	900	1,800	1,235	0.69
	Jane St to Keele St	2	900	1,800	1,503	0.84
	Keele St to Dufferin St	2	900	1,800	1,585	0.88
	Dufferin St to Bathurst St	2	900	1,800	1,518	0.84
Eastbound	Hwy 400 to Jane St	3	900	2,700	1,552	0.57
	Jane St to Keele St	2	800	1,600	1,093	0.68
	Keele St to Dufferin St	2	900	1,800	879	0.49
	Dufferin St to Bathurst St	2	900	1,800	1,164	0.65
Westbound	Hwy 400 to Jane St	3	900	2,700	1,826	0.68
	Jane St to Keele St	2	800	1,600	1,355	0.85
	Keele St to Dufferin St	2	900	1,800	1,568	0.87
	Dufferin St to Bathurst St	2	900	1,800	1,616	0.90
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	391	0.22
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	377	0.21
	Teston Rd to Kirby Rd	2	1,000	2,000	503	0.25
	Kirby Rd to King Vaughan Rd	2	1,000	2,000	648	0.32
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2487	1.38
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2224	1.24
	Teston Rd to Kirby Rd	2	1,000	2,000	1805	0.90
	Kirby Rd to King Vaughan Rd	2	1,000	2,000	1959	0.98
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	439	0.24
	Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	391	0.24
	Teston Rd to Kirby Rd	2	900	1,800	805	0.45
	Kirby Rd to King Vaughan Rd	2	900	1,800	685	0.38
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	2504	1.39
	Major Mackenzie Dr IC to Teston Rd IC	2	800	1,600	1675	1.05
	Teston Rd to Kirby Rd	2	900	1,800	1723	0.96
	Kirby Rd to King Vaughan Rd	2	900	1,800	2049	1.14
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	1002	0.56
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	780	0.43
	Teston Rd to Kirby Rd	2	1,000	2,000	369	0.18
	Kirby Rd to King Vaughan Rd	2	900	1,800	246	0.14
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	2	900	1,800	1998	1.11
	Major Mackenzie Dr IC to Teston Rd IC	2	900	1,800	2132	1.18
	Teston Rd to Kirby Rd	2	1,000	2,000	1747	0.87
	Kirby Rd to King Vaughan Rd	2	900	1,800	1606	0.89
Northbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	1327	0.49
	Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	1397	0.47
	Teston Rd to Kirby Rd	3	1,200	3,600	1599	0.44
	Kirby Rd to King Vaughan Rd	2	1,200	2,400	1127	0.47
Southbound	Rutherford Rd IC to Major Mackenzie Dr IC	3	900	2,700	2871	1.06
	Major Mackenzie Dr IC to Teston Rd IC	3	1,000	3,000	2698	0.90
	Teston Rd to Kirby Rd	3	1,200	3,600	2840	0.79
	Kirby Rd to King Vaughan Rd	2	1,200	2,400	2329	0.97

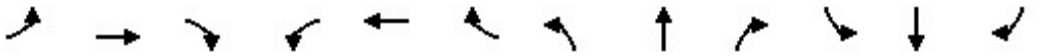
APPENDIX H: 2041 Synchro Results for Alternative 10

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	561	889	792	1151	4	61	0	140	0	3	1
Future Volume (vph)	0	561	889	792	1151	4	61	0	140	0	3	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	1.0	5.0		5.0		5.0		1.0	
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97		1.00		1.00	
Frpb, ped/bikes		1.00	0.99	1.00	1.00		1.00		1.00		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00		1.00		1.00		1.00	
Frt		1.00	0.85	1.00	1.00		1.00		0.85		0.97	
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00		1.00	
Satd. Flow (prot)		3318	1464	1630	3259		2603		1420		1856	
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00		1.00	
Satd. Flow (perm)		3318	1464	1630	3259		2603		1420		1856	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	561	889	792	1151	4	61	0	140	0	3	1
RTOR Reduction (vph)	0	0	338	0	0	0	0	0	127	0	1	0
Lane Group Flow (vph)	0	561	551	792	1155	0	61	0	13	0	3	0
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	10%	10%	12%	12%	0%	36%	0%	15%	0%	0%	0%
Turn Type	Perm	NA	Perm	Prot	NA		Prot		Perm		NA	
Protected Phases		6		5	2		8				7	
Permitted Phases	6		6						8	7		
Actuated Green, G (s)		38.1	38.1	51.1	93.2		10.5		10.5		1.3	
Effective Green, g (s)		40.1	40.1	54.1	95.2		11.5		11.5		5.3	
Actuated g/C Ratio		0.33	0.33	0.44	0.77		0.09		0.09		0.04	
Clearance Time (s)		7.0	7.0	4.0	7.0		6.0		6.0		5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0		3.0	
Lane Grp Cap (vph)		1081	477	716	2522		243		132		79	
v/s Ratio Prot		0.17		c0.49	0.35		c0.02				c0.00	
v/s Ratio Perm			c0.38						0.01			
v/c Ratio		0.52	1.16	1.11	0.46		0.25		0.10		0.04	
Uniform Delay, d1		33.6	41.5	34.5	4.9		51.8		51.0		56.4	
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00		1.00	
Incremental Delay, d2		1.8	91.6	66.6	0.6		0.5		0.3		0.2	
Delay (s)		35.4	133.0	101.0	5.5		52.3		51.3		56.6	
Level of Service		D	F	F	A		D		D		E	
Approach Delay (s)		95.2			44.3			51.6			56.6	
Approach LOS		F			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	65.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	123.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	115.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	574	127	0	1468	475	1021
Future Volume (vph)	574	127	0	1468	475	1021
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0		5.0	5.0	5.0
Lane Util. Factor	0.95	1.00		0.95	0.97	0.91
Frt	1.00	0.85		1.00	0.92	0.85
Flt Protected	1.00	1.00		1.00	0.98	1.00
Satd. Flow (prot)	3411	1526		3411	3137	1389
Flt Permitted	1.00	1.00		1.00	0.98	1.00
Satd. Flow (perm)	3411	1526		3411	3137	1389
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	574	127	0	1468	475	1021
RTOR Reduction (vph)	0	0	0	0	178	178
Lane Group Flow (vph)	574	127	0	1468	808	332
Heavy Vehicles (%)	7%	7%	0%	7%	7%	7%
Turn Type	NA	Free		NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases		Free				8
Actuated Green, G (s)	47.1	89.8		47.1	27.7	27.7
Effective Green, g (s)	49.6	89.8		49.6	30.2	30.2
Actuated g/C Ratio	0.55	1.00		0.55	0.34	0.34
Clearance Time (s)	7.5			7.5	7.5	7.5
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Lane Grp Cap (vph)	1884	1526		1884	1054	467
v/s Ratio Prot	0.17			c0.43	c0.26	
v/s Ratio Perm		0.08				0.24
v/c Ratio	0.30	0.08		0.78	0.77	0.71
Uniform Delay, d1	10.8	0.0		15.8	26.6	26.0
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1		3.3	3.4	5.1
Delay (s)	11.2	0.1		19.1	30.0	31.1
Level of Service	B	A		B	C	C
Approach Delay (s)	9.2			19.1	30.4	
Approach LOS	A			B	C	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	89.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	528	626	7	523	903	274	5	265	112	138	1694	578
Future Volume (vph)	528	626	7	523	903	274	5	265	112	138	1694	578
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1772	3544	1547	3506	3510	1126	1825	3288	1555	1772	3614	1597
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.07	1.00	1.00	0.57	1.00	1.00
Satd. Flow (perm)	1772	3544	1547	3506	3510	1126	125	3288	1555	1061	3614	1597
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	528	626	7	523	903	274	5	265	112	138	1694	578
RTOR Reduction (vph)	0	0	5	0	0	90	0	0	64	0	0	175
Lane Group Flow (vph)	528	626	2	523	903	184	5	265	48	138	1694	403
Confl. Peds. (#/hr)			2	2								
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	3%	3%	4%	1%	4%	45%	0%	11%	5%	3%	1%	1%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			6			2	
Permitted Phases			4			8	6		6	2		2
Actuated Green, G (s)	34.0	40.9	40.9	25.1	32.0	32.0	59.0	59.0	59.0	59.0	59.0	59.0
Effective Green, g (s)	37.0	44.4	44.4	28.1	35.5	35.5	61.5	61.5	61.5	61.5	61.5	61.5
Actuated g/C Ratio	0.26	0.31	0.31	0.19	0.24	0.24	0.42	0.42	0.42	0.42	0.42	0.42
Clearance Time (s)	4.0	8.5	8.5	4.0	8.5	8.5	7.5	7.5	7.5	7.5	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	452	1085	473	679	859	275	53	1394	659	450	1532	677
v/s Ratio Prot	c0.30	0.18		0.15	c0.26			0.08			c0.47	
v/s Ratio Perm			0.00			0.16	0.04		0.03	0.13		0.25
v/c Ratio	1.17	0.58	0.00	0.77	1.05	0.67	0.09	0.19	0.07	0.31	1.11	0.60
Uniform Delay, d1	54.0	42.4	34.9	55.4	54.8	49.5	25.0	26.2	24.8	27.6	41.8	32.2
Progression 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
Incremental Delay, d2	97.2	0.7	0.0	5.4	45.1	6.1	3.5	0.3	0.2	1.8	57.7	3.8
Delay (s)	151.2	43.1	35.0	60.8	99.8	55.5	28.6	26.5	25.0	29.4	99.5	36.0
Level of Service	F	D	C	E	F	E	C	C	C	C	F	D
Approach Delay (s)		92.2			80.7			26.1			80.2	
Approach LOS		F			F			C			F	

Intersection Summary			
HCM 2000 Control Delay	79.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	146.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

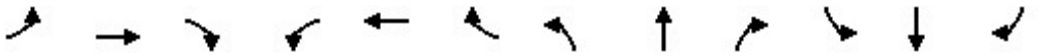
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						
Lane Util. Factor						
Frt						
Flt Protected						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0
Heavy Vehicles (%)	6%	6%	3%	4%	1%	7%
Turn Type		Perm	Perm		Prot	Perm
Protected Phases	6			2	8	
Permitted Phases		6	2			8
Actuated Green, G (s)						
Effective Green, g (s)						
Actuated g/C Ratio						
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)						
v/s Ratio Prot						
v/s Ratio Perm						
v/c Ratio						
Uniform Delay, d1						
Progression Factor						
Incremental Delay, d2						
Delay (s)						
Level of Service						
Approach Delay (s)	0.0			0.0	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	997	136	110	1215	313	18	306	67	77	1429	267
Future Volume (vph)	108	997	136	110	1215	313	18	306	67	77	1429	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1738	3288	1532	1209	3017	1361	1601	3123		1766	3544	1601
Flt Permitted	0.08	1.00	1.00	0.15	1.00	1.00	0.07	1.00		0.49	1.00	1.00
Satd. Flow (perm)	138	3288	1532	189	3017	1361	124	3123		909	3544	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	108	997	136	110	1215	313	18	306	67	77	1429	267
RTOR Reduction (vph)	0	0	42	0	0	85	0	15	0	0	0	91
Lane Group Flow (vph)	108	997	94	110	1215	228	18	358	0	77	1429	176
Confl. Peds. (#/hr)			2	2					4	4		
Heavy Vehicles (%)	5%	11%	5%	51%	21%	20%	14%	8%	38%	3%	3%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			6			2	
Permitted Phases	4		4	8		8	6			2		2
Actuated Green, G (s)	58.9	51.5	51.5	59.1	51.6	51.6	52.0	52.0		52.0	52.0	52.0
Effective Green, g (s)	64.9	54.0	54.0	65.1	54.1	54.1	54.5	54.5		54.5	54.5	54.5
Actuated g/C Ratio	0.50	0.42	0.42	0.50	0.42	0.42	0.42	0.42		0.42	0.42	0.42
Clearance Time (s)	4.0	7.5	7.5	4.0	7.5	7.5	7.5	7.5		7.5	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	196	1365	636	177	1255	566	51	1309		381	1485	671
v/s Ratio Prot	0.04	0.30		c0.05	c0.40			0.11			c0.40	
v/s Ratio Perm	0.23		0.06	0.26		0.17	0.15			0.08		0.11
v/c Ratio	0.55	0.73	0.15	0.62	0.97	0.40	0.35	0.27		0.20	0.96	0.26
Uniform Delay, d1	24.3	31.9	23.7	21.6	37.1	26.6	25.7	24.8		24.0	36.7	24.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.3	3.5	0.5	6.6	18.8	2.1	18.1	0.5		1.2	15.9	1.0
Delay (s)	27.7	35.4	24.2	28.3	55.9	28.8	43.9	25.3		25.1	52.7	25.6
Level of Service	C	D	C	C	E	C	D	C		C	D	C
Approach Delay (s)		33.5			48.9			26.1			47.4	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	42.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	115.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	890	252	252	1273	86	364	284	132	298	1628	5
Future Volume (vph)	5	890	252	252	1273	86	364	284	132	298	1628	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3650	1633	3404	3650	1445	3541	3259	1440	3219	3348	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1825	3650	1633	3404	3650	1445	3541	3259	1440	3219	3348	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	890	252	252	1273	86	364	284	132	298	1628	5
RTOR Reduction (vph)	0	0	84	0	0	55	0	0	80	0	0	0
Lane Group Flow (vph)	5	890	168	252	1273	31	364	284	52	298	1633	0
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	0%	0%	4%	0%	13%	0%	12%	12%	10%	9%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			
Actuated Green, G (s)	1.4	41.9	41.9	10.8	51.3	51.3	11.0	56.0	56.0	17.5	62.5	
Effective Green, g (s)	4.4	43.9	43.9	13.8	53.3	53.3	14.0	58.0	58.0	20.5	64.5	
Actuated g/C Ratio	0.03	0.30	0.30	0.09	0.36	0.36	0.09	0.39	0.39	0.14	0.44	
Clearance Time (s)	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	6.0	6.0	6.0	3.0	
Lane Grp Cap (vph)	54	1081	483	316	1312	519	334	1275	563	445	1457	
v/s Ratio Prot	0.00	0.24		c0.07	c0.35		c0.10	0.09		0.09	c0.49	
v/s Ratio Perm			0.10			0.02			0.04			
v/c Ratio	0.09	0.82	0.35	0.80	0.97	0.06	1.09	0.22	0.09	0.67	1.12	
Uniform Delay, d1	70.0	48.5	40.9	65.8	46.7	31.1	67.1	30.1	28.5	60.6	41.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	7.1	2.0	13.1	18.7	0.2	75.4	0.4	0.3	5.9	64.1	
Delay (s)	70.7	55.7	42.9	78.9	65.4	31.3	142.5	30.5	28.8	66.6	105.9	
Level of Service	E	E	D	E	E	C	F	C	C	E	F	
Approach Delay (s)		52.9			65.7			82.5			99.9	
Approach LOS		D			E			F			F	

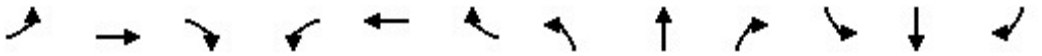
Intersection Summary			
HCM 2000 Control Delay	77.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	148.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	111.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						
Lane Util. Factor						
Frpb, ped/bikes						
Flpb, ped/bikes						
Frt						
Flt Protected						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0
Confl. Peds. (#/hr)		1	1		1	1
Heavy Vehicles (%)	6%	8%	2%	2%	5%	2%
Turn Type		Perm	Perm		Prot	Perm
Protected Phases	6			2	8	
Permitted Phases		6	2			8
Actuated Green, G (s)						
Effective Green, g (s)						
Actuated g/C Ratio						
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)						
v/s Ratio Prot						
v/s Ratio Perm						
v/c Ratio						
Uniform Delay, d1						
Progression Factor						
Incremental Delay, d2						
Delay (s)						
Level of Service						
Approach Delay (s)	0.0			0.0	0.0	
Approach LOS	A			A	A	

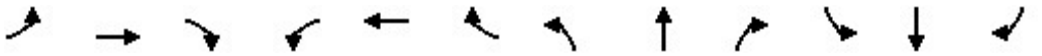
Intersection Summary			
HCM 2000 Control Delay	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	261	597	127	63	592	242	268	883	24	203	2006	414
Future Volume (vph)	261	597	127	63	592	242	268	883	24	203	2006	414
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3544	1331	1772	3510	1387	1644	3476	1523	1771	3579	1586
Flt Permitted	0.23	1.00	1.00	0.26	1.00	1.00	0.06	1.00	1.00	0.22	1.00	1.00
Satd. Flow (perm)	424	3544	1331	477	3510	1387	105	3476	1523	408	3579	1586
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	261	597	127	63	592	242	268	883	24	203	2006	414
RTOR Reduction (vph)	0	0	92	0	0	154	0	0	13	0	0	99
Lane Group Flow (vph)	261	597	35	63	592	88	268	883	11	203	2006	315
Confl. Peds. (#/hr)	16		1	1		16	5		14	14		5
Confl. Bikes (#/hr)			1			1			1			2
Heavy Vehicles (%)	5%	3%	21%	3%	4%	14%	11%	5%	4%	3%	2%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	42.4	35.4	35.4	39.4	33.9	33.9	73.0	63.0	63.0	75.2	64.1	64.1
Effective Green, g (s)	47.9	38.4	38.4	45.4	36.9	36.9	79.0	66.0	66.0	81.1	67.1	67.1
Actuated g/C Ratio	0.34	0.28	0.28	0.33	0.27	0.27	0.57	0.47	0.47	0.58	0.48	0.48
Clearance Time (s)	4.0	8.0	8.0	4.0	8.0	8.0	4.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	6.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	240	979	367	234	931	368	203	1650	723	376	1727	765
v/s Ratio Prot	c0.08	0.17		0.02	c0.17		c0.12	0.25		c0.05	c0.56	
v/s Ratio Perm	0.30		0.03	0.07		0.06	0.63		0.01	0.26		0.20
v/c Ratio	1.09	0.61	0.10	0.27	0.64	0.24	1.32	0.54	0.02	0.54	1.16	0.41
Uniform Delay, d1	42.2	43.8	37.4	33.5	45.1	40.1	46.2	25.7	19.3	16.1	36.0	23.2
Progression 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
Incremental Delay, d2	83.4	1.1	0.1	0.6	2.4	1.0	174.3	1.2	0.0	1.5	79.5	1.6
Delay (s)	125.6	44.9	37.5	34.2	47.5	41.0	220.5	26.9	19.4	17.6	115.5	24.8
Level of Service	F	D	D	C	D	D	F	C	B	B	F	C
Approach Delay (s)		65.3			44.8			70.9			93.6	
Approach LOS		E			D			E			F	

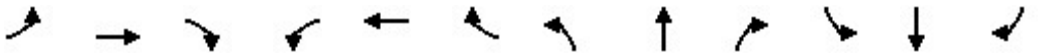
Intersection Summary			
HCM 2000 Control Delay	76.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	139.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	121.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1957	8	14	1637	588	6	0	13	1184	54	127
Future Volume (vph)	0	1957	8	14	1637	588	6	0	13	1184	54	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		1.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor		0.91		1.00	0.95	1.00	1.00		1.00	0.95	0.91	0.95
Frpb, ped/bikes		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	0.99
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Frt		1.00		1.00	1.00	0.85	1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00	1.00	0.95		1.00	0.95	0.96	1.00
Satd. Flow (prot)		4852		1372	3349	1633	1372		1247	1651	1559	1086
Flt Permitted		1.00		0.07	1.00	1.00	0.47		1.00	0.95	0.96	1.00
Satd. Flow (perm)		4852		98	3349	1633	671		1247	1651	1559	1086
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1957	8	14	1637	588	6	0	13	1184	54	127
RTOR Reduction (vph)	0	0	0	0	0	296	0	0	12	0	1	70
Lane Group Flow (vph)	0	1965	0	14	1637	292	6	0	1	663	585	46
Confl. Peds. (#/hr)			4	4			1					1
Heavy Vehicles (%)	0%	8%	10%	33%	9%	0%	33%	0%	31%	5%	20%	41%
Turn Type		NA		pm+pt	NA	Perm	Perm		Perm	Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases				6		6	8		8	4		4
Actuated Green, G (s)		55.2		62.0	62.0	62.0	6.1		6.1	55.4	55.4	55.4
Effective Green, g (s)		57.2		65.0	64.0	64.0	8.6		8.6	57.4	57.4	57.4
Actuated g/C Ratio		0.39		0.45	0.44	0.44	0.06		0.06	0.40	0.40	0.40
Clearance Time (s)		7.0		4.0	7.0	7.0	7.5		7.5	7.0	7.0	7.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		1914		94	1478	720	39		73	653	617	429
v/s Ratio Prot		0.40		0.01	c0.49							
v/s Ratio Perm				0.06		0.18	c0.01		0.00	c0.40	0.38	0.04
v/c Ratio		1.03		0.15	1.11	0.41	0.15		0.01	1.02	0.95	0.11
Uniform Delay, d1		43.9		32.7	40.5	27.6	64.7		64.2	43.8	42.4	27.6
Progression Factor		1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		27.7		0.7	58.7	1.7	1.8		0.1	39.1	24.0	0.1
Delay (s)		71.6		33.4	99.2	29.3	66.6		64.3	82.9	66.3	27.7
Level of Service		E		C	F	C	E		E	F	E	C
Approach Delay (s)		71.6			80.5			65.0			71.1	
Approach LOS		E			F			E			E	

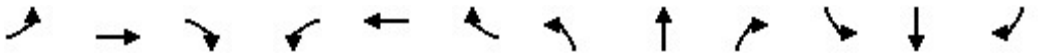
Intersection Summary			
HCM 2000 Control Delay	75.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1027	516	0	1706	133	519	0	514	0	0	0
Future Volume (vph)	0	1027	516	0	1706	133	519	0	514	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	1.5		5.0	1.5	5.0		5.0			
Lane Util. Factor		0.95	1.00		0.95	1.00	0.97		0.88			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		3411	1633		3444	1633	3190		2566			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		3411	1633		3444	1633	3190		2566			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1027	516	0	1706	133	519	0	514	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	198	0	0	0
Lane Group Flow (vph)	0	1027	516	0	1706	133	519	0	316	0	0	0
Heavy Vehicles (%)	0%	7%	0%	0%	6%	0%	11%	0%	12%	0%	0%	0%
Turn Type		NA	Free		NA	Free	Perm		Perm			
Protected Phases		2			6							
Permitted Phases			Free			Free	8		8			
Actuated Green, G (s)		88.9	130.0		88.9	130.0	27.1		27.1			
Effective Green, g (s)		91.4	130.0		91.4	130.0	28.6		28.6			
Actuated g/C Ratio		0.70	1.00		0.70	1.00	0.22		0.22			
Clearance Time (s)		7.5			7.5		6.5		6.5			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		2398	1633		2421	1633	701		564			
v/s Ratio Prot		0.30			c0.50							
v/s Ratio Perm			0.32			0.08	c0.16		0.12			
v/c Ratio		0.43	0.32		0.70	0.08	0.74		0.56			
Uniform Delay, d1		8.2	0.0		11.4	0.0	47.2		45.1			
Progression Factor		1.00	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		0.6	0.5		1.8	0.1	4.2		1.3			
Delay (s)		8.8	0.5		13.1	0.1	51.5		46.4			
Level of Service		A	A		B	A	D		D			
Approach Delay (s)		6.0			12.2			48.9			0.0	
Approach LOS		A			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	311	1072	169	259	1391	35	114	219	58	263	2058	321
Future Volume (vph)	311	1072	169	259	1391	35	114	219	58	263	2058	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3404	3476	1565	1755	3579	1306	1722	3380	1430	1678	3579	1578
Flt Permitted	0.95	1.00	1.00	0.09	1.00	1.00	0.07	1.00	1.00	0.60	1.00	1.00
Satd. Flow (perm)	3404	3476	1565	161	3579	1306	121	3380	1430	1054	3579	1578
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	311	1072	169	259	1391	35	114	219	58	263	2058	321
RTOR Reduction (vph)	0	0	81	0	0	0	0	0	34	0	0	90
Lane Group Flow (vph)	311	1072	88	259	1391	35	114	219	24	263	2058	231
Confl. Peds. (#/hr)	4		1	1		4	2		14	14		2
Heavy Vehicles (%)	4%	5%	3%	4%	2%	23%	6%	8%	11%	8%	2%	2%
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6	8		8	4		4
Actuated Green, G (s)	7.0	42.0	42.0	58.0	46.0	46.0	64.0	57.0	57.0	70.0	60.0	60.0
Effective Green, g (s)	11.0	45.0	45.0	61.0	49.0	49.0	70.0	60.0	60.0	74.0	63.0	63.0
Actuated g/C Ratio	0.08	0.31	0.31	0.42	0.34	0.34	0.48	0.41	0.41	0.51	0.43	0.43
Clearance Time (s)	5.0	8.0	8.0	4.0	8.0	8.0	4.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	258	1078	485	232	1209	441	168	1398	591	593	1555	685
v/s Ratio Prot	c0.09	0.31		c0.12	c0.39		c0.05	0.06		c0.04	c0.58	
v/s Ratio Perm			0.06	0.35		0.03	0.28		0.02	0.19		0.15
v/c Ratio	1.21	0.99	0.18	1.12	1.15	0.08	0.68	0.16	0.04	0.44	1.32	0.34
Uniform Delay, d1	67.0	49.9	36.5	44.4	48.0	32.7	32.3	26.6	25.3	20.6	41.0	27.2
Progression 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
Incremental Delay, d2	123.2	26.1	0.8	93.9	77.7	0.4	10.4	0.1	0.0	0.5	150.2	0.3
Delay (s)	190.2	76.0	37.4	138.3	125.7	33.0	42.7	26.7	25.4	21.2	191.2	27.5
Level of Service	F	E	D	F	F	C	D	C	C	C	F	C
Approach Delay (s)		94.7			125.7			31.2			154.3	
Approach LOS		F			F			C			F	

Intersection Summary			
HCM 2000 Control Delay	124.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	125.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	730	173	450	1083	48	63	319	57	5	1881	209
Future Volume (vph)	190	730	173	450	1083	48	63	319	57	5	1881	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0		1.0	5.0		1.0	5.0		1.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1738	3455		1789	3554		1738	3369		1797	3501	
Flt Permitted	0.11	1.00		0.11	1.00		0.06	1.00		0.53	1.00	
Satd. Flow (perm)	198	3455		198	3554		107	3369		997	3501	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	190	730	173	450	1083	48	63	319	57	5	1881	209
RTOR Reduction (vph)	0	14	0	0	2	0	0	9	0	0	5	0
Lane Group Flow (vph)	190	889	0	450	1129	0	63	367	0	5	2085	0
Confl. Peds. (#/hr)	15		7	7		15	20		13	13		20
Heavy Vehicles (%)	5%	2%	3%	2%	2%	0%	5%	6%	2%	1%	2%	5%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	43.0	34.0		58.0	45.0		74.0	68.6		65.9	64.5	
Effective Green, g (s)	49.0	36.0		61.0	47.0		77.0	70.6		71.9	66.5	
Actuated g/C Ratio	0.34	0.25		0.42	0.32		0.53	0.48		0.49	0.46	
Clearance Time (s)	4.0	7.0		4.0	7.0		4.0	7.0		4.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	193	851		333	1144		151	1629		515	1594	
v/s Ratio Prot	0.08	0.26		c0.21	c0.32		c0.02	0.11		0.00	c0.60	
v/s Ratio Perm	0.25			0.35			0.20			0.00		
v/c Ratio	0.98	1.04		1.35	0.99		0.42	0.23		0.01	1.31	
Uniform Delay, d1	40.3	55.0		46.2	49.2		31.7	21.8		18.9	39.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	59.8	43.0		176.7	23.6		1.9	0.3		0.0	143.1	
Delay (s)	100.2	98.0		222.9	72.8		33.5	22.2		18.9	182.9	
Level of Service	F	F		F	E		C	C		B	F	
Approach Delay (s)		98.4			115.6			23.8			182.5	
Approach LOS		F			F			C			F	

Intersection Summary			
HCM 2000 Control Delay	131.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	146.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	122.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Future Volume (vph)	28	753	98	334	1215	166	122	694	187	244	1566	231
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Satd. Flow (prot)	1755	3579	1544	1807	3579	1517	1807	3510	1542	1771	3614	1574
Satd. Flow (perm)	168	3579	1544	331	3579	1517	145	3510	1542	469	3614	1574
Adj. Flow (vph)	28	753	98	334	1215	166	122	694	187	244	1566	231
Lane Group Flow (vph)	28	753	30	334	1215	86	122	694	69	244	1566	131
Heavy Vehicles (%)	4%	2%	4%	1%	2%	6%	1%	4%	4%	3%	1%	2%
Protected Phases	5	2		1	6		3	8		7	4	
Actuated Green, G (s)	45.3	41.1	41.1	59.1	50.9	50.9	56.5	49.5	49.5	67.5	56.5	56.5
Actuated g/C Ratio	0.36	0.31	0.31	0.44	0.38	0.38	0.44	0.37	0.37	0.50	0.42	0.42
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
v/s Ratio Prot	0.01	0.21		c0.12	c0.34		c0.05	0.20		0.08	c0.43	
v/c Ratio	0.20	0.68	0.06	1.04	0.90	0.15	0.67	0.54	0.12	0.63	1.04	0.20
Progression 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
Delay (s)	34.2	46.4	34.8	91.3	51.5	29.7	42.1	35.8	29.8	25.7	75.8	26.4
Approach Delay (s)		44.7			57.1			35.4			64.2	

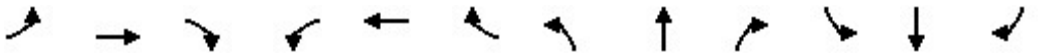
HCM 2000 Volume to Capacity ratio	0.96		
Intersection Capacity Utilization	115.2%	ICU Level of Service	H

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	826	379	113	775	390	100	835	183	484	1903	98
Future Volume (vph)	18	826	379	113	775	390	100	835	183	484	1903	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	4.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1722	3476	1585	1807	3544	1565	1807	3510	1551	1825	3614	1600
Flt Permitted	0.16	1.00	1.00	0.11	1.00	1.00	0.08	1.00	1.00	0.18	1.00	1.00
Satd. Flow (perm)	282	3476	1585	206	3544	1565	145	3510	1551	348	3614	1600
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	18	826	379	113	775	390	100	835	183	484	1903	98
RTOR Reduction (vph)	0	0	0	0	0	179	0	0	106	0	0	45
Lane Group Flow (vph)	18	826	379	113	775	211	100	835	77	484	1903	53
Confl. Peds. (#/hr)	1					1	7		8	8		7
Heavy Vehicles (%)	6%	5%	3%	1%	3%	3%	1%	4%	3%	0%	1%	0%
Turn Type	pm+pt	NA	Free	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		Free	6		6	8		8	4		4
Actuated Green, G (s)	35.8	33.0	140.0	44.0	37.2	37.2	56.3	49.3	49.3	82.0	71.0	71.0
Effective Green, g (s)	41.8	35.0	140.0	47.0	39.2	39.2	62.3	51.3	51.3	85.0	73.0	73.0
Actuated g/C Ratio	0.30	0.25	1.00	0.34	0.28	0.28	0.44	0.37	0.37	0.61	0.52	0.52
Clearance Time (s)	4.0	7.0		4.0	7.0	7.0	4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	143	869	1585	183	992	438	183	1286	568	545	1884	834
v/s Ratio Prot	0.01	c0.24		c0.04	0.22		0.04	0.24		c0.20	c0.53	
v/s Ratio Perm	0.03		0.24	0.16		0.14	0.20		0.05	0.34		0.03
v/c Ratio	0.13	0.95	0.24	0.62	0.78	0.48	0.55	0.65	0.14	0.89	1.01	0.06
Uniform Delay, d1	36.3	51.6	0.0	36.4	46.4	42.0	31.6	36.9	29.6	29.2	33.5	16.6
Progression 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
Incremental Delay, d2	0.4	20.6	0.4	6.1	6.1	3.8	3.3	1.1	0.1	16.1	23.2	0.0
Delay (s)	36.7	72.3	0.4	42.5	52.6	45.7	34.9	38.0	29.7	45.3	56.7	16.6
Level of Service	D	E	A	D	D	D	C	D	C	D	E	B
Approach Delay (s)		49.5			49.6			36.4			52.9	
Approach LOS		D			D			D			D	

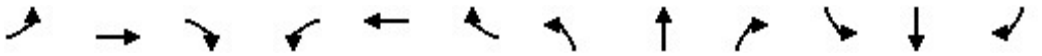
Intersection Summary			
HCM 2000 Control Delay	48.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	105.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group



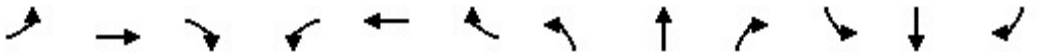
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	490	126	284	978	403	248	243	12	555	1395	9
Future Volume (vph)	5	490	126	284	978	403	248	243	12	555	1395	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1615	3579	1541	1738	3614	1484	1460	3318	1471	1825	3544	1585
Flt Permitted	0.17	1.00	1.00	0.29	1.00	1.00	0.09	1.00	1.00	0.60	1.00	1.00
Satd. Flow (perm)	292	3579	1541	533	3614	1484	139	3318	1471	1154	3544	1585
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	490	126	284	978	403	248	243	12	555	1395	9
RTOR Reduction (vph)	0	0	99	0	0	177	0	0	0	0	0	0
Lane Group Flow (vph)	5	490	27	284	978	226	248	243	12	555	1395	9
Heavy Vehicles (%)	13%	2%	6%	5%	1%	10%	25%	10%	11%	0%	3%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	21.7	20.3	20.3	34.3	28.9	28.9	48.2	41.2	41.2	48.2	41.2	41.2
Effective Green, g (s)	27.7	21.8	21.8	37.3	30.4	30.4	54.2	44.7	44.7	54.2	44.7	44.7
Actuated g/C Ratio	0.27	0.21	0.21	0.37	0.30	0.30	0.53	0.44	0.44	0.53	0.44	0.44
Clearance Time (s)	4.0	6.5	6.5	4.0	6.5	6.5	4.0	8.5	8.5	4.0	8.5	8.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	137	768	330	350	1082	444	204	1461	647	682	1560	698
v/s Ratio Prot	0.00	0.14		c0.10	c0.27		c0.12	0.07		0.08	c0.39	
v/s Ratio Perm	0.01		0.02	0.19		0.15	0.53		0.01	0.35		0.01
v/c Ratio	0.04	0.64	0.08	0.81	0.90	0.51	1.22	0.17	0.02	0.81	0.89	0.01
Uniform Delay, d1	28.0	36.3	31.9	24.9	34.1	29.4	28.7	17.1	16.0	17.3	26.2	16.0
Progression 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
Incremental Delay, d2	0.1	1.7	0.1	13.3	10.6	0.9	133.3	0.1	0.0	7.4	7.0	0.0
Delay (s)	28.1	38.0	32.0	38.2	44.7	30.3	162.0	17.2	16.0	24.7	33.2	16.0
Level of Service	C	D	C	D	D	C	F	B	B	C	C	B
Approach Delay (s)		36.7			40.1			88.6			30.7	
Approach LOS		D			D			F			C	

Intersection Summary			
HCM 2000 Control Delay	40.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	101.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	111.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	701	119	20	1196	268	299	406	99	470	1579	5
Future Volume (vph)	11	701	119	20	1196	268	299	406	99	470	1579	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1706	3579	1445	1789	3579	1519	1508	3380	1477	1382	3579	1500
Flt Permitted	0.10	1.00	1.00	0.17	1.00	1.00	0.08	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	178	3579	1445	325	3579	1519	124	3380	1477	619	3579	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	701	119	20	1196	268	299	406	99	470	1579	5
RTOR Reduction (vph)	0	0	86	0	0	93	0	0	65	0	0	3
Lane Group Flow (vph)	11	701	33	20	1196	175	299	406	34	470	1579	2
Confl. Peds. (#/hr)	1					1	3		1	1		3
Confl. Bikes (#/hr)						1			1			
Heavy Vehicles (%)	7%	2%	13%	2%	2%	6%	21%	8%	9%	32%	2%	7%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	38.4	38.4	38.4	46.6	46.6	46.6	67.1	48.1	48.1	85.5	62.5	62.5
Effective Green, g (s)	40.4	40.4	40.4	49.6	48.6	48.6	73.1	50.6	50.6	88.5	65.0	65.0
Actuated g/C Ratio	0.28	0.28	0.28	0.34	0.33	0.33	0.50	0.35	0.35	0.60	0.44	0.44
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	49	986	398	181	1186	503	269	1166	509	563	1586	665
v/s Ratio Prot		0.20		0.01	c0.33		c0.17	0.12		c0.21	0.44	
v/s Ratio Perm	0.06		0.02	0.03		0.12	c0.39		0.02	0.30		0.00
v/c Ratio	0.22	0.71	0.08	0.11	1.01	0.35	1.11	0.35	0.07	0.83	1.00	0.00
Uniform Delay, d1	41.0	47.8	39.4	34.4	49.0	37.0	48.3	35.7	32.2	18.2	40.7	22.7
Progression 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
Incremental Delay, d2	2.3	2.4	0.1	0.3	28.2	0.4	88.2	0.2	0.1	10.3	21.4	0.0
Delay (s)	43.3	50.3	39.4	34.6	77.2	37.4	136.5	35.9	32.2	28.5	62.1	22.7
Level of Service	D	D	D	C	E	D	F	D	C	C	E	C
Approach Delay (s)		48.6			69.5			72.9			54.3	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	60.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	146.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1001	265	19	1488	12	95	231	36	148	1456	5
Future Volume (vph)	5	1001	265	19	1488	12	95	231	36	148	1456	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	1.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	3650	1601	1825	3650	1633	1789	3579	1633	1825	3579	1601
Flt Permitted	0.08	1.00	1.00	0.18	1.00	1.00	0.08	1.00	1.00	0.61	1.00	1.00
Satd. Flow (perm)	146	3650	1601	340	3650	1633	150	3579	1633	1168	3579	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1001	265	19	1488	12	95	231	36	148	1456	5
RTOR Reduction (vph)	0	0	84	0	0	7	0	0	19	0	0	3
Lane Group Flow (vph)	5	1001	181	19	1488	5	95	231	17	148	1456	2
Heavy Vehicles (%)	2%	0%	2%	0%	0%	0%	2%	2%	0%	0%	2%	2%
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	52.9	52.9	52.9	47.6	47.6	47.6	57.1	57.1	57.1	46.1	46.1	46.1
Effective Green, g (s)	55.9	54.4	54.4	49.1	49.1	49.1	56.1	60.1	60.1	49.1	49.1	49.1
Actuated g/C Ratio	0.45	0.44	0.44	0.39	0.39	0.39	0.45	0.48	0.48	0.39	0.39	0.39
Clearance Time (s)	4.0	6.5	6.5	6.5	6.5	6.5	4.0	8.0	8.0	8.0	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	122	1594	699	134	1439	644	146	1727	788	460	1411	631
v/s Ratio Prot	0.00	c0.27			c0.41		c0.03	0.06			c0.41	
v/s Ratio Perm	0.02		0.11	0.06		0.00	0.26		0.01	0.13		0.00
v/c Ratio	0.04	0.63	0.26	0.14	1.03	0.01	0.65	0.13	0.02	0.32	1.03	0.00
Uniform Delay, d1	28.1	27.2	22.3	24.2	37.7	22.9	28.8	17.8	16.8	26.2	37.7	22.9
Progression 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
Incremental Delay, d2	0.1	0.8	0.2	0.5	33.0	0.0	9.9	0.2	0.1	1.8	32.6	0.0
Delay (s)	28.2	28.0	22.5	24.7	70.7	22.9	38.8	18.0	16.9	28.0	70.3	22.9
Level of Service	C	C	C	C	E	C	D	B	B	C	E	C
Approach Delay (s)		26.8			69.7			23.3			66.2	
Approach LOS		C			E			C			E	

Intersection Summary			
HCM 2000 Control Delay	53.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	124.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Future Volume (vph)	22	863	299	388	1056	52	415	1052	131	129	2154	47
Total Lost time (s)	5.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0	1.0	5.0	5.0
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Satd. Flow (prot)	1825	3650	1633	1789	3650	1601	1825	3579	1601	1789	3579	1633
Satd. Flow (perm)	233	3650	1633	215	3650	1601	114	3579	1601	353	3579	1633
Adj. Flow (vph)	22	863	299	388	1056	52	415	1052	131	129	2154	47
Lane Group Flow (vph)	22	863	200	388	1056	18	415	1052	73	129	2154	22
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Permitted Phases	4		4	8		8	2		2	6		6
Effective Green, g (s)	33.0	33.0	33.0	49.0	48.0	48.0	82.5	71.0	71.0	76.5	66.0	66.0
Clearance Time (s)	7.0	7.0	7.0	4.0	7.0	7.0	4.0	7.5	7.5	4.0	7.5	7.5
Lane Grp Cap (vph)	54	860	384	232	1251	548	250	1815	811	295	1687	769
v/s Ratio Perm	0.09		0.12	0.42		0.01	0.80		0.05	0.21		0.01
Uniform Delay, d1	45.2	53.5	46.6	39.8	42.5	30.6	47.8	24.1	17.8	17.6	37.0	19.8
Incremental Delay, d2	4.9	31.5	1.3	320.8	5.4	0.0	314.1	1.4	0.2	1.0	129.3	0.1
Level of Service	D	F	D	F	D	C	F	C	B	B	F	B
Approach LOS		E			F			F			F	

HCM 2000 Control Delay	124.4	HCM 2000 Level of Service	F
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0
Analysis Period (min)	15		