APPENDIX A

Transportation Assessment Report

Transportation Assessment Report (Rev-02)

Upper Wellington Street (Stone Church Road East to Limeridge Road East) Schedule ‘C’ Municipal Class Environmental Assessment

Project # CA-EI-IM20103037

Prepared for:

City of Hamilton

100 King St W, 2nd Floor Hamilton, ON L8P 1A2

3/5/2025

Transportation Assessment Report (Rev-02)

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Schedule 'C' Municipal Class Environmental Assessment
Project # CA-EI-IM20103037

Prepared for:

City of Hamilton
100 King St W, 2nd Floor Hamilton, ON L8P 1A2

Prepared by:

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March 5, 2025

March 5, 2025

Olivia Stanciu, M.SC., PMP
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We are pleased to provide you with the final report (Revision 2) summarizing the results of our transportation assessment for Upper Wellington Street (Stone Church Road East to Limeridge Road East) Municipal Class Environmental Assessment after considering the following as the preferred future scenario:

- Upper Wellington Street between Stone Church Road and Towercrest Drive/Sirente Drive: Widening from a two-lane cross section to a three-lane cross section (one lane in each direction with a centre turn lane).
- Upper Wellington Street between Towercrest Drive/Sirente Drive and Limeridge Road: Road diet to reduce from a four-lane cross section with a two-lane cross section with a centre turn lane at the intersections.

Should you have any comments or questions, please feel free to contact us.

Sincerely,

WSP E&I Canada Limited

M.A. Talpur	
Mir Ahsan Talpur, RPP, MCIP Senior Environmental Planner	Lachlan Fraser, MPIA Senior Transportation Planner

Table of Contents

List of Figures

List of Tables

List of Appendices

1.0 Introduction

The City of Hamilton ("the City") retained WSP E&I Canada Limited (WSP) (formerly Wood Environment & Infrastructure Solutions) (Wood E&I) to complete a Municipal Class Environmental Assessment (MCEA) to address the necessary improvements to Upper Wellington Street between Limeridge Road East and Stone Church Road East (the "Project").

As part of the Phase 1 of the Project, a transportation assessment was completed to assess traffic operations and safety within the study area in order to identify any operational constraints and potential safety related concerns. This report documents the methodology and results of the transportation assessment and proposed corridor improvements to accommodate future demand within the study area. The analysis identifies the traffic and capacity deficiencies for the existing conditions (2020) and future conditions (2031). The existing road network was used for the future year analysis within the study area in order to identify these deficiencies, otherwise referred to as the "Do Nothing" scenario in the MCEA process.

As part of the Phase 2 of the Project, future conditions (2031) were assessed with a four-lane cross section along Upper Wellington Street (the "Road Widening" scenario) on the first revision of this report. This scenario was examined in order to understand traffic operations along the corridor with geometric improvements. However, at Public Information Centre No. 1 (PIC#1) meeting and after presenting the four-lane cross section, some members of the public questioned the need for a four-lane cross section, noting that the section to the south has a three-lane cross section only and asking if a three-lane cross section would work in the subject section. Related to this, there were concerns over property taking as a result of the widening, the removal of mature trees and a possibility of increased vehicle speeds in the study area as a result of a four-lane cross section. As a result of this meeting, further analysis was suggested by the city's staff to build a potential case for a three-lane cross section, which was included in this revision of the report (Revision 2). Specifically, the following was assessed as part of this report:

- Upper Wellington Street between Stone Church Road and Towercrest Drive/Sirente Drive: Widening from a two-lane cross section to a three-lane cross section (one lane in each direction with a centre turn lane).
- Upper Wellington Street between Towercrest Drive/Sirente Drive and Limeridge Road: Road diet to reduce from a four-lane cross section with a two-lane cross section with a centre turn lane at the intersections.

2.0 Background Studies

Prior to conducting the transportation assessment, the following studies were reviewed to gain a background understanding of the study corridor as well as the planned road improvements for Upper Wellington Street.

2.1 City of Hamilton

2.1.1 South Mountain Area Transportation Master Plan (2000)

The South Mountain Area Transportation Master Plan (SMATMP), 2000, addressed the requirements of Phases 1 and 2 of the Municipal Class EA process. It described existing and future conditions, identified problems/opportunities and examined alternative solutions for the South Mountain Area, which encompasses the current Study Area. The transportation problems considered in the SMATMP, 2000, included: road capacity and Level of Service; road and corridor safety; and road condition. To address these problems, following alternative solutions were identified and evaluated as part of the SMATMP, 2000:

- Transit;
- Limit or manage growth;
- Traffic diversion;
- Build new roads;
- Expand/upgrade roads; and
- Do nothing.

Based on the evaluation of alternative solutions the SMATMP, 2000, confirmed that the preferred solution for South Mountain Area was to expand or upgrade existing roads. It recommended that Upper Wellington between south of the Lincoln Alexander Parkway and Stone Church Road East be widened from two (2) lanes to five (5) lanes (4 travel lanes and a two-way left-turn lane).

2.1.2 South Mountain Area Transportation Master Plan Review (2006)

The SMATMP Review was completed in 2006, which involved reviewing City's new directions on transportation policy, assessing changes in the South Mountain Area, reviewing and updating short-term and long-term transportation problem areas, and identifying need for detailed analysis.

As a result of the activities outlined above, the SMATMP Review, 2006, reconfirmed the recommendations of the SMATMP, 2000. It identified that a number of road improvements were required in the South Mountain Area in both the short-term (0-5 year) and long-term horizon (> 5 years). The widening of Upper Wellington Street from south of the Lincoln Alexander Parkway to Stone Church Road East from 2 to 5 lanes (4 travel lanes and a two-way left-turn lane) was identified as a long-term recommendation. It also confirmed this undertaking as a Schedule 'C' project under the Municipal Class EA process.

It also noted that the Growth-Related Integrated Development Strategy (GRIDS) may result in changes to population and employment projections. Accordingly, the long-term roadway improvement needs (2011-2021) for the South Mountain Area should be re-examined once GRIDS and the City-wide Transportation Master Plan (TMP) have been completed.

2.1.3 Urban Hamilton Official Plan, 2009

The City's Official Plan (OP) implements and outlines various goals and policies that move the City towards its visions for the future. The Urban Hamilton Official Plan (UHOP) was adopted by Council in July 2009. Along with the Rural Hamilton Official Plan, these policies support other planning documents within the City such as the City of Hamilton Transportation Master Plan Review and Update (2018). The

UHOP supports a roadway network that includes transit, active transportation, commercial vehicles, and automobiles. The function of the transportation network and overarching objective of the OP is to move people and goods safely and efficiently.

Schedule C of the UHOP provides functional road classifications for the City's transportation network within the urban boundary. The Schedule identifies Upper Wellington Street as a minor arterial road which typically considers medium to high volumes of traffic with permitted controlled land access. Schedule C-2, Future Road Widenings of the UHOP, identifies a corridor containing the study corridor, along Upper Wellington Street from Mohawk Road to Rymal Road to have a right-of-way width of 30.480m.

2.1.4 Hamilton Pedestrian Mobility Plan, 2012

The Hamilton Pedestrian Mobility Plan, 2012, establishes a pedestrian framework for the City. It was completed following the Municipal Class EA process (Master Plan Approach #1), and it addressed the requirements of Phases 1 and 2. This plan identified "Context Areas" to characterize pedestrian environments by the type of built environment and streetscape throughout the city. The current Study Area falls within Suburban Context Area, for which the recommended Sidewalk Clear-Zone Width for local, collector, and arterial roads was identified to be minimum of 1.5 metres.

2.1.5 Hamilton Transportation Master Plan, 2018

The City's Transportation Master Plan (TMP) was completed in 2018 and is a comprehensive review and update of the 2007 TMP that continues to plan and build for the 2031 planning horizon and beyond. The 2018 TMP followed the Municipal Class Environmental Assessment process for Master Plans, hereby addressing Phases 1 and 2 of the EA process.

The TMP update outlines the need to supplement rapid transit, ITS, emerging technologies and TDM tools with road system improvements, including selective road expansion in order to accommodate future growth and increasing travel demand.

The TMP update outlines proposed infrastructure improvements including road widening and the inclusion of a two-way left-turn lane along Upper Wellington Street (from Limeridge Road to Stone Church Road East).

The road improvements assessed in this report meet the requirements of a Class EA Schedule 'C' project.

In an effort to balance the infrastructural needs for all modes including vehicles, transits, pedestrians, and cyclists, the Complete-Livable-Better (CLB) Streets have been established, as mentioned in City Wide Transportation Master Plan Review and Update. The overview of the approach is summarized in the presentation titled "Complete Livable Better Streets Design Manual Update" (dated January 11, 2021) by the City of Hamilton. The detailed descriptions are provided in "Complete Livable Better Streets Design Manual (PED21020/PW21002) (City Wide)" (dated January 11, 2011) by the City of Hamilton, along with its appendices.

2.1.6 Cycling Master Plan Review and Update, 2018

The City of Hamilton Cycling Master Plan Review and Update was completed in 2018 as part of the TMP update in order to provide an overview and identify revisions to Hamilton's Cycling Master Plan (CMP): Shifting Gears approved by Council in 2009.

The CMP Update lays out a mandate to integrate cycling infrastructure needs into the 10 Year Capital Budget for specified road reconstruction, rehabilitation and new roads as guided by the updated CMP, with an emphasis on achieving physical separation.

Consequently, bike lane installation as well as roadway reconstruction along Upper Wellington Street from Stone Church Road East to Limeridge Road East is proposed in the CMP update.

2.1.7 Truck Route Master Plan Update, 2022

The City of Hamilton Truck Route Master Plan (TRMP) provides a comprehensive, consolidated update to the existing truck route network. Furthermore, it provides recommendations for future action, policies for truck route signage, and a methodology for dealing with truck route network issues in the future. The Truck Route Master Plan was initially developed in 2010, and updated in 2022. City-wide truck routes are shown in the Truck Route Network, developed as part of the TRMP Update, 2022. The Upper Wellington corridor from Limeridge Road East to Stone Church Road East has no designated full-time or part-time truck route in the TRMP Update, 2022.

2.2 Provincial Context

There are several provincial plans and policies that govern the development of the Rural and Urban Hamilton Official Plan including the Growth Plan for the Greater Golden Horseshoe and the 2041 Regional Transportation Plan (successor of The Big Move).

2.2.1 Provincial Planning Statement, 2024

The Provincial Planning Statement is a streamlined provincial land use planning policy document that replaces both the Provincial Policy Statement, 2020 and A Place to Grow: Growth Plan for the Greater Golden Horseshoe, 2019 (amended in 2020). It was issued under section 3 of the Planning Act and came into effect October 20, 2024.

The PPS 2024 offers municipalities the resources and flexibility to facilitate construction of homes. It allows municipalities to:

- Plan for and promote development, boosting the housing supply throughout the province
- Coordinate development with infrastructure to strengthen and prepare the economy for investment
- Support the long-term sustainability of rural areas
- Safeguard agricultural lands, the environment, and public health and safety

The PPS 2024 requires municipalities to base population and employment growth forecasts on the Ontario Population Projections published by the Ministry of Finance, with the option to modify them as needed. It also allows municipalities the flexibility to continue using previous provincial forecasts for land use planning.

2.2.2 2041 Regional Transportation Plan, 2018

The 2041 Regional Transportation Plan (2041 RTP) was adopted by the Metrolinx Board of Directors on March 8, 2018. The Plan is the successor to The Big Move, the first Regional Transportation Plan for the GTHA which was released in 2008. The vision of the 2041 RTP is to ensure the GTHA will have a sustainable transportation system that is aligned with land use and supports healthy and complete communities. As part of its implementation, Metrolinx and its partners have committed to deliver rapid transit solutions across the GTHA to serve the people currently travelling in and out of these regions.

The 2041 RTP also includes policies to optimize the highway, major road and rail networks for goods movement and making safety and transportation demand management a priority.

3.0 Study Area

3.1 Corridor Characteristics

The study area is approximately 1.1km in length and is situated along Upper Wellington Street, between Limeridge Road East at the north end and 50m south of the intersection at Stone Church Road East at the south end (the "Study Area" or the "Study Corridor"). Travelling south; there are intersections at Limeridge Road East, Towercrest Drive – Sirente Drive, Desoto Drive, and Stone Church Road East. The study corridor falls under the jurisdiction of the City of Hamilton.

The City of Hamilton classifies the Upper Wellington study corridor as a minor arterial road. The corridor consists of two lanes south of the Upper Wellington Street intersection with Towercrest Drive – Sirente Drive. North of this intersection the corridor opens up into four lanes until the study area boundary at Limeridge Road. The posted speed limit is 40 km/h and there are no roadway divisions within the study corridor bounds. Land use along the study corridor is mainly residential. The corridor also provides access to natural open spaces, parks, and major institutions such as churches and an elementary school. The Study Corridor is at-grade, with an approximately 70 m bridge crossing just south of Limeridge Road East. This section of the corridor provides elevated right-of-way above the Lincoln M. Alexander Parkway.

The study corridor and the study intersections are shown in Figure 1.

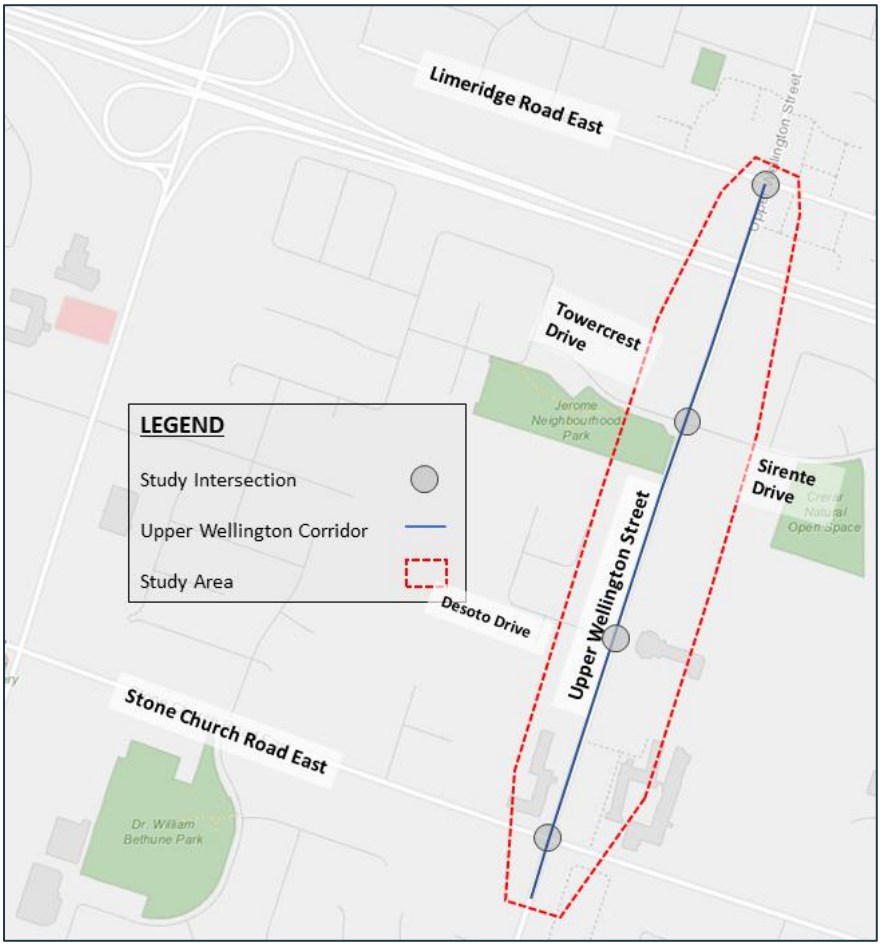


Figure 1: Study Area and Study Intersections

3.2 Transit Service

Transit Service to the Study Corridor consists of two bus routes operated by Hamilton Street Railway (HSR); Route 26 which travels along the Upper Wellington corridor, and Route 43 which intersects the corridor at Stone Church Road East.

Route 26 – Upper Wellington travels North-South from the McNab Terminal Platform #4 to Limeridge Mall Terminal Platform #4. The service runs seven days a week from the early morning until after midnight. The off-peak service runs every 20 minutes, evenings and weekends have 30 minutes to an hour-long headway, while there are 15-minute peak hour headways.

Route 43 – Stone Church travels East-West from Highland at Saltfleet School to the Meadowlands Terminal. The service runs seven days a week from the early morning until after midnight. There is 30 minutes peak hour headway, while the off-peak/weekend service has 30 minutes to an hour-long headway.

Figure 2 shows the study corridor bus route access.

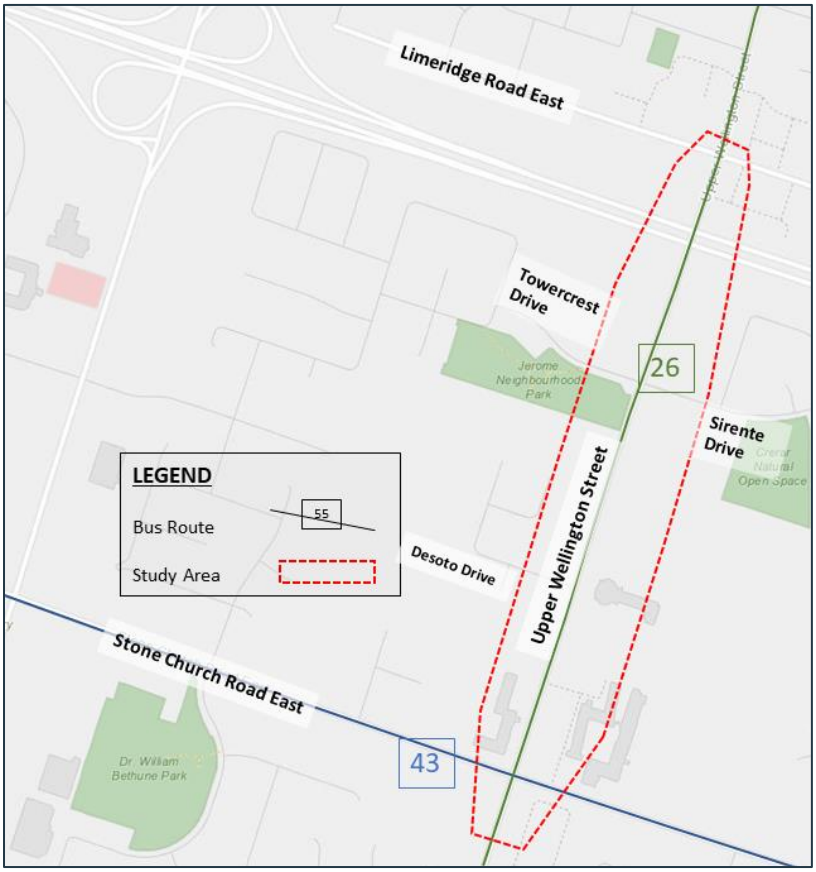


Figure 2: Study Corridor Bus Route Access

3.3 Active Transportation

Sidewalks are the primary active transportation facility along the Upper Wellington corridor within the Study Area. Bicycle lanes are provided south of Stone Church Road East on both sides of the road, however the northbound bicycle lane south of Stone Church Road East lacks definition approaching the intersection. Limeridge Road East at the north limit of the study area is an existing signed on-street bicycle route providing east-west connectivity across the mountain. Stone Church Road East at the south limit of the study area has existing bicycle lanes providing east-west connectivity across the mountain.

Sidewalks are present on the east side of the corridor until the intersection at Towercrest Drive – Sirente Drive, north of which there are sidewalks on both sides until the northern boundary of the study area at Limeridge Road East.

Figure 3 shows the active transportation facilities along the study corridor including the distribution of sidewalks and sheltered/non-sheltered bus stops in the study area.

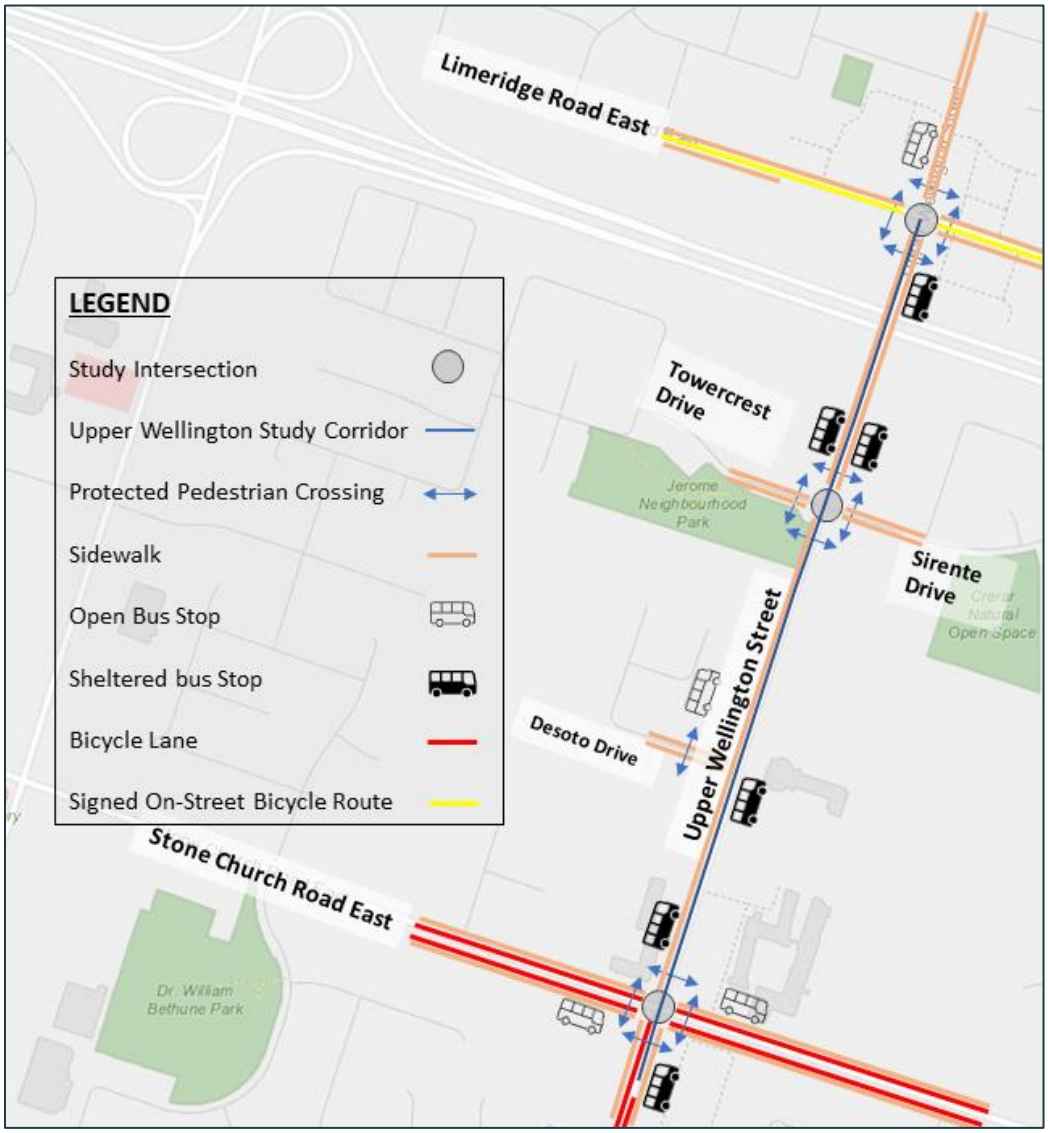


Figure 3: Study Corridor Active Transportation Facilities

3.4 Goods Movement

The Upper Wellington corridor from Limeridge Road East to Stone Church Road East has no designated full-time or part-time truck route in the TRMP Update, 2022.

4.0 Methodology

This transportation assessment consists of a link-capacity analysis, intersection operation analysis, safety review, and high-level multimodal assessment. This section describes the methodology for obtaining necessary data and conducting the aforementioned analyses.

4.1 Data Collection

4.1.1 Signal Timing Plans

Three of the four intersections in the study area are signalized: Upper Wellington Street / Stone Church Road East, Upper Wellington Street / Towercrest Drive – Sirente Drive, and Upper Wellington Street / Limeridge Road East.

The existing signal timing plans were received from the City in November 2020. The phase allocation data, which were not included in the signal timing plans initially provided for Upper Wellington Street / Towercrest Drive – Sirente Drive and Upper Wellington Street / Limeridge Road East, were received on January 27, 2021. The signal timing data are attached in **Appendix A.**

4.1.2 Turning Movement Counts

The existing/historical turning movement counts (TMCs) for intersections in the study area were provided by the City in November 2020. The list of intersections and count dates are summarized in **Table 1**. Although the TMC at Upper Wellington Street / Limeridge Road East was collected on March 4, 2020, it is unlikely that it was affected by the COVID-19 pandemic since it was prior to when the Government of Ontario declared its state of emergency on March 17, 2020. In the City of Hamilton, city facilities, restaurants, bars, and night clubs, were closed or ordered to close as of March 17, 2020.

Table 1: Turning Movement Counts

Intersection	Count Date
Upper Wellington Street / Stone Church Road East	November 25, 2019 May 22, 2009 December 1, 2003
Upper Wellington Street / Towercrest Drive – Sirente Drive	December 9, 2019 September 7, 2011 May 22, 2009 November 7, 2007
Wellington Street / Limeridge Road East	March 4, 2020[1, 2] May 22, 2009 December 5, 2003

Note(s)

1. Prior to the state of emergency declared by the Government of Ontario on March 17, 2020. Source: Ontario Enacts Declaration of Emergency to Protect the Public | Ontario Newsroom.
2. Prior to the (ordered) closure of city facilities, restaurants, bars, and night clubs on March 17, 2020. Sources: COVID-19 Update: City facilities completely closed to the public beginning Tuesday morning | City of Hamilton, Ontario, Canada, Hamilton's Medical Officer of Health Orders Restaurants, Bars and Nightclubs to Close Immediately | City of Hamilton, Ontario, Canada.

The TMCs are attached in **Appendix B**.

4.1.3 Collision Data

Historical collision data were provided by the City of Hamilton for a 5-year period from 2015 to 2019. This dataset was used to conduct a safety assessment of the study corridor. This data is incorporated into the Safety Analysis in Section 9.0 of this report.

4.2 Travel Demand Forecasting

4.2.1 Existing (2020) Demand

To establish the existing condition (2020) baseline traffic volumes, the most recent turning movement counts (TMCs) were selected for each intersection, for the weekday morning (AM) and afternoon (PM) peak hours. There was a discrepancy of the traffic volumes for the Upper Wellington Street / Towercrest Drive – Sirente Drive intersection when compared to its upstream and downstream intersections. Therefore, additional vehicle traffic volumes were added to the intersection to be balanced with the other two intersections to remain conservative. The heavy vehicles at the same intersection were not adjusted since they were already higher than the upstream and downstream heavy vehicle traffic volumes.

It seemed that the turning movement counts for buses at the Upper Wellington Street at Towercrest Drive – Sirente Drive intersection were not representative. The north approach volume during the PM peak hour was recorded as 31 buses per hour. The only transit route the corridor is serving, "26 Upper Wellington," was scheduled with a headway of 15 minutes (i.e., 4 buses per hour) according to the Hamilton Transit website. The upstream and downstream intersections recorded 5 and 7 buses per hour, respectively. The higher of the two (i.e., 7 buses per hour) was used for bus blockages in Synchro for a slightly more conservative evaluation. Based on input provided by City's Transit Team, effective September 2022, the number of buses per hour during peak periods increased to 3 in each direction at the intersection of Stone Church Road and Upper Wellington Street.

The pedestrian volumes were used as recorded in the TMCs without any adjustments. Existing cycling volumes on this segment are assumed to be very low due to the lack of existing cycling infrastructure.

4.2.2 Future (2031) Demand

The future (2031) demand was forecasted as the sum of the existing (2020) baseline traffic volumes and corridor growth between 2020 and 2031. The corridor growth with a compound annual growth rate (CAGR) of 1% was applied along the Upper Wellington Street between the year 2020 and 2031. The detailed assessment methodology to determine the growth factor is included in Section 6.0. The City has expressed agreement with the proposed CAGR during the virtual meeting on September 27, 2021 after Wood E&I (now WSP) presented the revised analysis considering all available historical traffic data along Upper Wellington and nearby parallel corridors with similar characteristics (West 5th Street and Upper Sherman Avenue). The resulting step-by-step processes for calculating the future demand are described in Section 7.1.1.1.

For other background developments in the vicinity of Upper Wellington Street (Shalom Manor and Jerome Meadows Townhouses) were deemed having insignificant impacts and were not added to the forecasted volumes.

Since there was no change in the road network between the "Do Nothing" and "Three Lane Cross Section" scenarios, it is expected that there is no significant change in the travel patterns. Therefore, the same forecasted 2031 intersection volumes were used for both scenarios.

4.3 Link Capacity Analysis

The link volume-to-capacity ratios (v/c) for the study corridor were calculated for the AM and PM peak hours using the existing and forecasted traffic volumes based on the TMCs and growth (See Section 4.2). The assumed lane capacity is based on Highway Capacity Manual (HCM) for urban roads with similarity to Upper Wellington Street with 850 vhphpl. It's noted that the City's EMME model assumes only 700 vhphpl which represents approximately 80% of the maximum capacity suggested by HCM, this can be

justified as EMME model is usually considered as planning tool, thus lower capacity than HCM is considered for planning purposes.

For the three-lane cross section, the City's Emme transportation demand model assumed an additional 50% increase to the lane capacity as a result of having the centre left turn lane, however as conservative approach Wood E&I (now WSP) considered 250 vehicles as the capacity threshold for a centre left lane.

4.4 Intersection Capacity Analysis

The intersection capacity analysis was conducted using Synchro 10 and the Highway Capacity Manual (HCM) 2000 published by the Transportation Research Board (TRB). The methodology of traffic operations assessment was based on a review of the "Traffic Impact Study Guidelines" (dated July 2009) by the City of Hamilton and the memorandum titled "Re: Transportation Assessment Methodology for Upper Wellington EA" (dated December 1, 2020) by Wood E&I (now WSP). The performance metrics included volume-to-capacity ratios (v/c), delays, and levels of service (LOS). The LOS criteria for signalized and unsignalized intersections are summarized in **Table 2**.

Table 2: Level of Service Criteria for Signalized and Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (second / vehicle)	
	Signalized Intersection[1]	Unsignalized Intersection[1]
A	≤ 10	≤ 10
B	>10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Note(s)

1. Highway Capacity Manual (HCM) 2000

Critical movements were identified as movements exceeding v/c of 0.85 for through movements or shared through/turning movements, or exceeding 0.90 for exclusive turning movements, as described in the "Traffic Impact Study Guidelines" (dated July 2009) by the City of Hamilton, in the AM or PM peak hour. The peak hour factors (PHFs) were computed from the observed turning movement counts.

The road network and lane configurations were established based on a review of aerial and street-level views on Google Maps, Google Earth, Google Street View, and Bing Maps.

4.5 Collision Analysis

The safety assessment includes an in-office review of historical collision data. The in-office review helps identify any patterns with respect to collision type, direction, severity, and other contributing factors. These collision analysis findings provide an understanding of the overall safety performance of the study corridor, for intersections and midblock segments.

The frequency and severity of collisions along the study corridor were analyzed by year, month, and day of the week; time of the day; lighting conditions; environmental conditions; and locations. Additional analysis was performed to assess collisions in potential problem areas based on initial impact type, vehicle approach direction and vehicle maneuvers.

4.6 Active Transportation Assessment

4.6.1 Multimodal Level of Service

The multimodal level of service (MMLOS) assessment was initially included as part of the study in accordance with the memorandum titled "Re: Transportation Assessment Methodology for Upper Wellington EA" (dated December 1, 2020) by Wood E&I (now WSP). However, the City informed Wood E&I (now WSP) by e-mail that it would prefer not to use the MMLOS for analysis or evaluation purposes, until the City has its approved methodology. Therefore, the MMLOS evaluation was not included in this report.

4.6.2 Complete Streets

The multimodal review of the study corridor was conducted based on the Complete-Livable-Better (CLB) Streets documented in the "Complete Livable Better Streets Design Manual (PED21020/PW21002) (City Wide)" (dated January 11, 2011) by the City of Hamilton, along with its appendices and relevant presentations. CLB Design Manual details and the multimodal review of the study area are provided in Section 8.0 – Complete Streets.

5.0 Existing Conditions (2020) Assessment

This section contains results and discussions of existing conditions (2020) assessment. The road network and lane configurations are illustrated in Figure 4.

5.1 Existing Travel Demand

The existing baseline traffic volumes were established based on turning movement counts (TMCs) as discussed in Section 4.2.1. The resulting traffic volumes for the weekday morning (AM) and afternoon (PM) peak hours are summarized in Figure 5.

The established traffic volumes suggest that the dominant northbound movement was in the AM peak direction and the dominant southbound movement was in the PM peak direction. In addition to Upper Wellington Street, a high traffic demand was observed along Stone Church Road East. Since Limeridge Road East and Towercrest Drive – Sirente Drive mostly provide access to residential neighborhoods, traffic volumes on these roads are not as high as on Upper Wellington Street or Stone Church Road East.

Figure 4: Existing (2020) – Lane Configuration

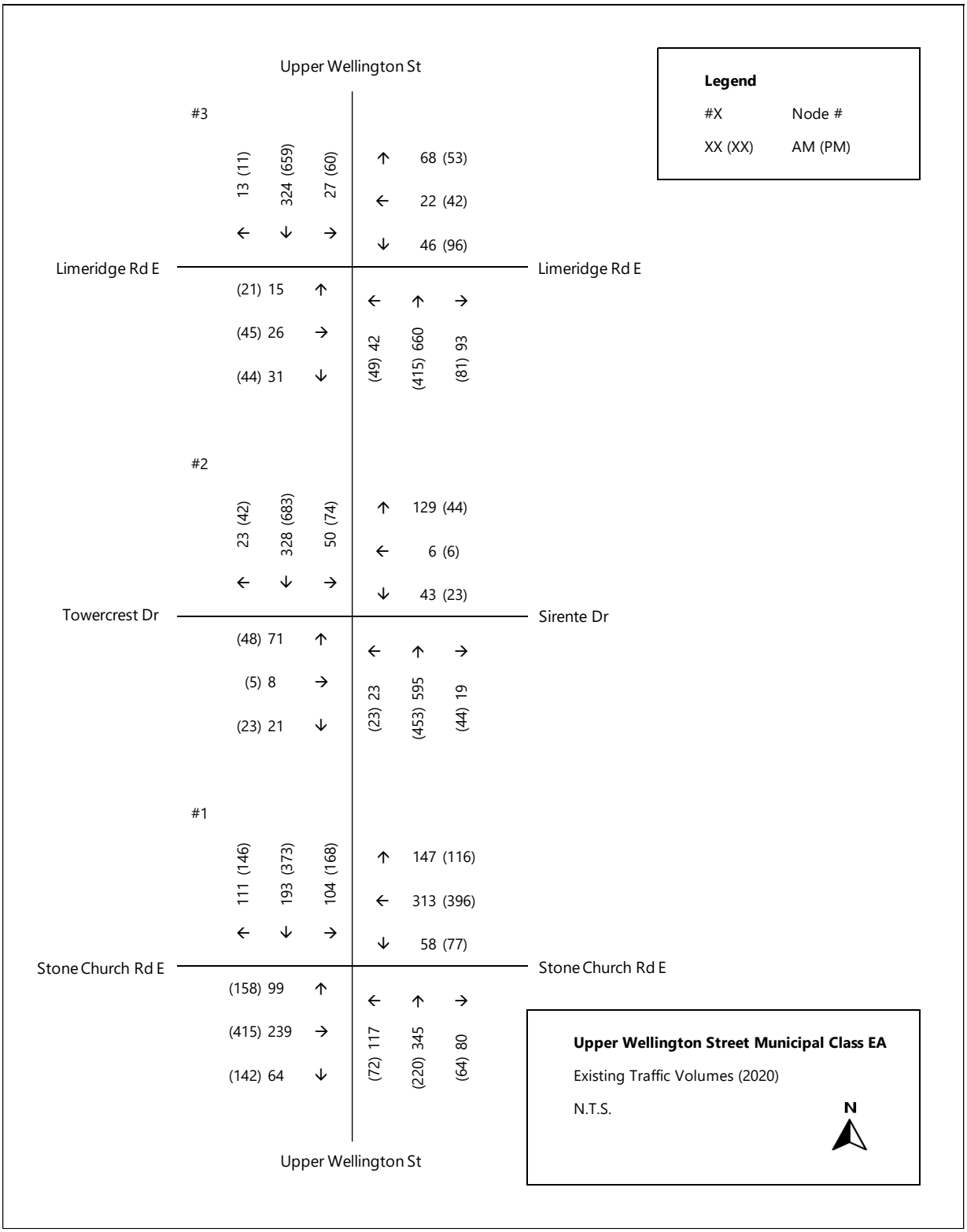


Figure 5: Existing Traffic Volumes (2020)

5.2 Existing Conditions (2020) Link Capacity Analysis

The link capacity analysis was undertaken with a methodology described in Section 4.3. The results summarized in **Table 3** and **Table 4** for the AM and PM peak hours, respectively.

The Upper Wellington Street corridor between Stone Church Road East and Limeridge Road East is currently operating with good LOS during peak hours. This section of the corridor has a number of driveways from/to residential areas and retail/community spaces with parking lots, which may be further impeding the traffic flow. The link capacity was assumed to be 850 vehicles/hours for a single lane.

Table 3: Existing Condition (2020) Link Capacity Analysis – AM Peak Hour

Segment	Northbound					Southbound				
	# of Lanes	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**	**# of Lanes**	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**
Upper Wellington St										
North of Stone Church Rd E	1	850	850	637	0.75	1	850	850	408	0.48
North of Towercrest Dr – Sirente Dr	2	850	1,700	795	0.47	2	850	1,700	401	0.24

Abbreviation(s)

Cap: Capacity
Vol: Volume

Table 4: Existing Condition (2020) Link Capacity Analysis – PM Peak Hour

Segment	Northbound					Southbound				
	# of Lanes	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**	**# of Lanes**	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**
Upper Wellington St										
North of Stone Church Rd E	1	850	850	520	0.61	1	850	850	729	0.86
North of Towercrest Dr – Sirente Dr	2	850	1,700	545	0.32	2	850	1,700	799	0.47

Abbreviation(s)

Cap: Capacity
Vol: Volume

5.3 Existing Conditions (2020) Intersection Capacity Analysis

The intersection capacity analysis was undertaken as described in Section 4.4. As summarized in **Table 5**, at Upper Wellington Street / Stone Church Road, the eastbound through-right movement operates at a v/c ratio of 0.98 with LOS E in the AM peak hour, and westbound through-right movement operates at a v/c ratio of 0.93 with LOS E in both AM and PM peak hours. This is likely caused by high through traffic volumes in the east-west direction combined with delay incurred by vehicles making right turns onto Upper Wellington Street. These critical movements are highlighted in the aforementioned table and illustrated in **Figure 6**. Other movements operate at an acceptable level of service. The Synchro reports are compiled in **Appendix C**.

Table 5: Existing (2020) Signalized Intersection Operations

Lane	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	Delay	LOS	v/c	Delay	LOS
1: Upper Wellington St & Stone Church Rd E						
EBL	0.52	25.8	C	0.86	53.1	D
EBTR	0.59	35.7	D	0.98[1]	67.2	E
WBL	0.19	23.8	C	0.52	27	C
WBTR	0.93[1]	62.3	E	0.93[1]	58.4	E
NBL	0.29	17.2	B	0.35	21.9	C
NBTR	0.71	34	C	0.47	28.5	C
SBL	0.32	18.2	B	0.42	19.1	B
SBTR	0.51	27.7	C	0.83	42	D
Overall	**0.75**	**-**	**D**	**0.89**	**-**	**D**
2: Upper Wellington St & Towercrest Dr/Sirente Dr						
EBL	0.67	47.2	D	0.52	40.5	D
EBTR	0.07	33.7	C	0.07	37.2	D
WBL	0.28	34.9	C	0.25	38.2	D
WBTR	0.58	38.6	D	0.1	37.3	D
NBL	0.06	3.7	A	0.06	2.7	A
NBTR	0.6	8	A	0.45	4.7	A
SBL	0.15	3.9	A	0.16	2.4	A
SBT-TR	0.19	3.4	A	0.33	2.4	A
Overall	**0.61**	**-**	**B**	**0.45**	**-**	**A**
3: Upper Wellington St & Limeridge Rd E						
EBL	0.13	37.7	D	0.14	35.9	D
EBT	0.16	37.8	D	0.23	36.3	D

Lane	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	Delay	LOS	v/c	Delay	LOS
EBR	0.02	37.2	D	0.03	35.3	D
WBL	0.39	39.2	D	0.66	45.5	D
WBT	0.14	37.7	D	0.21	36.1	D
WBR	0.05	37.3	D	0.04	35.3	D
NBL	0.06	3.1	A	0.1	3.7	A
NBT-TR	0.34	3.9	A	0.23	3.7	A
SBL	0.06	2.8	A	0.1	3.5	A
SBT-TR	0.15	2.9	A	0.3	4.1	A
Overall	**0.34**	**-**	**A**	**0.35**	**-**	**B**

Note(s)

1. Movement exceeds v/c of 0.85 for through movements or shared through/turning movements, or exceeds 0.90 for exclusive turning movements, as described in the "Traffic Impact Study Guidelines" (dated July 2009) by the City of Hamilton, in the AM or PM peak hour.

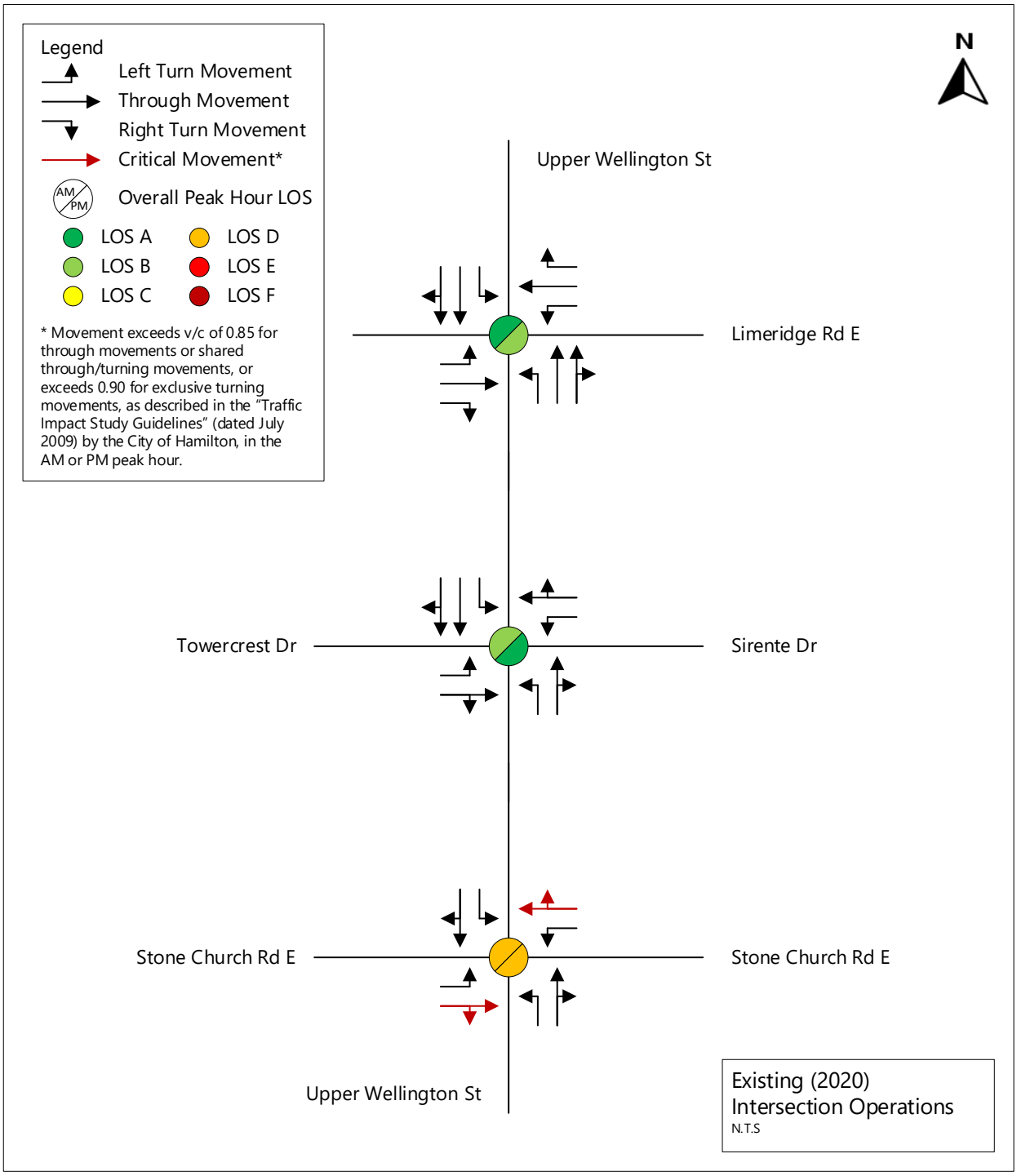


Figure 6: Existing (2020) Intersection Operations

6.0 Assessment of Three-Lane Cross Section

In Public Information Centre No. 1 (PIC#1) meeting and after presenting the four-lanes cross section, some members of the public questioned the need for a four-lane cross section, noting that the section to the south of Stone Church Road has a three-lane cross section only and asking if a three-lane cross section would work in the subject section. Related to this, there were concerns over property taking as a result of widening to four-lanes, along with the removal of mature trees and a possibility of increased vehicle speeds in the study area.

As a result of this meeting, further analysis was suggested by the City's staff to build a potential case for a three-lane cross section. Wood E&I (now WSP) conducted a thorough review to assess the growth rate along Upper Wellington Street based on the available historical data along other parallel corridors. The following sections document the findings.

6.1 Volume Thresholds for Road Diets

Wood E&I (now WSP) conducted a literature review to determine volume thresholds for road diets in general. It should be noted that these studies were examining the volume threshold for converting a four-lane cross section to a three-lane cross section.

To ensure the feasibility of implementing a road diet, hourly volumes should be ideally scenario below 750 vehicle per hour per direction (vphpd). A road diet is to be considered cautiously between 750 – 875 vphpd during the peak hour and feasibility is less likely above 875 vphpd, where it is expected that there will be reduced arterial LOS during the peak period [(1)]. Nevertheless, one study conducted a sensitivity analysis to determine at what hourly volumes the arterial LOS declines, it found that a two-way peak hour volume of 1,750 veh/hour (875 each direction) was the threshold when a decrease in LOS was observed. It also found that this could be mitigated by signal optimization which will be considered along this corridor [(1)].

A 2011 Kentucky study showed road diets could work up to an ADT of 23,000 vehicles per day, however a report by the Federal Highway Administration advises that roadways with 20,000 vehicles per day or less may be a good candidate for a road diet [(1)]. (source: FHWA Road Diet Informational Guide, 2014).

Based on the above thresholds, its noted that the maximum volume along Upper Wellington Street between Towercrest Drive / Sirente Drive and Limeridge Road East is expected to be 17,079 vehicles per day based on the 2031 EMME base model, noting that this section was assumed to be a four-lane cross section. The maximum volume is below the maximum threshold for Upper Wellington Street to be a good candidate for three-lane cross section, thus reducing the lanes for the Towercrest Drive / Sirente Drive and Limeridge Road section will not be an issue. Accordingly, road diet was proposed along this section (i.e., Upper Wellington Street between Towercrest Drive / Sirente Drive and Limeridge Road).

Furthermore, the 2020 existing volumes indicate that all NB and SB volumes along the study corridor are less than 750 vehicles per hour.

With regards to left turn volumes, City of Seattle modelling flow chart [(1)] suggests 200 vphpl for the left lane as threshold capacity, it noted that none of the left turn volumes along Upper Wellington Street study area exceeds 200 vph thus another reason to make it a good candidate for a three-lane cross section.

Its important to highlight those vehicles using the centre left turn lane will allow for more capacity to through traffic thus more capacity was assigned to through traffic, this will be reflected in the link analysis.

Notes:
(1) https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/index.cfm

6.2 Turn Lane Volumes

A select link analysis assessment was considered for Upper Wellington Street based on the City's EMME model to roughly estimate the left turn volumes for the centre left turn lane for both directions along the street. Based on the EMME model select link capture shown in **Figure 7**, the following is noted:

- 16.7% of the SB volume will use the turn lane to turn left along Upper Wellington (PM peak),
- 1.5% of the NB volume will use the turn lane to turn left along Upper Wellington (PM peak), and
- The average usage of the turn lane in both directions is approximately ~8% (PM peak).

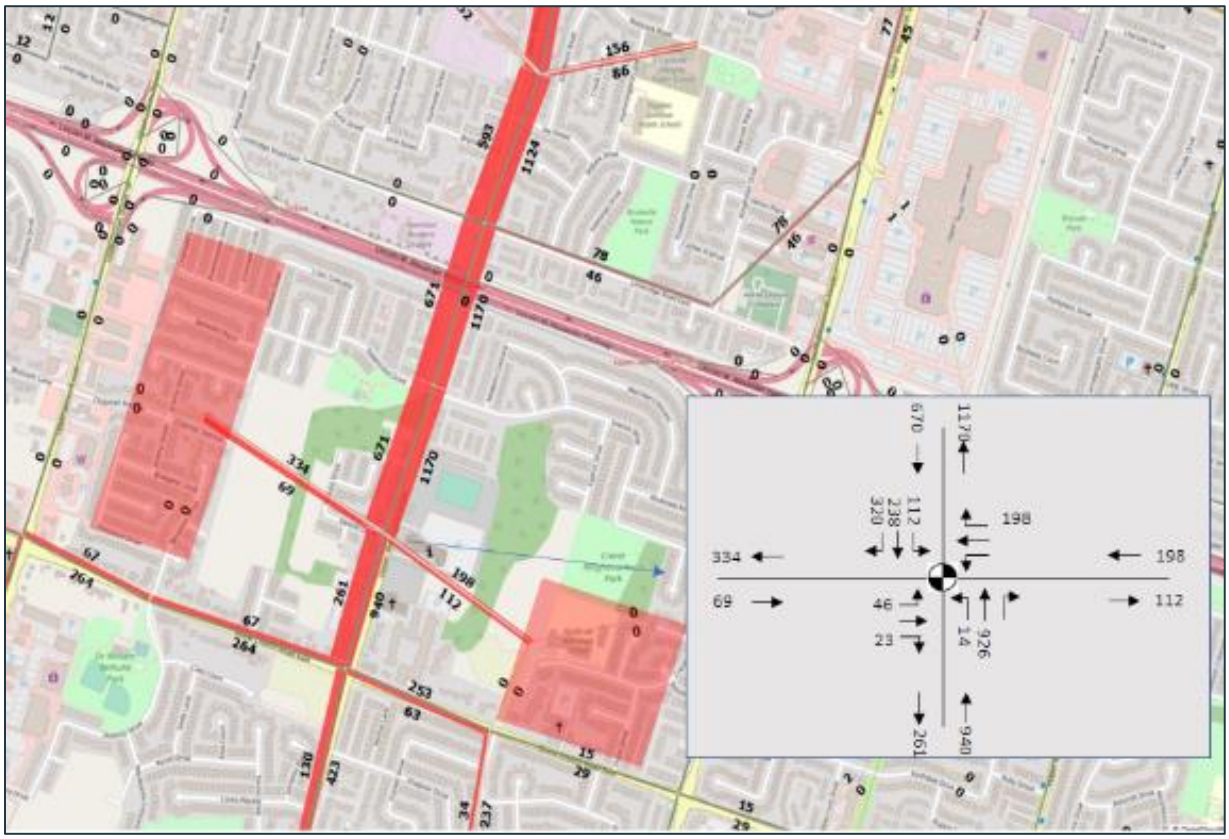


Figure 7: Select Link Capture for Upper Wellington Street

6.3 Growth Rate Assessment

Reviewing the historical data is key to understand the traffic trends and patterns. Upper Wellington Street is among a group of road corridors that are provide a north-south link across the Lincoln Alexander Parkway and plays an important role in the City of Hamilton's road network grid system.

West 5th Street and Upper Sherman Avenue are similar to Upper Wellington as they provide connectivity to the road network grid system located north of Lincoln Alexander Parkway without a direct connection to the parkway itself, in contrast to Upper Wentworth Street and Upper James Street that are directly connected to the parkway and have a five-lane cross section. Both West 5th Street and Upper Sherman Avenue have a three-lane cross section and are understood to be operating with no issues with congestion, thus another reason for Upper Wellington Street to have three-lanes and to function the same way.

The historical volume data for West 5th Street, Upper Sherman Avenue and Upper Wellington Street were summarized and compared against existing and EMME model volumes. The analysis was conducted for two locations north and south of Lincoln Alexander Parkway due to number of lane difference. ATR volumes were reviewed as they are whenever the ATR data is available and the TMC volumes for the 7 hours were factored to estimate the ADT for each location using the proportion of the 7 hours of data to the whole day. Also, the 2031 model volumes for the peak hour were factored to get the ADT for each location using the proportion of the peak hour to the whole day from the ATR data. These steps enabled Wood E&I (now WSP) to compare different traffic data sources available for this study. **Table 6** shows the summary of all available data sorted by year and source.

Table 6: Summary of All Available Traffic Data

Street Name	Location	Location 2	2003	2007	2009	2011	2014	2017	2018	2019	2020	2021	2031
West 5th	*North of LAP*	*Limeridge*							*15,810*			*11,419*	*13,647*
	South of LAP	Rosehill/Chester						11,092		11,710		10,623	13,647
	South of LAP	Stone Church							14,097			10,623	10,745
Upper Wellington	*North of LAP*	*Limeridge*	*11,592*	*15,260*	*15,950*						*14,540*	*11,399*	*17,079*
	South of LAP	Towercrest / Sirente		14,982	16,375	16,355				10,107		10,151	17,079
	South of LAP	Stone Church	11,782		15,214					12,481		10,151	10,282
Upper Sherman	*North of LAP*	*Limeridge*								*16,242*		*11,436*	*17,989*
	South of LAP	Princip/Atherley/Rowntree					16,452			11,017		11,113	17,989
	South of LAP	Stone Church								12,875		11,113	10,830
Data Period			2003 – 2014					2017 – 2020 (pre-COVID)				During COVID	EMME Model
ATR Data			**TMC Data**					EMME Model Data					

*LAP – Lincoln Alexander Parkway

The following is a summary of findings for the above table are listed below:

- The most recent ATR data along Upper Wellington (2019) and south of Lincoln Alexander Parkway is lower than the previous years (2003-2014) by almost 4,000 vehicles per day,
- The volumes north of Lincoln Alexander Parkway are always higher than volumes to the south due to the availability of more cross section lanes (four-lanes)
- There are volume similarities when comparing north and south of Lincoln Alexander Parkway volumes along all corridors between 2017 and 2020, thus considering selecting a similar cross section for Upper Wellington is a reasonable approach
- Traffic volumes during the COVID-19 pandemic along all corridors show an average reduction in traffic volumes by ~10% per year, and
- Comparing the 2031 model volumes with the most recent data on Upper Wellington (2019 or 2020) suggests a growth of 1.4% or 1.5% per year (with 3-lane cross section), noting that the model volumes include the bypass trips that are not related to zones along Upper Wellington Street

6.4 Growth Assessment based on Jobs and Population Data

Another means to assess growth is reviewing jobs and population data. The model demographic data was requested from the city's staff to two main reasons:

- To conduct the select link analysis that will determine the left turn volumes along Upper Wellington that expected to use the left turn lane. The select link analysis will help determining the spare capacity for the through movements after deducting the left turn volumes, and
- Review jobs and population model input for the Traffic Analysis Zones (TAZ) on the vicinity of Upper Wellington Street (TAZ 5051, 5056, 5069 and 5075) as shown in Figure 8**.**

Figure 8: Traffic Analysis Zones (TAZ's) at the vicinity of Upper Wellington Street

Table 7 summarizes the Jobs and population data for the aforementioned TAZ's, and **Table 8** provides the expected growth for each and all TAZ's.

Table 7: Growth in Jobs and Population Data (2021 – 2031)

GTA06 TAZ #	Pop2021	Jobs2021	Pop2031	Jobs2031
5051	4,522	1,005	4,375	1,014
5056	2,989	1,195	3,629	1,376
5069	2,506	175	2,405	175
5075	2,078	645	2,173	685
Total	**12,095**	**3,020**	**12,582**	**3,250**

Table 8: Growth in Jobs and Population Summary (2021-2031)

GTA06 TAZ #	Population	Jobs
5051	-0.33%	0.09%
5056	1.96%	1.42%
5069	-0.41%	0.00%
5075	0.45%	0.60%
Growth between 2021 & 2031	**0.40%**	**0.74%**

The above table shows that the growth in population between 2021 and 2031 is expected to be only 0.40% per year and the growth in jobs between 2021 and 2031 is expected to be only 0.74% per year. Also, these TAZ's have accesses to other parallel streets (Upper James Street and Upper Wentworth Street) thus traffic related to this growth is expected to be distributed among these streets and actual growth along Upper Wellington Street study area is expected to be minimal. It is noted that the area on the vicinity of the Upper Wellington Street study area is already fully developed. Based on the above finding, considering 1.0% growth factor per annum along the corridor is a realistic approach.

6.5 Sensitivity Analysis

The City' staff requested to conduct intersection analysis based on the 2% growth factor to show the impact on the overall intersections' performances and queues, the main findings for the 2% analysis are listed below:

- The 2% growth will increase the delay slightly on Upper Wellington Street and Towercrest Drive/Sirente Drive and Limeridge Road East intersections, however good LOS will be maintained
- Upper Wellington Street and Stone Church Road intersection delay will increase by more than one half a minute and LOS will degrade from "E" to "F" in the PM peak
- The 2% growth will increase the southbound approach average queue length at Upper Wellington Street and Stone Church Road intersection by 58 metres (from 174m to 232 m) in the PM peak
- 2% growth will increase the southbound approach 95th percentile queue length at Upper Wellington Street and Stone Church Road by 62 meters (from 246m to 308 m) in the PM peak
- The southbound approach 95th percentile queue length will reach 308 meters in the PM peak (**Note:** the total distance between Stone Church Road and Towercrest Drive/Sirente Drive is about 655 meters), and
- Accesses on the west side of Upper Wellington Street will be impacted and blocked during the peak hour as a result of the southbound queue (308m) in the PM peak.

Figure 9 summarizes the above findings.

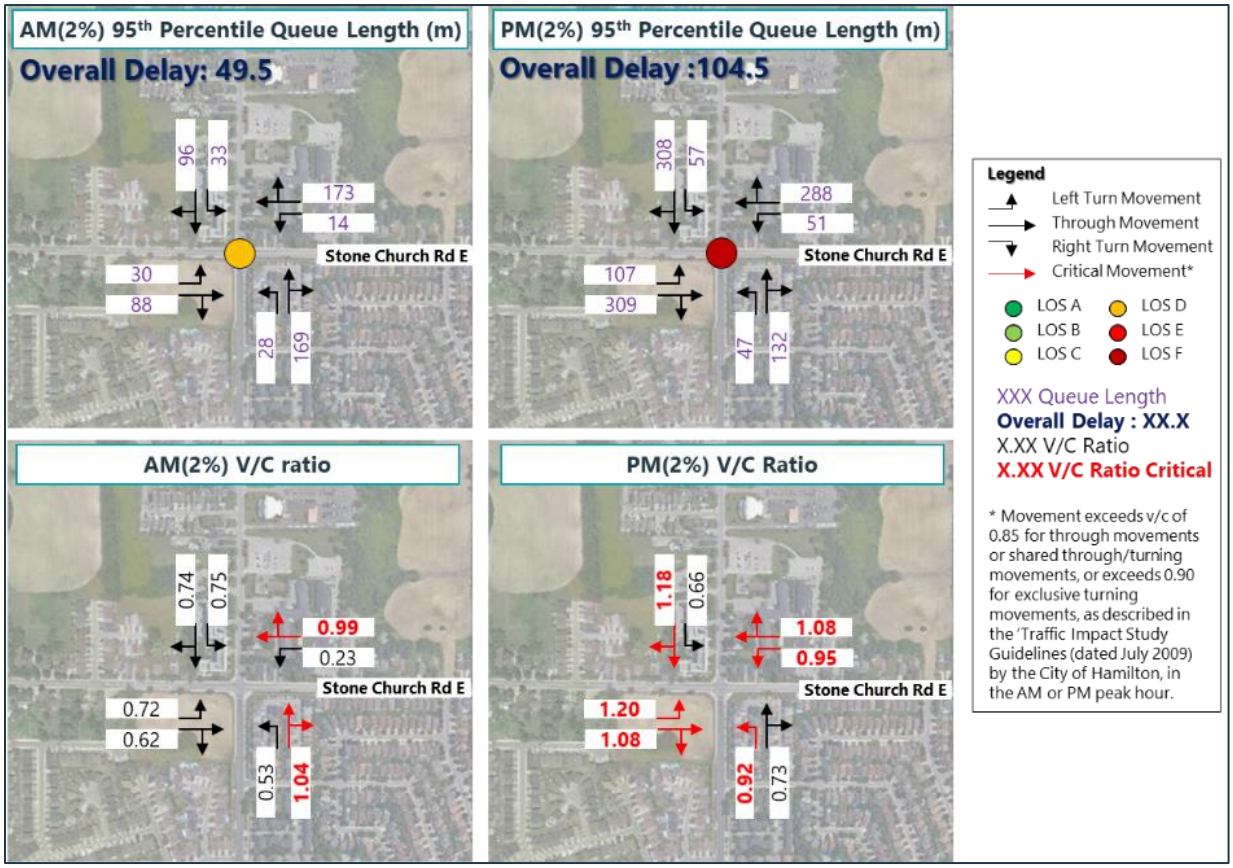


Figure 9: AM and PM Peak Analysis Results for 2% Growth

6.6 Three-Lane Cross Section Assessment Conclusions

Finally, and based on the above assessment and findings, Upper Wellington Street is a good candidate for a three-lane cross section. Accordingly, the following was proposed in terms of motor vehicle travel lanes:

- Upper Wellington Street between Stone Church Road and Towercrest Drive/Sirente Drive: Widening from a two-lane cross section to a three-lane cross section (one lane in each direction with a centre turn lane).
- Upper Wellington Street between Towercrest Drive/Sirente Drive and Limeridge Road: Road diet to reduce from a four-lane cross section with a two-lane cross section with a centre turn lane at the intersections.

The following is noted:

- Additional benefits for a three-lane cross section are that it is expected that it will have lower traffic volumes when compared to a four-lane cross section. Some road diet before-after studies suggest a reduction in ADT by 10% (four lanes to three lanes). This will alleviate any congestion along Upper Wellington Street for the foreseen future;
- A number of road authorities have implemented road diets (4 lanes to 3 lanes). These have also been shown to improve connectivity for bicyclists and will increase bicycle ridership compared to 4-lane cross sections. They have been shown to reduce pedestrian and bicycle crashes when compared to a four-lane cross section;
- Jobs and population growth data suggest a lower growth rate (0.40 - 0.74%), The growth in jobs and population between 2021 and 2031 is relatively small thus the growth should reflect that 2031 model volumes include the bypass trips that are not related to zones along Upper Wellington Street;
- The select link analysis shows that left turn lane will capture about ~8% of the total ADT traffic along Upper Wellington Street, this will allow for extra capacity for through traffic; and
- growth of 1.0% per annum between 2021 and 2031 will be adopted for the future analysis.

A summary of a presentation made to City staff concerning the above is provided in **Appendix F**.

7.0 Future Conditions (2031) "Do Nothing" Scenario Assessment

The assessment of future conditions (2031) was undertaken on the existing road network assuming that no improvements were implemented, referred to hereafter as the "Do Nothing" scenario. This was done to determine whether these road improvements such as widening could be justified. The road network and lane configurations, therefore, are consistent with the existing conditions, as illustrated previously in Figure 4.

7.1 Future (2031) Travel Demand

The future (2031) Do Nothing traffic volumes were established based on methodologies discussed in Section 4.2.2. The corridor growth rate was determined as described in Section 6.0. The resulting traffic volumes for the weekday morning (AM) and afternoon (PM) peak hours are summarized in Figure 10. Since there are no drastic changes in the road network or in land use patterns, the travel pattern in the study area is similar to the existing conditions but with higher traffic volumes.

7.1.1.1 Corridor Growth

A compound annual growth rate (CAGR) of 1% was applied. Future cycling volumes are not projected as a numerical estimate. The current methodology of the City regarding cycling growth is to create a connected cycling network across the City to foster an increase in cycling ridership.

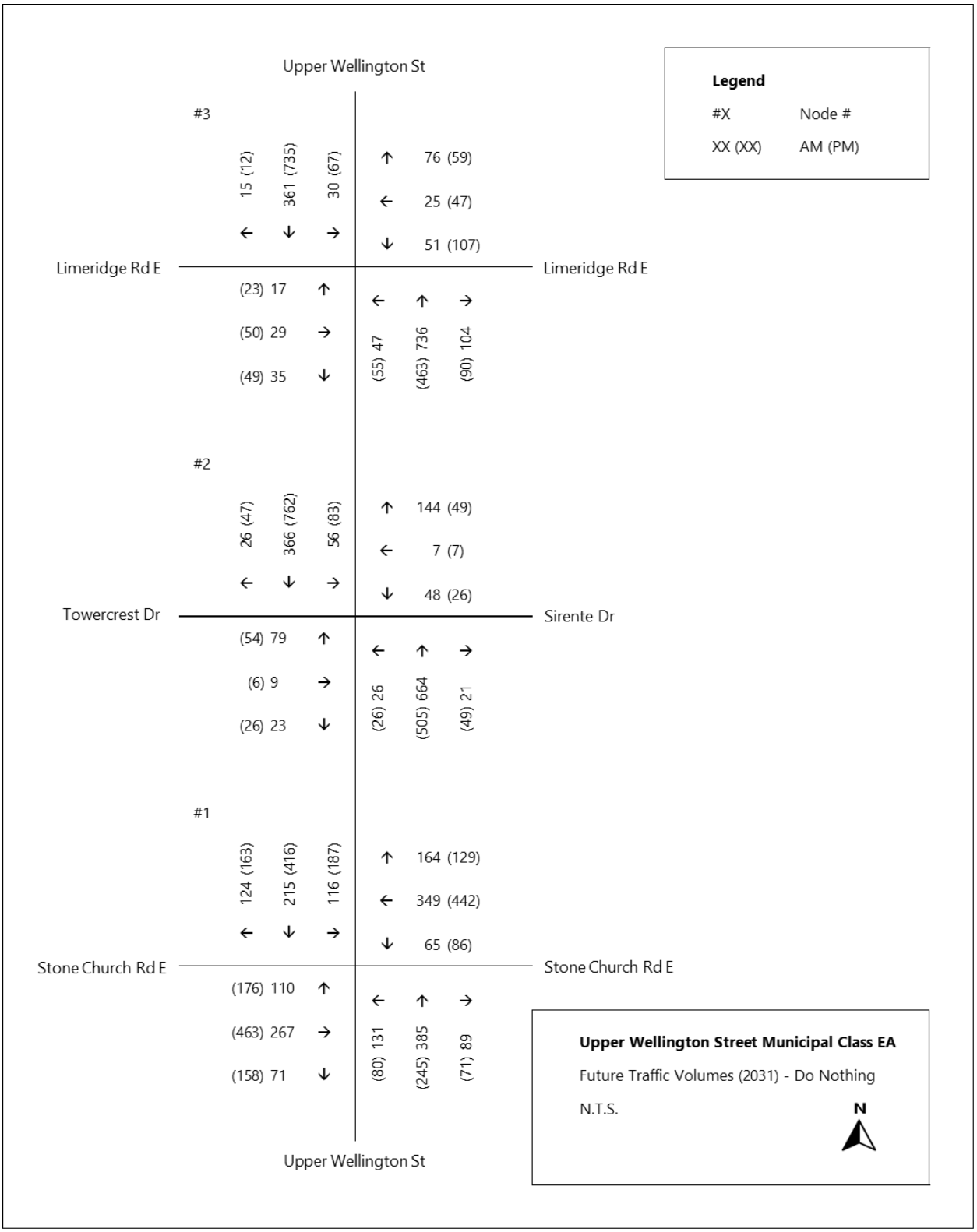


Figure 10: Future Traffic Volumes (2031) – Do Nothing

7.2 Future Conditions (2031) Link Capacity Analysis

The link capacity analysis was undertaken with the methodologies described in **Seciton 4.3** for the "Do Nothing" scenario. The results summarized in **Table 9** and **Table 10** demonstrate that the study corridor would be operating in an oversaturated condition for peak hour movements (AM northbound, PM southbound).

In the AM peak hour, the Upper Wellington Street corridor north of Stone Church Road East operates at a v/c ratio of 0.99 in a northbound direction. In the PM peak hour, it operates at a v/c ratio of 1.13 in a southbound direction. However, an additional centre left turn lane will allow for more capacity for through lanes thus better LOS in general.

Table 9: Future Condition Do Nothing (2031) Link Capacity Analysis – AM Peak Hour

Segment	Northbound					Southbound				
	# of Lanes	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**	**# of Lanes**	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**
Upper Wellington St										
North of Stone Church Rd E	1	850	850	840	0.99	1	850	850	546	0.64
North of Towercrest Dr – Sirente Dr	2	850	1,700	1047	0.62	2	850	1,700	534	0.31

Abbreviation(s)

Cap: Capacity
Vol: Volume

Table 10: Future Condition Do Nothing (2031) Link Capacity Analysis – PM Peak Hour

Segment	Northbound					Southbound				
	# of Lanes	Lane Cap. (v/h/l)	Total Cap. (v/h)	Vol. (v/h)	v/c	# of Lanes	Lane Cap. (v/h/l)	Total Cap. (v/h)	Vol. (v/h)	v/c
Upper Wellington St										
North of Stone Church Rd E	1	850	850	692	0.81	1	850	850	963	1.13
North of Towercrest Dr – Sirente Dr	2	850	1,700	725	0.43	2	850	1,700	1055	0.62

Abbreviation(s)

Cap: Capacity
Vol: Volume

7.3 Future Conditions (2031) Intersection Capacity Analysis

The intersection capacity analysis was undertaken as described in **Section 4.4**. The results are summarized in **Table 11** and illustrated in **Figure 11**. The Synchro reports for the future codnition (2031) are attached in **Appendix D**.

At Upper Wellington Street / Stone Church Road East, the westbound through-right movement and northbound through-right movement are critical, with v/c ratios of 0.96 and 0.85 respectively in the AM peak hour. In the PM peak hour, the eastbound left and eastbound through-right operate at a v/c larger of 1.06 with a LOS F. The westbound through-right and southbound through-right movements are also critical with v/c ratios of 1.00 and 0.96 respectively, and LOS 'E'. Geometric improvements are recommended to in order to alleviate the north-south delays. Furthermore, localized improvements with a signal optimization may provide more capacity to the east-west movements. The traffic operating conditions with improvements (three-lane cross section) are further examined in the next section.

Table 11: Future (2031) Do Nothing Signalized Intersection Operations

Lane	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	Delay	LOS	v/c	Delay	LOS
1: Upper Wellington St & Stone Church Rd E						
EBL	0.6	27.4	C	1.06[1]	111.7	F
EBTR	0.61	34.3	C	1.06[1]	86.8	F
WBL	0.21	22.2	C	0.59	30.3	C
WBTR	0.96[1]	66.9	E	1.00[1]	72.7	E
NBL	0.37	19.5	B	0.53	25.8	C
NBTR	0.85[1]	45.4	D	0.54	31.3	C
SBL	0.45	21.1	C	0.52	22	C
SBTR	0.6	32.4	C	0.96[1]	61	E
Overall	**0.84**	**-**	**D**	**1.01**	**-**	**E**
2: Upper Wellington St & Towercrest Dr/Sirente Dr						
EBL	0.73	52.8	D	0.56	42.2	D
EBTR	0.07	32.5	C	0.08	36.9	D
WBL	0.28	33.8	C	0.28	38.1	D
WBTR	0.67	41.8	D	0.11	37.1	D
NBL	0.07	4.2	A	0.08	3	A
NBTR	0.68	10.3	B	0.5	5.3	A
SBL	0.21	5.3	A	0.19	2.7	A
SBT-TR	0.22	4	A	0.37	2.5	A
Overall	**0.69**	**-**	**B**	**0.51**	**-**	**A**
3: Upper Wellington St & Limeridge Rd E						
EBL	0.14	37.7	D	0.15	35.3	D
EBT	0.18	37.8	D	0.24	35.8	D
EBR	0.02	37.1	D	0.03	34.7	C

Lane	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	Delay	LOS	v/c	Delay	LOS
WBL	0.44	39.5	D	0.69	46.9	D
WBT	0.15	37.7	D	0.21	35.6	D
WBR	0.05	37.2	D	0.04	34.7	C
NBL	0.07	3.3	A	0.13	4.4	A
NBT-TR	0.38	4.4	A	0.26	4.4	A
SBL	0.07	2.9	A	0.12	3.9	A
SBT-TR	0.17	3	A	0.33	4.6	A
Overall	**0.38**	**-**	**A**	**0.39**	**-**	**B**

Note(s)

1. Movement exceeds v/c of 0.85 for through movements or shared through/turning movements, or exceeds 0.90 for exclusive turning movements, as described in the "Traffic Impact Study Guidelines" (dated July 2009) by the City of Hamilton, in the AM or PM peak hour.

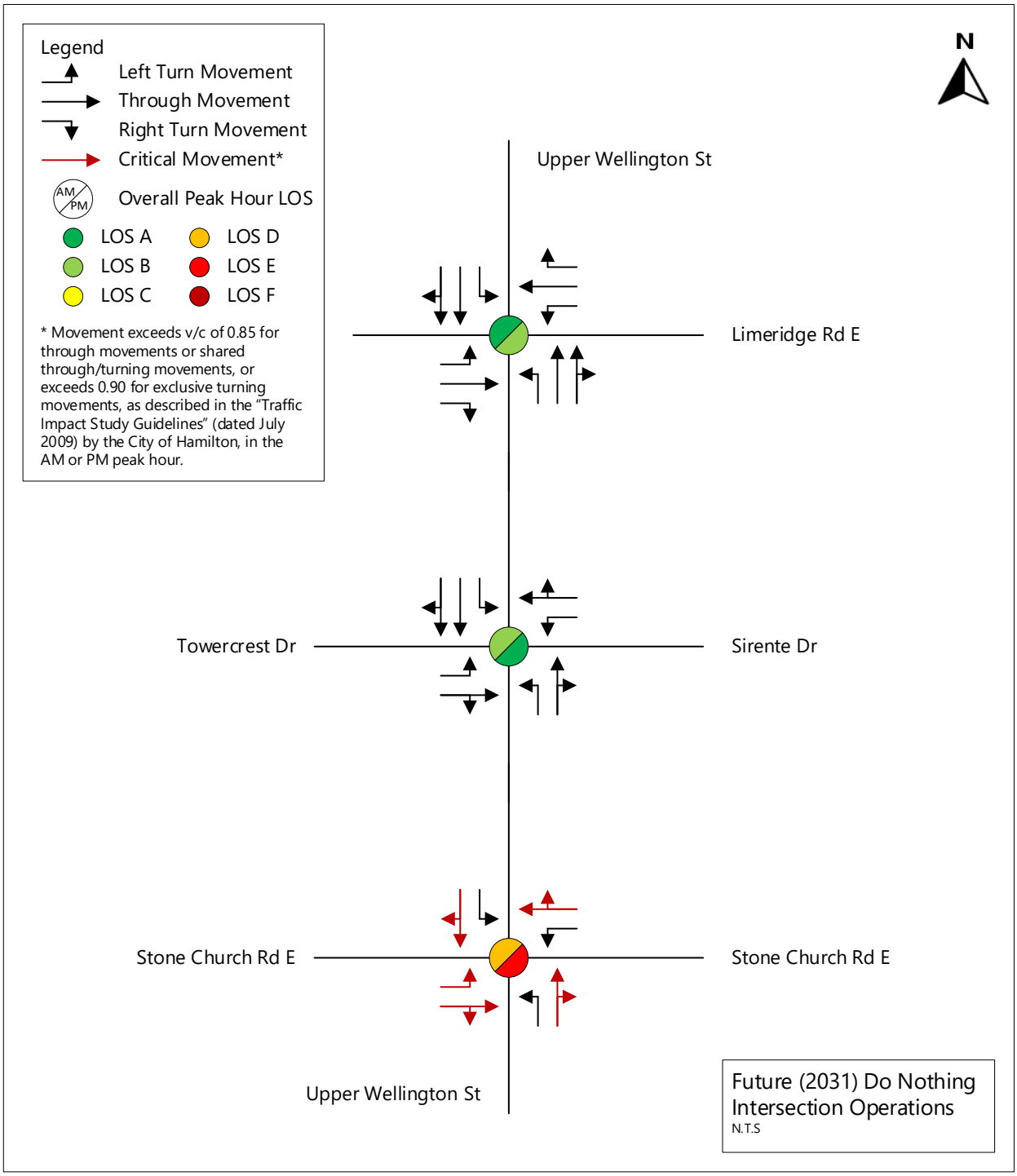


Figure 11: Future (2031) Do Nothing Intersection Operations

8.0 Future Conditions (2031) "Three-Lanes Cross Section" Scenario Assessment

The assessment of future conditions (2031) was undertaken for the 'Three-Lane Cross Section' scenario. The Study Corridor segment between Stone Church Road East and Towercrest Drive – Sirente Drive was expanded from a two-lane cross section in the "Do Nothing" scenario to a "three-lane cross section" in this scenario. North of Towercrest Drive-Sirente Drive, the four-lane cross section was reduced to three lanes to accommodate cyclists. As a result of adopting a centre left turn lane along the studied corridor, the number of lanes at this section will be reduced to three-lane cross section (two through lanes with centre median) to match the same configuration of Upper Wellington Street between Stone Church Road East and Towercrest Dr / Sirente Drive. This will allow an additional cycling lane to be accommodated in both directions.

As illustrated in Figure 12, the intersection lane configurations at the Upper Wellington Street / Towercrest Drive – Sirente Drive and Upper Wellington Street / Stone Church Road East intersections were modified to maintain one through lane flow for both northbound and southbound directions with the additional left turn lane in the middle along the study corridor.

Figure 12: Future (2031) Lane Configurations – Three-Lane Cross Section Scenario

8.1 Future (2031) Travel Demand

The travel pattern in the "Three Lane Cross Section" scenario is expected to be comparable to the travel pattern in the "Do Nothing" scenario since there is no significant change in the road network which would introduce re-routings. Therefore, the same forecasted intersection volumes were used for the "Three Lane Cross Section" scenario as the "Do Nothing" scenario. See Section 7.1. for the forecasted volumes. The lane reduction between Towercrest Dr / Sirente Dr and Limeridge Road East along with the adoption of the three-lane cross section will divert some of the bypass traffic to parallel roads that have more lanes i.e., Upper James and Street Upper Wentworth Street. Thus, less traffic volumes than the ones considered for this analysis.

8.2 Future Conditions (2031) Link Capacity Analysis

The link capacity analysis was undertaken with the methodologies described in Section 4.3. The results summarized **Table 12** and **Table 13** demonstrate that the Study Corridor would be operating in an acceptable condition with the road widening. The highest v/c ratios in the peak directions were 0.95 for the northbound AM peak hour, and 0.96 for southbound PM peak hours. This is an improvement from the "Do Nothing" scenario in which the highest v/c ratios in the peak directions were 0.99 for the AM northbound and 1.13 for southbound PM peak hour.

Table 12: Future Condition (2031) Scenario Link Capacity Analysis – AM Peak Hour

Segment	Northbound					Southbound				
	# of Lanes	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**	**# of Lanes**	**Lane Cap. (v/h/l)**	**Total Cap. (v/h)**	**Vol. (v/h)**	**v/c**
Upper Wellington St										
North of Stone Church Rd E	1+1[1]	850+250[1]	1,100	840	0.76	1+1[1]	850+250[1]	1,100	546	0.50
North of Towercrest Dr – Sirente Dr	1+1[1]	850+250[1]	1,100	1,047	0.95	1+1[1]	850+250[1]	1,100	534	0.49

Abbreviation(s) 1 – Two way left turn Lanes have an assumed capacity of 250 v/l/h in addition to 850 v/l/h for conventional through lanes

Cap: Capacity
Vol: Volume

Table 13: Future Condition (2031) Scenario Link Capacity Analysis – PM Peak Hour

Segment	Northbound					Southbound				
	# of Lanes	Lane Cap. (v/h/l)	Total Cap. (v/h)	Vol. (v/h)	v/c	# of Lanes	Lane Cap. (v/h/l)	Total Cap. (v/h)	Vol. (v/h)	v/c
Upper Wellington St										
North of Stone Church Rd E	1+1[1]	850+250[1]	1,100	692	0.63	1+1[1]	850+250[1]	1,100	963	0.88
North of Towercrest Dr – Sirente Dr	1+1[1]	850+250[1]	1,100	725	0.66	1+1[1]	850+250[1]	1,100	1055	0.96

Abbreviation(s)
1 – Two way left turn Lanes have an assumed capacity of 250 v/l/h in addition to 850 v/l/h for conventional through lanes

Cap: Capacity
Vol: Volume

8.3 Future Conditions (2031) Intersection Capacity Analysis

The intersection capacity analysis was undertaken as described in Section 4.4. The results are summarized in **Table 14** and illustrated in **Figure 13**. The Synchro reports for the future condition (2031) are attached in **Appendix E**.

The signal timing plans were reviewed and optimized in an effort to keep v/c ratios below 1.00 and LOS E or better. Upon the review, the signal timing plans at the Upper Wellington Street / Limeridge Road East and Upper Wellington Street / Towercrest Drive – Sirente Drive intersections were unchanged since all movements were far below the limits to be considered critical movements. The signal timing plans at the Upper Wellington Street / Stone Church Road East were optimized in the AM and PM peak hours. The signal timing optimization led to v/c ratios of 0.91 and LOS D or better in the AM peak hour and v/c ratios of 1.00 or better in the PM peak hour. The other two signalized intersections at Upper Wellington Street / Towercrest Drive – Sirente Drive and Upper Wellington Street / Limeridge Road East operate in acceptable conditions.

At Upper Wellington Street / Stone Church Road, the eastbound and westbound left turn movements, have 95th percentile queue lengths for the PM peak hour in Synchro exceeding available storage lengths by about 6 metres. At the Upper Wellington Street / Limeridge Road East intersection, the westbound left 95th percentile queue length for the PM peak hour was 33 metres, which was longer than the storage length of 30 metre. Storage should be increased for these lanes at these intersections.

Table 14: Future (2031) "Three-Lane" Scenario Signalized Intersection Operations

Lane	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	Delay	LOS	v/c	Delay	LOS
1: Upper Wellington St & Stone Church Rd E						
EBL	0.57	19.5	B	0.98	89.9	F
EBTR	0.6	22.3	C	1.00	76.6	E
WBL	0.2	15.4	B	0.65	38.8	D
WBTR	0.91	43.4	D	1.00	78.3	E
NBL	0.44	18.2	B	0.58	34.7	C
NBTR	0.96	57.3	E	0.64	43.2	D

Lane	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	Delay	LOS	v/c	Delay	LOS
SBL	0.58	20.8	C	0.54	25.4	C
SBTR	0.67	30.1	C	1.04	89.9	F
Overall	**0.89**	**-**	**D**	**1.02**	**-**	**E**
2: Upper Wellington St & Towercrest Dr/Sirente Dr						
EBL	0.87	89	F	0.55	42.2	D
EBTR	0.08	37.1	D	0.08	37.1	D
WBL	0.31	38.7	D	0.23	37.9	D
WBTR	0.16	37.7	D	0.09	37.2	D
NBL	0.07	3.9	A	0.11	3.5	A
NBTR	0.66	9.4	A	0.48	5	A
SBL	0.19	4.7	A	0.18	2.9	A
SBTR	0.42	5.3	A	0.77	7.5	A
OVERALL	**0.69**	**-**	**B**	**0.75**	**-**	**A**
3: Upper Wellington St & Limeridge Rd E						
EBL	0.16	42.6	D	0.14	35.2	D
EBT	0.2	42.7	D	0.23	35.6	D
EBR	0.03	41.9	D	0.04	34.6	C
WBL	0.48	44.7	D	0.7	47.8	D
WBT	0.17	42.6	D	0.21	35.5	D
WBR	0.05	42	D	0.04	34.6	C
NBL	0.07	1.9	A	0.15	4.2	A
NBTR	0.74	6.1	A	0.52	6.2	A
SBL	0.08	2.8	A	0.13	4	A
SBTR	0.32	3.7	A	0.7	10.1	B
OVERALL	**0.71**	**-**	**B**	**0.7**	**-**	**B**

Note(s)

1. Movement exceeds v/c of 0.85 for through movements or shared through/turning movements, or exceeds 0.90 for exclusive turning movements, as described in the "Traffic Impact Study Guidelines" (dated July 2009) by the City of Hamilton, in the AM or PM peak hour.

While the major traffic flow direction at the intersection of Upper Wellinton Street and Stone Church road is the east-west direction, the southbound through-right movement is also critical, performing at LOS 'F' with a v/c ratio of 1.04 in the PM Peak Hour. The northbound through right movement at this intersection is also critical (v/c ratio of 0.96).

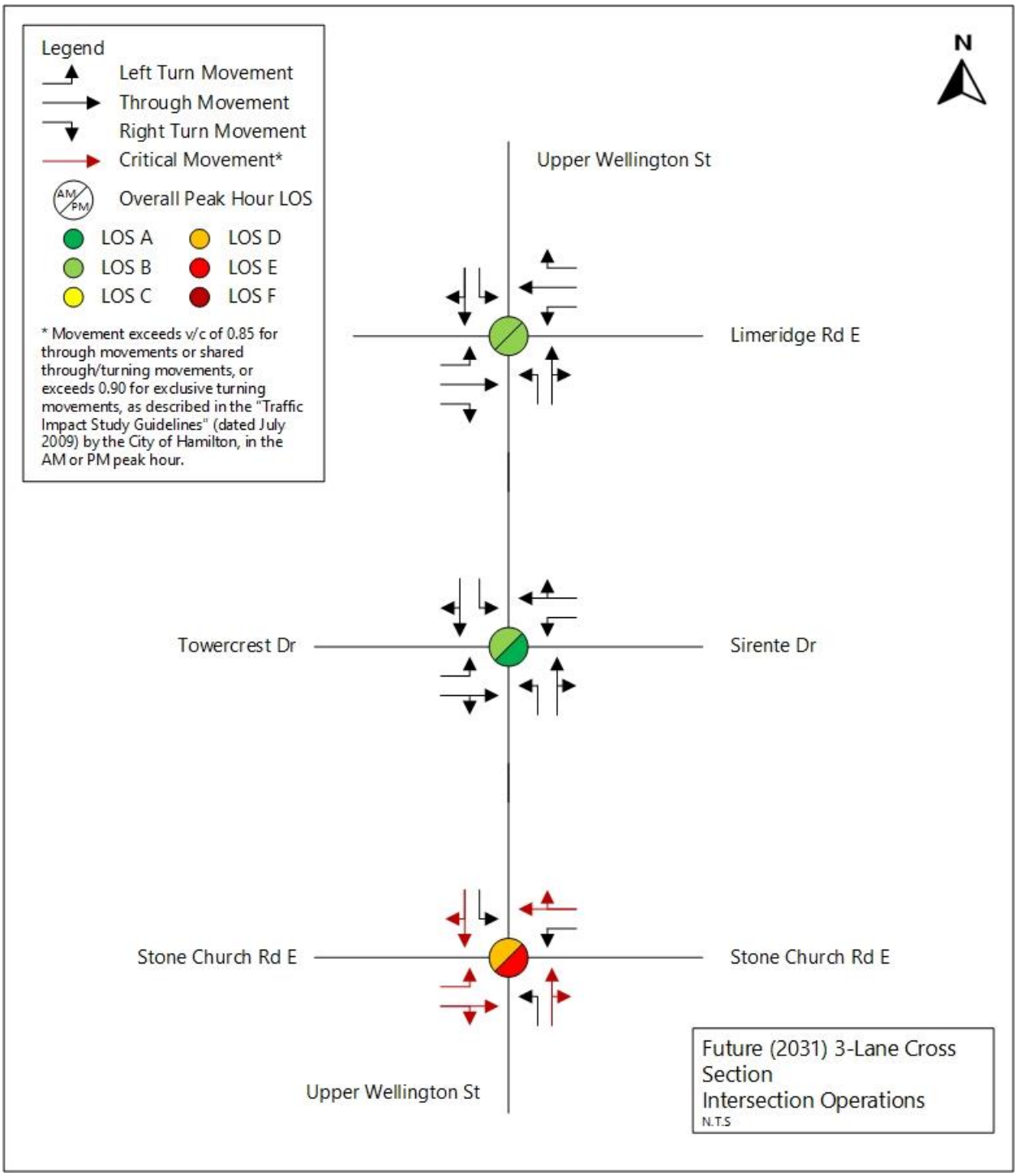


Figure 13: Future (2031) "Three-Lane Cross Section" Scenario Intersection Operations

Per the City's request, Synchro analysis was performed in order to assess potential for improvements at this intersection with the inclusion of a dedicated southbound right turn lane. Analysis shows improvements to LOS 'D' and LOS 'C' and v/c ratios of 0.73 and 0.16 for the improved southbound through and separate right turn movements respectively; with the inclusion of a 50-metre exclusive right turn storage lane. Given that the congestion is limited to the peak hour only and widening the interection of Upper Wellington Street and Stone Church Road will result in significant property impacts, and an increased crossing distance for pedestrians with a corresponding lengthening of pedestrian clearance, the southbound right turn lane is not recommended. **Table 15** shows the results below.

Table 15: Future (2031) "Three-Lane Cross Section" Scenario - Dedicated Right Turn Lane Analysis for Upper Wellington St & Stone Church Rd E Southbound Approach

Lane	Weekday AM Peak Hour			Weekday PM Peak Hour		
	v/c	Delay	LOS	v/c	Delay	LOS
1: Upper Wellington St & Stone Church Rd E						
EBL	0.57	19.5	B	0.98	89.9	F
EBTR	0.60	22.3	C	1.00	76.6	E
WBL	0.20	15.4	B	0.65	38.8	D
WBTR	0.91	43.4	D	1.00	78.3	E
NBL	0.33	17.1	B	0.32	28.5	C
NBTR	0.96	57.3	E	0.64	43.2	D
SBL	0.58	20.8	C	0.54	25.4	C
SBT	0.43	23.4	C	0.73	42.6	D
SBR	0.09	18.0	B	0.16	26.7	C
Overall	**0.89**	**34.5**	**C**	**0.89**	**59.0**	**E**

Conclusions

The intersection analysis for future scenario 'three-lane cross section' shows that both Upper Wellington Street & Towercrest Drive/Sirente Drive and Upper Wellington Street & Limeridge Road East intersections will perform with an adequate level of service in the 2031 horizon year. This analysis is based on the lane configuration shown in **Figure 13** in which only one lane for NB and SB through lanes were considered. The transition between the three-lanes and four-lanes cross sections with the dedicated cycling lanes on both directions will need to be considered in the preliminary design for this road, keeping in mind the continuity of the cycling facilities is paramount to the City.

Upper Wellington St and Stone Church Rd East intersection experience some congestion during the AM and PM peak during the 2031 horizon year. In context of the impacts of adding a second through lane with the associated property impacts and increased crossing distance for pedestrians, it is considered to be acceptable.

9.0 Safety Analysis

The safety assessment was undertaken as described in Section 4.5, consisting of an in-office review of historical collision data followed by a field investigation.

9.1 Collision Analysis

Collision data for the most recent regular five-year period (2015 to 2019 inclusively) was reviewed on a corridor level to identify any overall trends and patterns over the analysis period. Collisions reported with a classification of 'Non-reportable' are assumed to be 'Property Damage Only' (PDO).

A total of 102 collisions were recorded during the five-year period, of which two were pedestrian-auto collisions involving pedestrians crossing with the right-of-way. Two collisions were cyclist-auto collisions, and the remainder of the reported collisions were auto-auto collisions, with two collisions involving municipal transit buses.

9.1.1 Collision by Year, Month, Day of the Week

While there were no fatalities within the study corridor in the years analysed, there were a total of 102 accidents, of which 24 resulted in non-fatal injuries (NFI) and 78 resulted in property damage only (PDO). The Upper Wellington corridor experienced an average of 20.4 collisions per year over the 5-year period. **Table 16** and **Figure 14** show the collision frequency by year and severity.

Table 16: Total Collisions by Year and Severity

	2015	2016	2017	2018	2019	Total	Percentage
NFI	5	5	5	6	3	**24**	**24%**
PDO	10	19	16	16	17	**78**	**76%**
Total	**15**	**24**	**21**	**22**	**20**	**102**	**100%**
Percentage	**15%**	**24%**	**21%**	**22%**	**20%**	**100%**	-

The frequency of collisions is fairly evenly distrubuted by year, with the highest number of reported collisions (about 24%) occurring in 2016.

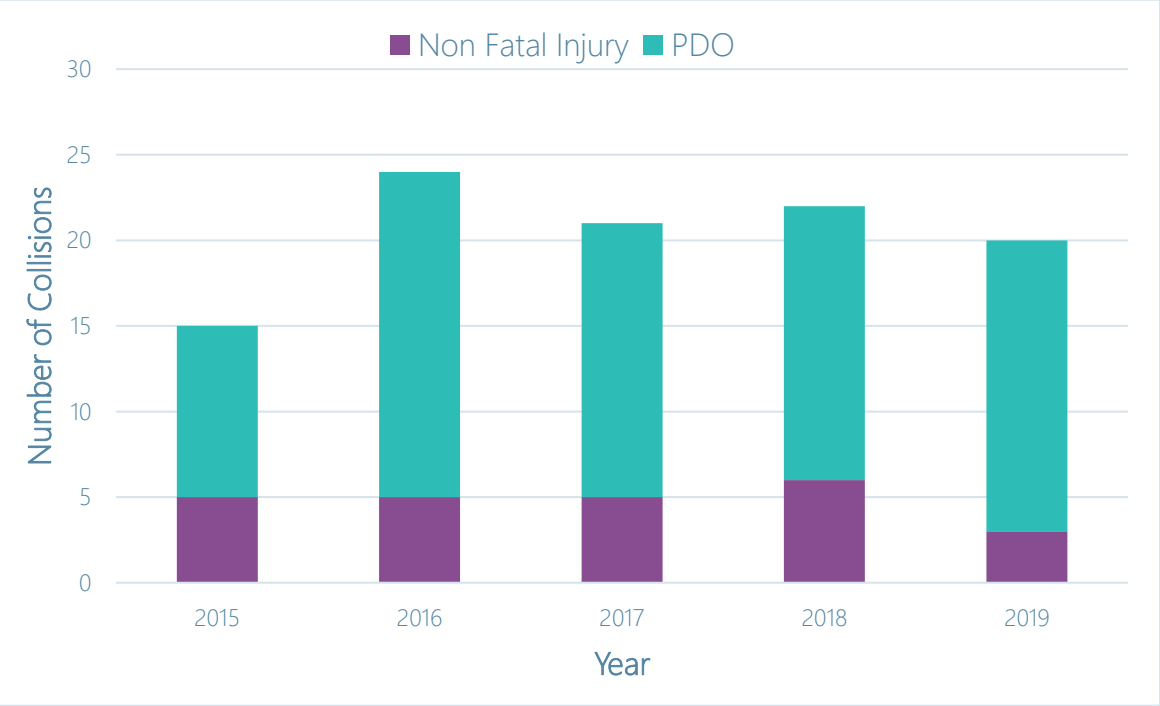


Figure 14: Total Collisions by Year and Severity

Table 17 and **Figure 15** show the collision frequency within the study corridor by month and severity. The highest number of collisions was reported in June and July, each with approximately 15% of the reported collisions during the five-year observation period.

Table 17: Total Collisions by Month and Severity

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Percentage
NFI	2	1	1	2	1	4	4	0	3	3	2	1	24	**24%**
PDO	2	8	9	4	4	11	11	11	4	6	3	5	78	**76%**
Total	**4**	**9**	**10**	**6**	**5**	**15**	**15**	**11**	**7**	**9**	**5**	**6**	**102**	**100%**
Percentage	**4%**	**9%**	**10%**	**6%**	**5%**	**15%**	**15%**	**11%**	**7%**	**9%**	**5%**	**6%**	**100%**	

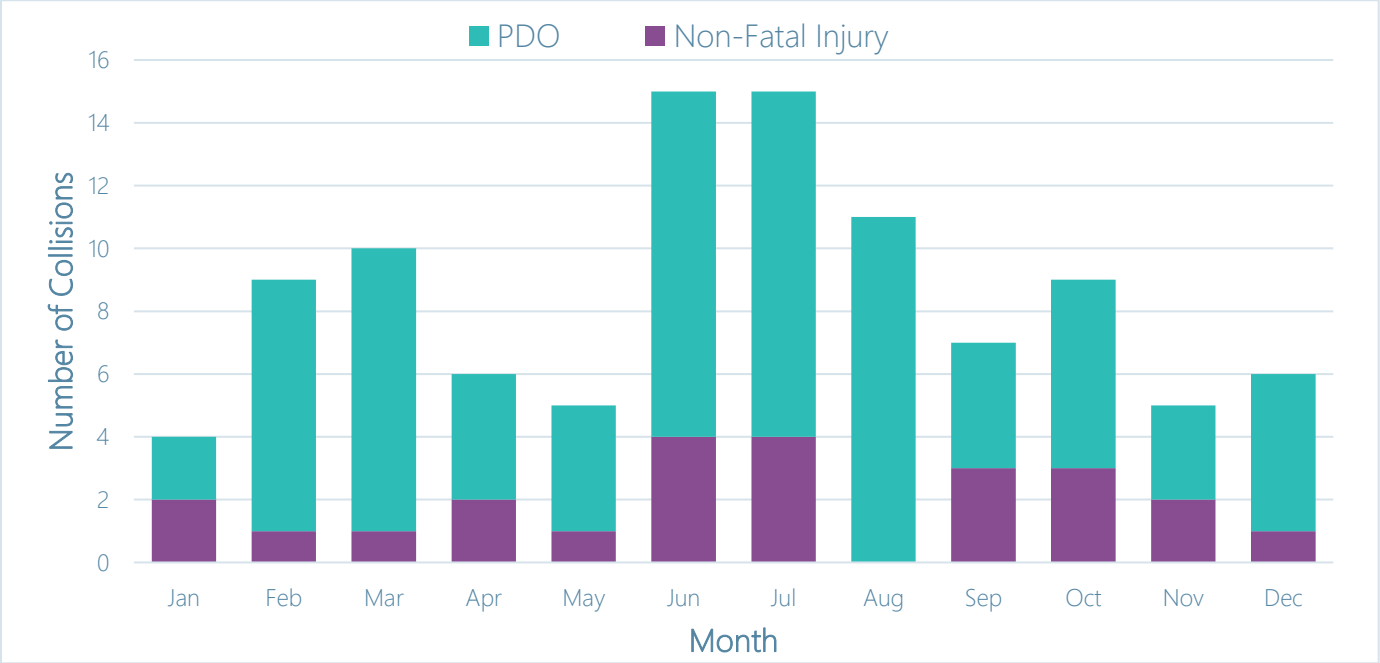


Figure 15: Total Collisions by Month and Severity

Table 18 and **Figure 16** illustrate the frequency of collisions within the study corridor by day of the week and intensity. As shown in the table, the highest number of collisions was reported on Sundays, accounting for about 18% of the total collisions along the study corridor.

Table 18: Total Collisions by Day of the Week and Severity

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Percentage
NFI	3	2	7	4	2	3	3	24	**24%**
PDO	15	7	7	12	10	13	14	78	**76%**
Total	18	9	14	16	12	16	17	102	**100%**
Percentage	**18%**	**9%**	**14%**	**16%**	**12%**	**16%**	**17%**	**100%**	

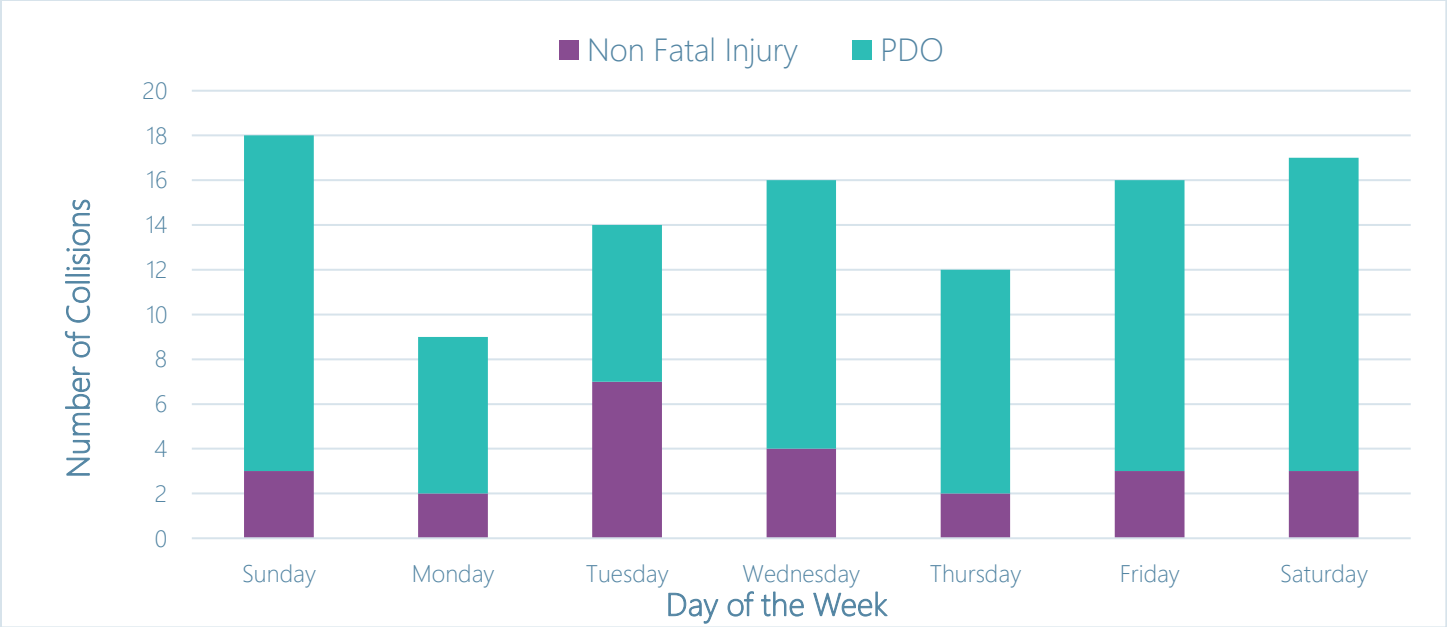


Figure 16: Total Collisions by Day of the Week and Severity

9.1.2 Collision by Time of Day

Figure 17 illustrates the frequency of collisions by time of day and severity. As shown in the figure, the frequency of collisions peaks during the mid-day and PM peak hours. The highest frequency of collisions resulting in non-fatal injuries occurs around 12PM, while collisions resulting in property damage only occurred most frequently around 4PM.

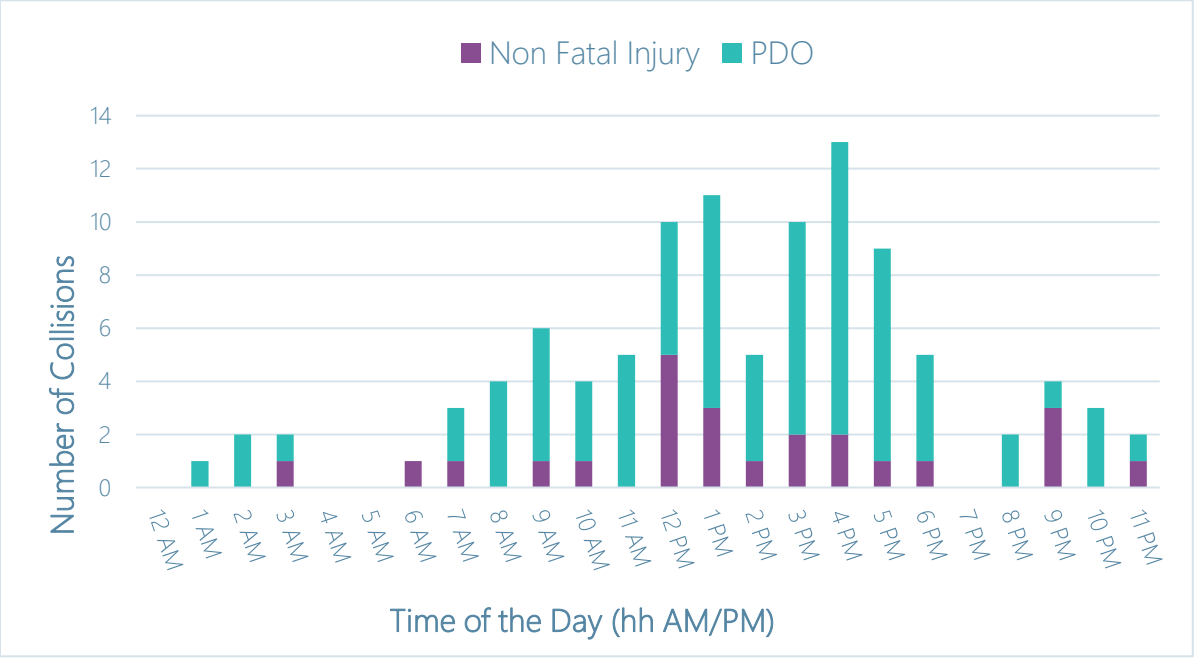


Figure 17: Collisions by Time of Day and Severity

9.1.3 Collision by Environmental Conditions

Collison frequency along the corridor was analyzed by environmental conditions as shown in **Figure 18.** A majority of all collisions occurred under clear conditions (about 83%).

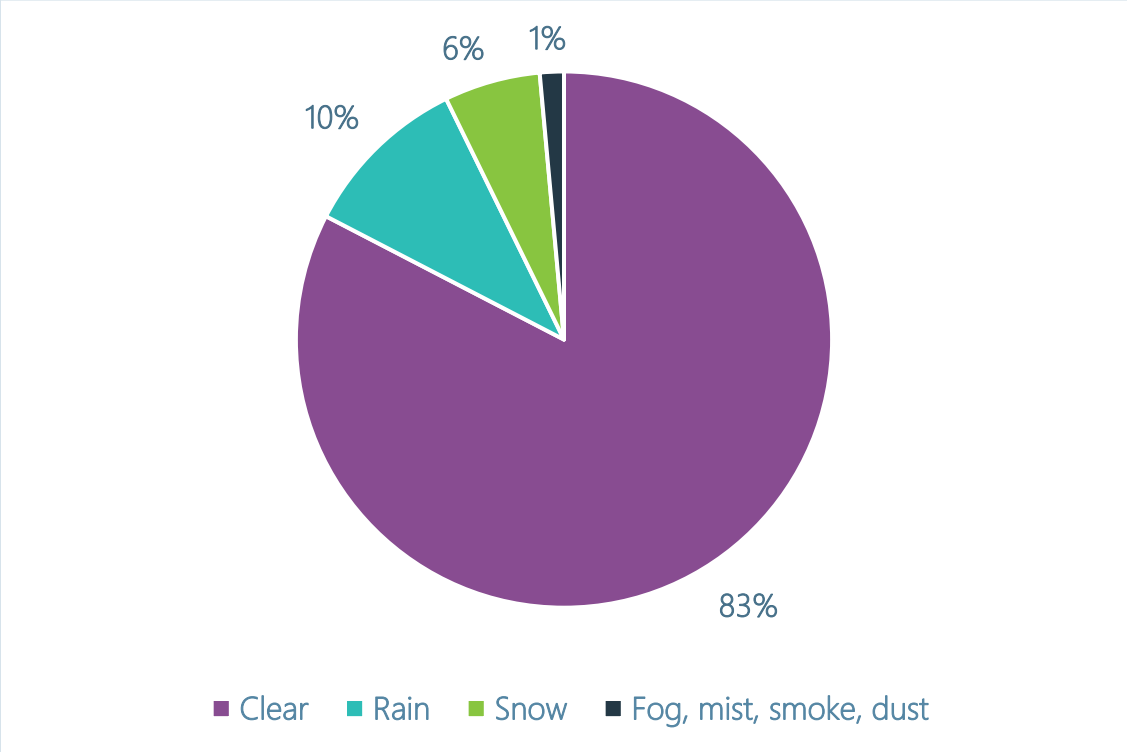


Figure 18: Collisions by Environmental Conditions

9.1.4 Collision by Light Conditions

Collison frequency along the corridor was analyzed by light conditions as shown in **Figure 19**. A majority of all collisions occurred in daylight conditions (about 74%).

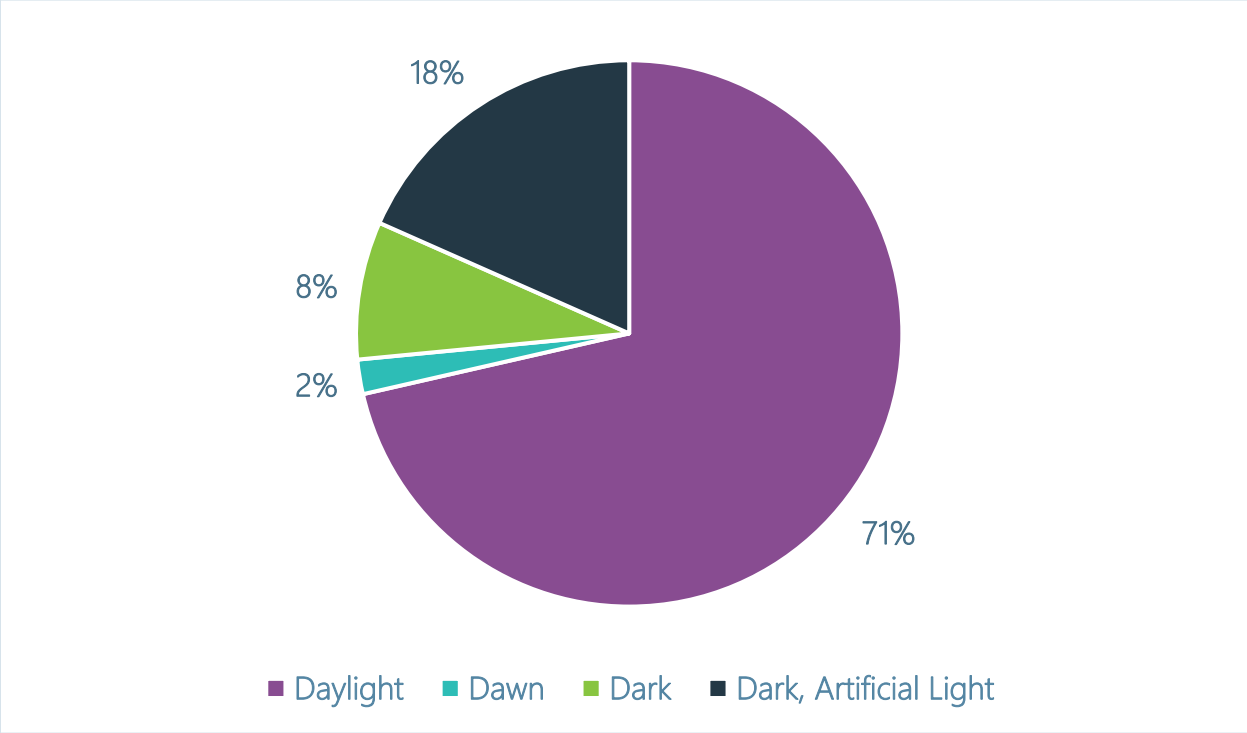


Figure 19: Collisions by Light Conditions

9.1.5 Collision by Location and Severity

The collision data was analyzed by location and severity to determine any hot spots along the corridor which would require further investigation. Collisions occurring at intersections and midblock segments were analyzed separately.

9.1.5.1 Intersection Collision

The collision frequency and severity at the study intersections are provided in **Table 19** and **Figure 20**. A total of 88 (86%) of the 102 recorded collisions along the corridor were intersection related. The intersection of Upper Wellington Street and Stone Church Road East experienced the highest number of collisions resulting in both non-fatal injuries and property damage, totaling 58 collisions (66% of total intersection collisions). In comparison, the intersections at Limeridge Road East and Towercrest Drive each experienced a relatively low number of collisions (15 or 17% of total intersection collisions).

Table 19: Total Collisions at Study Intersections by Severity

Intersection	Non-Fatal Injury	PDO	Total
Upper Wellington Street / Limeridge Road East	5	10	**15**
Upper Wellington Street / Stone Church Road East	14	44	**58**
Upper Wellington Street / Towercrest Drive - Sirente Drive	2	13	**15**
Total	**21**	**67**	**88**

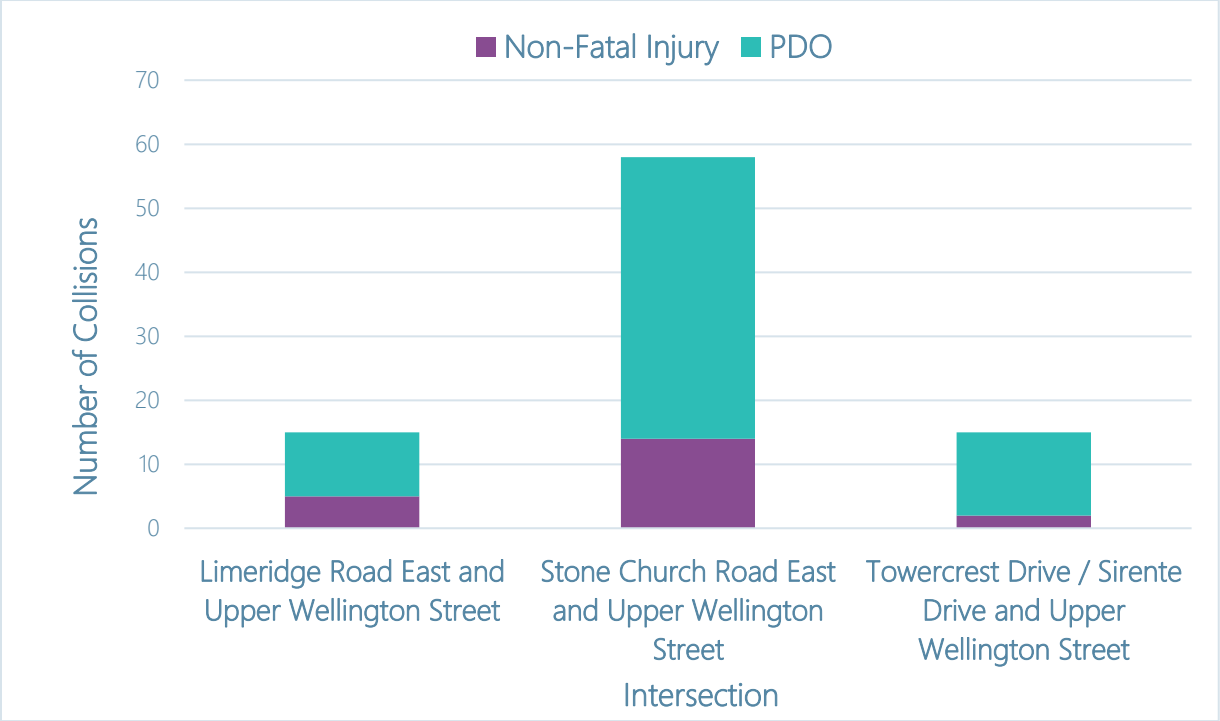


Figure 20: Total Collisions at Study Intersections by Severity

9.1.5.2 Midblock Collision

The collision frequency and severity along the Upper Wellington corridor midblock locations are provided in **Table 20** and **Figure 21**.

A total of 18 (14%) of the 102 recorded collisions along the corridor were non-intersection related or occurring along midblock segments.

The frequency of collisions along the study corridor midblock segments is relatively low and evenly distributed, however, slightly higher collision frequencies are observed within close proximity to the intersection of Stone Church Road East and Upper Wellington Street which experiences the highest collision frequency of the intersections in the study.

Table 20: Total Midblock Collisions (north to south) along Study Corridor

Segment of Upper Wellington Street (N – S)	Non-Fatal Injury	PDO	Total
Limeridge Road East to Major Road Bridge[1]	0	1	**1**
Major Road Bridge[1] to Towercrest Drive / Sirente Drive	1	2	**3**
Towercrest Drive / Sirente Drive to Private Access (by Desoto Drive)	1	3	**4**
Private access (by Desoto Drive) to Stone Church Road East	1	5	**6**
Total	**3**	**11**	**14**

Note(s)

1. Major Road Bridge refers to the north-south Upper Wellington Street Bridge crossing above the Lincoln M. Alexander Parkway

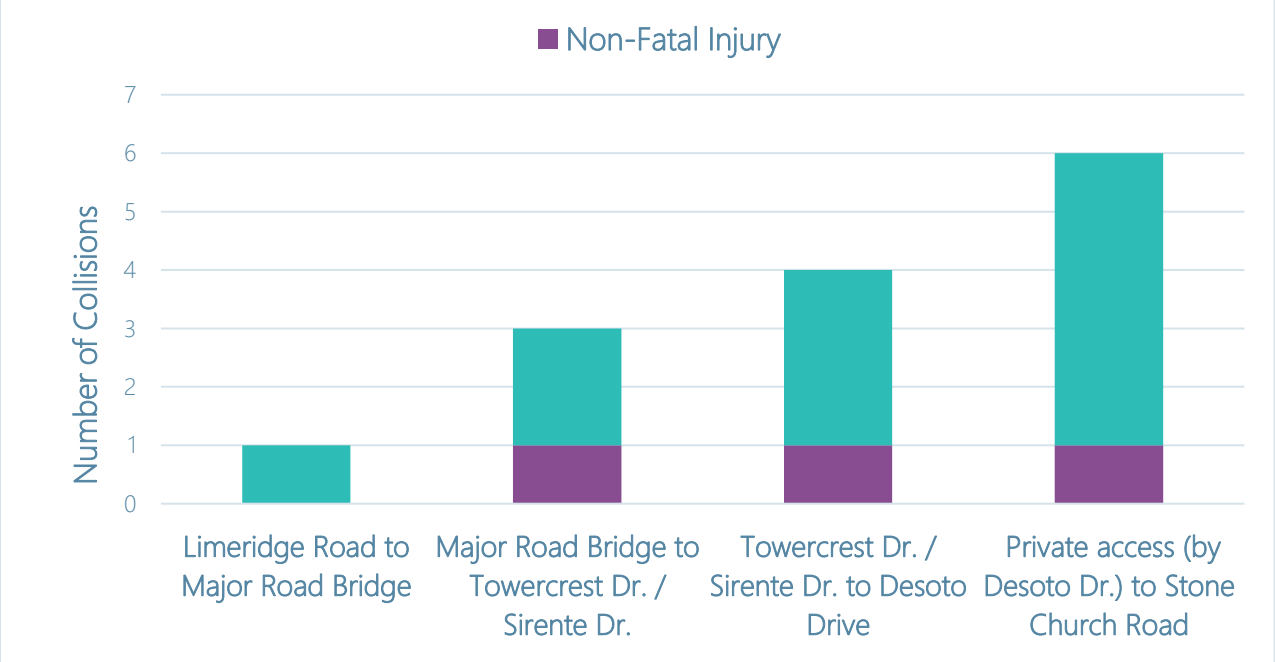


Figure 21: Total Midblock Collisions along Study Corridor

9.1.6 Additional Collision Analysis

As illustrated in **Figure 20**, the intersection of Upper Wellington Street and Stone Church Road East experiences a particularly high frequency of collisions. This location was examined further to identify any patterns signifying potential causal factors, as documented below.

9.1.6.1 Upper Wellington Street and Stone Church Road East Intersection

This intersection experienced 58 collisions during the five-year study period; 44 of which resulted in property damage only, while the remaining 14 resulted in non-fatal injuries. Investigations were conducted to understand the impact types experienced at the intersection, as well as the initial vehicle directions and vehicle maneuvers.

Collision by Initial Impact Type

The impact types experienced at this intersection were investigated and illustrated in **Figure 22**.

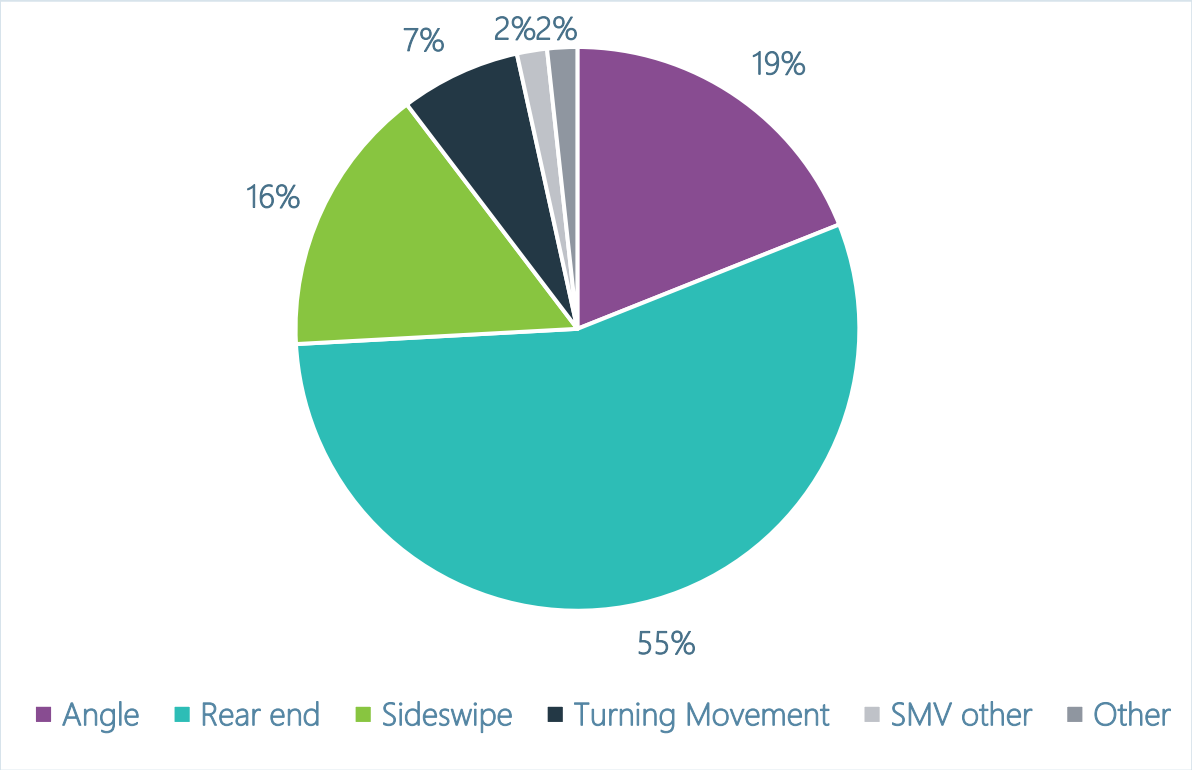


Figure 22: Vehicle Collision Impact Types at Upper Wellington Street and Stone Church Road East

As shown in the figure, rear end collisions account for the majority (about 55%) of the collisions experienced at the intersection. A rear-end collision occurs when a vehicle crashes into the one in front of it. Common factors contributing to rear-end collisions include driver inattention or distraction and panic stops. Reduced traction due to wet weather can also lead to rear end collisions, however we observed that majority of the collisions occurred under clear conditions. Also, apparent driver action/behaviour was not observed to be a significant cause for collisions at the intersection.

Angle (19%) and sideswipe collisions (16%) had the second and third highest frequency of occurrence respectively.

Angle and sideswipe accidents occur when one of the vehicles hits at an angle while changing lanes and the other is going straight. Sometimes both vehicles are changing lanes at the same time or one car is

drifting from one lane to another. Most sideswipe accidents occur on a level, straight road with clear visibility.

Rear-end, angle and sideswipe collisions are known to occur predominantly at intersections / junctions.

Collision by Vehicle Initial Direction

An investigation of vehicle initial travel directions (prior to maneuvers resulting in collisions) along the study corridor was carried out and the results are summarized in **Table 21**.

Table 21: Intersection Initial (Pre-collision) Vehicle Directions

		Vehicle 2 Initial Direction					
		Unspecified	**North**	**South**	**East**	**West**	**Total**
Vehicle 1 Initial Direction	**Unspecified**	0	0	1	0	1	**2**
	North	0	6	1	1	2	**10**
	South	1	1	11	2	1	**16**
	East	0	3	0	16	0	**19**
	West	0	2	0	2	7	**11**
	Total	**1**	**12**	**13**	**21**	**11**	**58**

As shown in the table it was observed that the highest incidence of collisions occurring in the intersection involved scenarios where both vehicles were approaching the intersection driving in the same direction - south along Upper Wellington Street, or east along Stone Church Road East.

Notably the total collisions involving vehicles travelling east is relatively high, suggesting that the traffic along Stone Church Road East contributes largely to the collisions along the study corridor.

Collision by Vehicle Maneuver

An investigation of the vehicle maneuvers resulting in collisions was conducted in order to identify patterns that might suggest a causative factor. The results of this investigation are shown in **Table 22**.

Table 22: Vehicle Maneuvers Resulting in Collision

			Vehicle 2 Maneuver						
		Other	Going ahead	Slowing or stopping	Turning left	Turning right	Changing lanes	Stopped	Total
Vehicle 1 Maneuver	**Other**	0	1	1	0	0	0	1	**3**
	Going ahead	0	16	2	3	0	0	3	**24**
	Slowing or stopping	0	3	2	0	0	0	3	**8**
	Turning left	0	3	0	0	0	1	1	**5**
	Turning right	1	3	0	0	0	0	0	**4**
	Stopped	2	11	0	0	1	0	0	**14**
	Total	**3**	**37**	**5**	**3**	**1**	**1**	**8**	**58**

As shown in the table it was observed that the highest frequency of collisions at the intersection involved vehicles that were going ahead and vehicles which were slowing or stopping / stopped. With significantly fewer turning movements resulting in collisions, this further suggests that many of the collisions may be associated with the eastbound through volumes along Stone Church Road East.

9.1.7 Network Screening (Collision) Rankings

Network screening locations were examined along the study corridor in order to assess overall collision rankings and collision rankings by group. Analysis revealed that sidewalks are required for the entire section on both sides of the study corridor. There are no major concerns related to network screening (collision) rankings.

The intersection of Upper Wellington Street and Stone Church Road East is ranked #40 in the Traffic Signal group; the environmental assessment should review ways to improve safety at the intersection. The network screening locations and rankings were received from the City of Hamilton in November 2020, as summarized in **Table 23.**

Table 23: Study Corridor Screening (Collision) Rankings

Location	Overall Rank	Group	Group Rank
Upper Wellington - Stone Church Road East to Limeridge Road East	524	Rural Road	173
Upper Wellington Street and Stone Church Road East	535	Signal	40
Upper Wellington Street and Limeridge Road East	1154	Signal	210
Upper Wellington Street and Towercrest Drive / Sirente Drive	1533	Signal	313

9.2 Field Investigation

A site visit was undertaken on February 26th, 2021 to evaluate existing conditions and future needs within the study area with respect to road safety and active transportation. Conditions at the time of the site visit were dry and sunny. The following sections outlines the findings.

Upper Wellington Street at Stone Church Road East

The intersection of Upper Wellington Street and Stone Church Road East is a four-legged signalized intersection that intersects at right-angles. All four approaches have dedicated left turn lanes. Stone Church Road East and the south leg of Upper Wellington Street has bicycle lanes. Pedestrian signal heads and crosswalks are provided. Sight lines are adequate on all four approaches.

Upper Wellington Street between Stone Church Road East and Towercrest Drive / Sirente Drive

The section of Upper Wellington Street between Stone Church Road East and Towercrest Drive/Sirente Drive primarily has a two-lane rural cross section. Adjacent land use consists of a two retirement homes, two churches, a soccer field, a forested area and residential homes that front directly onto Upper Wellington Street.

A sidewalk is provided on the west side of Upper Wellington that primarily consists of an asphalt pathway (1.5 metres in width) separated from the roadway by a 2.0 metre gravel shoulder. For a short (approximately 45m) section where the south leg of the Upper Wellington approach meets the intersection, the asphalt pathway is located directly adjacent to the roadway.

On the west side of the roadway is a set of utility poles that are offset from the travel lanes by around 1.4 m. A 2.0 metre gravel shoulder is provided on the east side of the roadway. One unsignalized intersection

is located midway between Stone Church Road East and Towercrest Drive/Sirente Drive that leads into a small residential subdivision (Desoto Drive). The intersection is Stop controlled.

Upper Wellington Street at Towercrest Drive / Sirente Drive

The intersection of Upper Wellington Street and Towercrest Drive / Sirente Drive is a four-legged signalized intersection that intersects at right-angles. All four approaches have dedicated left turn lanes. Bicycle lanes are not provided along any of the approaches. Pedestrian signal heads and crosswalks are provided.

Sight lines are adequate on all four approaches, however on the south leg (northbound approach) of the intersection, drivers will experience a temporary sightline issue caused by sudden change in the vertical grade when travelling north towards the intersection that restricted visibility of vehicles queued on the northbound approach to the intersection. Figure 23 and Figure 24 show the approach to the intersection, where the slope is experienced.

As shown in **Figure 23**, in addition to the available sight distance, a cautionary "PREPARE TO STOP WHEN FLASHING" road sign is stationed approximately 135 metres from the intersection, warning drivers to prepare to stop when the signal is red or about to turn red.

Figure 23: Northbound Approach at Upper Wellington Street and Towercrest Dr. / Sirente Dr. (Dashcam Footage)

Figure 24: Northbound Approach Reverse Angle (Dashcam Footage)

A sight distance analysis for this approach was conducted in order to ensure adequate stopping distance for vehicles approaching the intersection.

The methodology for assessing the adequacy of sight distance at this location is adopted from the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (2017).

In order to estimate the desirable stopping sight distance a conservative design speed of 60 km/h was used to derive the stopping distance from the design guide's range of sight distance values shown in **Figure 25**, which recognizes the variation in complexity that exists at various sites.

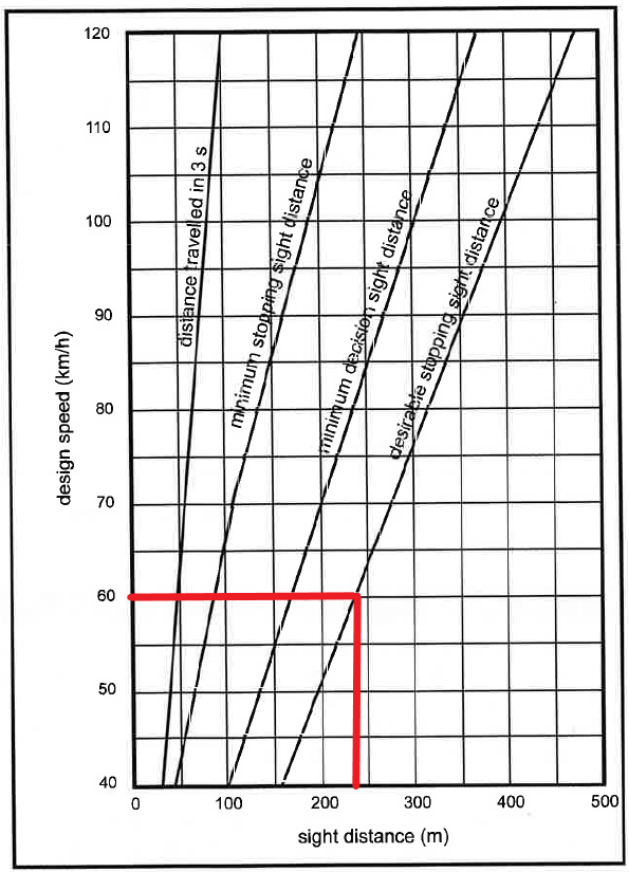


Figure 25: TAC Geometric Design Guide Excerpt – Decision Stopping Distance by Design Speed

As shown in the figure, the desired stopping distance at the assumed design speed of 60 km/h is about 240 metres. The stop bar intersection becomes visible from approximately 250 metres out, thus the available sight distance exceeds the desirable stopping distance. During detailed design phase, options shall be explored to flatten the vertical curvature on the north approach to this intersection in order to increase the desirable sight distance.

Upper Wellington Street between Towercrest Drive / Sirente Drive and Limeridge Road East

The segment of Upper Wellington Street between Towercrest Drive/Sirente Drive and Limeridge Road East has a four-lane cross section. This section of the corridor provides no access to adjacent land.

As mentioned in Section 3.1, this section consists of an approximately 70 metre bridge crossing just south of Limeridge Road East. This section of the corridor provides elevated right-of-way above the Lincoln M. Alexander Parkway. A 2.5-metre-wide concrete sidewalk is provided on both sides of Upper Wellington along this segment. There are guard rails on both sides of the road leading up to the bridge, followed by concrete barriers along the bridge on both sides.

Upper Wellington Street at Limeridge Road East

The intersection of Upper Wellington Street and Limeridge Road East is a four-legged signalized intersection that intersects at right-angles. All four approaches have dedicated left turn lanes. Bicycle lanes are not provided along any of the approaches. Pedestrian signal heads and crosswalks are provided. Sight lines are adequate on all four approaches.

10.0 Complete Streets

In an effort to balance the infrastructural needs for all modes including vehicles, transits, pedestrians, and cyclists, the Complete-Livable-Better (CLB) Streets have been established, as mentioned in the "City Wide Transportation Master Plan Review and Update (PED18137)" by the City of Hamilton. The overview of the approach is summarized in the presentation titled "Complete Livable Better Streets Design Manual Update" (dated January 11, 2021) by the City of Hamilton. The detailed descriptions are provided in "Complete Livable Better Streets Design Manual (PED21020/PW21002) (City Wide)" (dated January 11, 2011) by the City of Hamilton, along with its appendices.

While the information provided in the aforementioned presentation is preliminary, for the purpose of this transportation assessment, the Upper Wellington Street corridor was assumed to be interpreted as "connectors," which "link residential and employment areas together and to other parts of the City" with "medium people-movement capacity with moderate access control." A schematic for Connector Streets is provided below (Source: Hamilton Complete Streets Design Guidelines (June 2022).

Complete Streets are streets that are safe for everyone: pedestrians, cyclists, transit users, or drivers, and people of all ages and abilities. Complete, Livable, Better (CLB) Streets are Hamilton's version of Complete Streets. The CLB Streets approach is a shift away from traditional design that prioritizes the movement of motor vehicles. A CLB Street is also a public space that equitably considers the needs of all road users. Through proper design, CLB Streets can improve safety, accessibility, connectivity, sense of place and the public realm overall.

The City of Hamilton has developed Complete Streets Design Guidelines (June 2022). This document provides a set of consistent guidelines and tools to inform the design, implementation, maintenance and monitoring of CLB Streets across the city. Hamilton's Complete Streets approach identifies eight (8) typologies, approved by Council in 2021, which represent the diverse range of streets found throughout the city. An overview of City's Complete Streets Typologies is provided in the graphic below (Source: Hamilton Complete Streets Design Guidelines (June 2022).

	URBAN AVENUES	TRANSITIONING AVENUES	MAIN STREETS	CONNECTORS	INDUSTRIAL STREETS	NEIGHBOURHOOD STREETS	RURAL ROADS	RURAL SETTLEMENT ROADS
CONTEXT	Urban	Urban / Suburban / Industrial	Urban	Urban / Suburban	Industrial	Urban / Suburban	Rural	Rural
PRIMARY STREET FUNCTION	Mobility and place-making	Mobility	Placemaking and access	Mobility and access	Access	Access	Mobility	Access
TYPICAL RIGHT OF WAY	20–26 m	36 m	18–20 m	20–26 m	26–30 m	15–20 m urban 20–26 m rural	26–36 m	20–26 m
NUMBER OF LANES	2–4	4	2	2	3	1–2	2	2
TARGET SPEED	40–50 km/h	50–60 km/h	30–40 km/h	30–40 km/h	40–50 km/h	30–40 km/h	60–80 km/h	40–50 km/h
CYCLING FACILITIES	Cycle tracks	Cycle tracks or multi-use paths	Shared lanes	Cycle tracks	Cycle tracks or multi-use paths	Mixed traffic or contraflow lane	Shared lanes, paved shoulder, or multi-use path	Bicycle lanes, cycle tracks, or multi-use paths
WALKWAY ZONE WIDTH	2.0–3.5 m	1.8–2.5 m	2.0–3.5 m	1.8–2.0 m	2.0 m	1.8 m	n/a	1.8 m

Figure 26: Schematic for Connector Streets

As part of the development of the Complete, Streets Design Guidelines, a CLB Street Design Decision Support and Audit Tool was prepared. This tool is intended to help designers and planners to interpret the design manual and evaluate the street that is being designed. The use of the tool will help determine the best application and treatments to ensure the street being designed is a CLB street, considering the street context and the adjacent land uses in which the project is located. The tool can also be used to audit the conditions of existing streets to inform future needs and opportunities.

The audit tool was used to audit existing conditions of Upper Wellington Street and to inform future needs. Upper Wellington Street corridor was assumed to be interpreted as "connectors," which "link residential and employment areas together and to other parts of the City" with "moderate people-movement capacity with moderate access control." Characteristics for Connector Streets from Hamilton Complete Streets Design Guidelines (June 2022) are provided below.

CONTEXT	Urban/Suburban
STREET FUNCTION	Mobility and access
RIGHT OF WAY	20–26 m
NUMBER OF LANES	2
TARGET SPEED	30–40 km/h
CYCLING FACILITIES	Cycle tracks (on-street lanes, advisory lanes, or shared lanes may be appropriate depending on context)
PEDESTRIAN CLEAR ZONE WIDTH	1.8m, 2.0m adjacent to high pedestrian generators

Figure 27: Complete Livable Better Streets Typology for Connector Streets

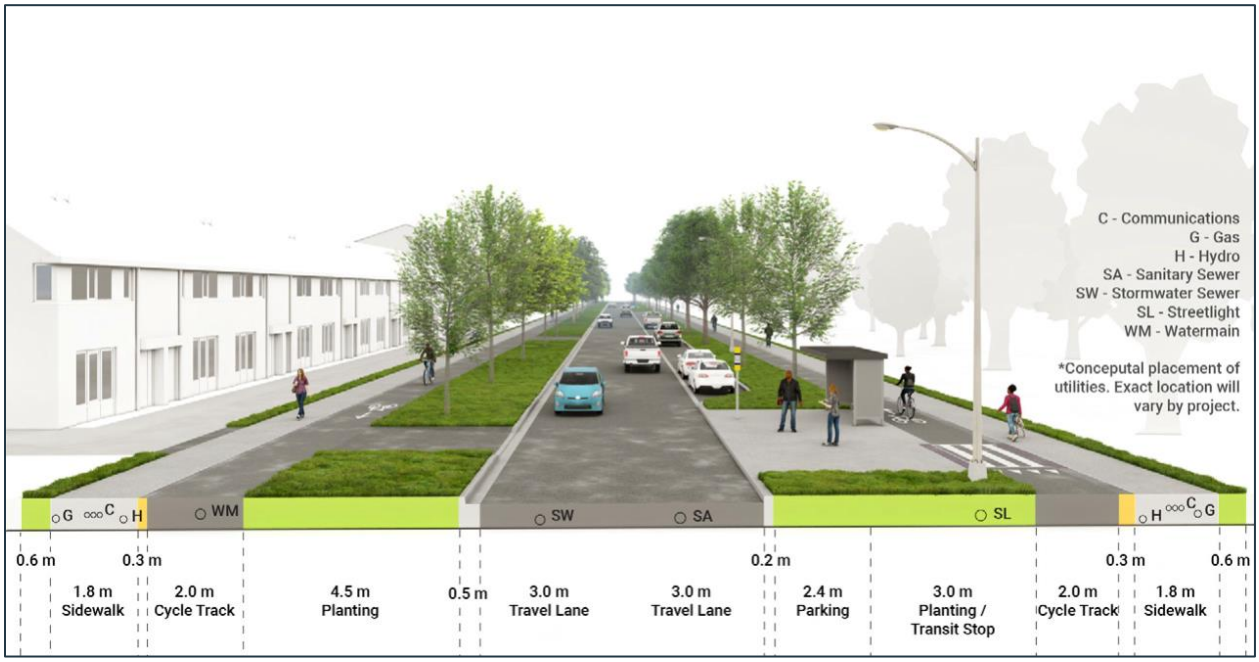
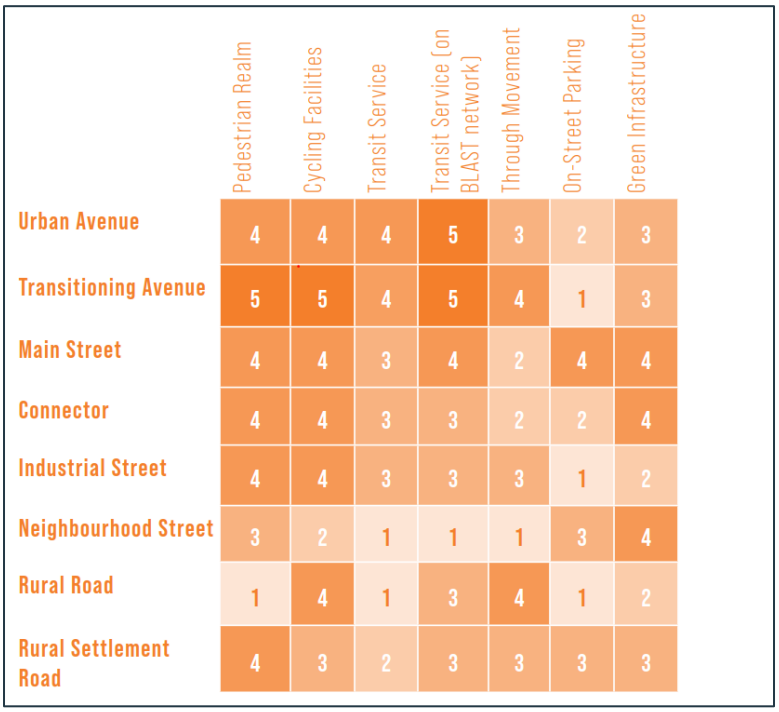


Figure 28: Schematic for Connector Streets

As shown in **Figure 29**, for connectors, a relatively high level of pedestrian realm and cycling facility infrastructure are desired (Source: Hamilton Complete Streets Design Guidelines (June 2022).



	Pedestrian Realm	Cycling Facilities	Transit Service	Transit Service (on BLAST network)	Through Movement	On-Street Parking	Green Infrastructure
Urban Avenue	4	4	4	5	3	2	3
Transitioning Avenue	5	5	4	5	4	1	3
Main Street	4	4	3	4	2	4	4
Connector	4	4	3	3	2	2	4
Industrial Street	4	4	3	3	3	1	2
Neighbourhood Street	3	2	1	1	1	3	4
Rural Road	1	4	1	3	4	1	2
Rural Settlement Road	4	3	2	3	3	3	3

Figure 29: Desired Conditions for Complete Street Typologies

As summarized in **Table 24,** Hamilton Complete Streets Design Guidelines (June 2022) describes the expected infrastructure provisions for the desired conditions. Since the study area is not part of the BLAST transit network, this area of interest was not assessed. The area of interest "Green Infrastructure" was not related to transportation. Therefore, it was not included as part of the complete streets review.

Table 24: Street Element Condition Definitions

Area of Interest	Desired Conditions[1]	Description[2]
Pedestrian Realm	4	"3.0 m MUP, physically separated from travelled portion of roadway"
Cycling Facilities	4	"Buffered paved shoulder - or - 3.0 m MUP, physically separated from travelled portion of roadway"
Transit Services	3	"Frequent local transit service. Most stops have shelters and basic amenities"
Transit Service (on BLAST network)	3	N/A
Through Movement	2	"6.0 to 7.0 m pavement[.] Centreline may or may not be marked[.] No paved shoulder"
On-Street Parking	2	"Permanent or off-peak parking if there is sufficient space in the ROW and demand cannot be met with off-street supply. Parking may be provided in specific locations only (where needed, or where curbside space is available), and may not be provided on every block. Parking may be on one or both sides of the street."
Green Infrastructure	4	"Tree canopy at maturity exceeds coverage guideline[.] Sustainability, resilience and ecological principles are primary themes of the design. LID incorporated in a comprehensive manner."

Note(s)

1. Desired conditions for Connectors as indicated in **Figure 29**.
2. Descriptions of desired conditions in a rural context (as opposed to urban).

The sidewalks on Towercrest Drive – Sirente Drive at Upper Wellington Street had boulevards present. However, on the south side of the west leg of the Upper Wellington Street / Limeridge Road East intersection, a sidewalk was not present. Since no shoulder was present, there was no way for pedestrians to reach sidewalks present approximately 180 metre west of the intersection, at least on the south side. It is worthwhile to note that although sufficient pedestrian infrastructure was present near all the four intersections, sidewalks on mid-block segments, especially between Stone Church Road East and Towercrest Drive – Sirente Drive, were either in poor conditions or unpaved. It is recommended that the poor surface conditions for the sidewalks and lack of buffers to be addressed, especially due to the high traffic volumes along Upper Wellington Street.

As described in **Section 3.3**, the northbound bicycle lane south of Stone Church East lacks definition approaching the intersection. Through the study area, the roadway platform is not currently wide enough to demarcate bicycle lanes. As proposed in the Cycling Master Plan, bike lane installation as well as roadway reconstruction along Upper Wellington Street from Stone Church Road East to Limeridge Road East is recommended. This would provide better connectivity of the cycling network than the existing conditions. Based on initial observations, opportunities exist to explore active transportation infrastructure improvements along the bridge south of Limeridge Road East, while retaining the existing bridge cross-section.

The transit service along the corridor via route 26 provides 15-minute headways during weekday peak hours. Some of the bus stops are open bus stops while the others are sheltered bus stops, as explained in **Section 3.2** and **Section 3.3**. Overall, the current transit service and infrastructure meet the criteria for the desired conditions.

For through movements, the corridor would meet the criteria with the road widening. Note that the existing infrastructure does not provide sufficient paved shoulder as per the desired conditions.

On-street parking is currently not provided, and there is no need to do so in the future as per the desired conditions.

11.0 Summary and Recommendations

A transportation assessment was completed to assess existing traffic operations, road safety, and active transportation infrastructure along the Upper Wellington Street corridor between Limeridge Road East and Stone Church Road East to identify operational constraints and potential safety-related concerns based on the existing conditions (2020) and the forecasted future (2031) "Do Nothing" scenarios. The assessment findings and recommendations are summarized in this section.

11.1 Background Studies

Prior to conducting the transportation assessment, the following studies were reviewed to gain a background understanding of the study corridor as well as the planned road improvements for Upper Wellington Street:

- City of Hamilton Context
    - South Mountain Area Transportation Master Plan Review, (2006)
    - Urban Hamilton Official Plan (2009)
    - City of Hamilton Transportation Master Plan (2018)
    - Hamilton Pedestrian Mobility Plan (2012)
    - Cycling Master Plan Review and Update (2018)
    - Truck Route Master Plan Update (2022)
- Provincial Context
    - Provincial Planning Statement (2024)
    - 2041 Regional Transportation Plan (2018)

As documented in Section 2.0, provincial and City of Hamilton background studies detail plans for road widening and installation of active transportation facilities within the study corridor along Upper Wellington Street. There is no goods movement / trucking activity along the study corridor.

11.2 Existing Conditions (2020)

The baseline existing traffic volumes for the study area were established based on the existing turning movement counts (TMCs). Upper Wellington Street provides north-south movement in the City while Stone Church Road East provides east-west movement in the area. Limeridge Road East and Towercrest Drive – Sirente Drive act as access points from/to the residential neighbourhoods.

The link capacity analysis revealed that the study corridor operates at v/c of 0.75 and 0.86 in the peak directions in the weekday morning (AM) and afternoon (PM), respectively. This was the case between Stone Church Road East and Towercrest Drive – Sirente Drive.

The intersection capacity analysis showed capacity deficiencies in the east and west direction at the Upper Wellington Street / Stone Church Road East intersection. This was likely due to the high throughput in all travel directions with delays incurred by east-west vehicles turning onto Upper Wellington Street.

Given these results, widening of the study corridor to three-lanes cross section with centre left turn is recommended in order to allow for more capacity for the through traffic and improve the overall safety and active transportation facilities along the study corridor.

11.3 Future Conditions (2031)

The future travel demand within the study area was forecasted based on the existing volumes, general corridor growth, and background developments. A compound annual growth rate (CAGR) of 1% was applied between the year 2020 and 2031.

The link capacity analysis showed the study corridor between Stone Church Road East and Limeridge Road with a three-lane cross section will operate at a maximum v/c of 0.95 and 0.96 in the peak directions in the AM and PM peak hours, respectively.

The intersection capacity analysis demonstrated similar traffic operations at the Upper Wellington Street / Stone Church Road East intersection. The eastbound through-right, westbound through-right, northbound through-right, and southbound through-right movements operate as critical movements, with the intersection overall v/c of 0.89 and 1.02 in the AM and PM peak hours, respectively. These are considered acceptable considering the three-lane cross section's considerable benefits to the safety of active transportation users, in line with Complete Streets concepts. Also, the intersection operational issues described above are projected for the horizon year scenario and are expected to happen during peak hours only.

Upper Wellington St and Stone Church Rd East intersection will be under pressure particularly in the PM peak hour as demonstrated by the analysis results. The overall delay for this intersection will improve slightly with the inclusion of a dedicated southbound right turn lane, but the additional lane will significantly impact property taking and increase pedestrian's exposure to vehicle traffic while crossing the intersection. Therefore, it is not recommended.

Based on the results above, the widening of the study corridor between Stone Church Road and Towercrest Drive/Sirente Drive to a three-lane cross section is strongly recommended. Upon implementation of the road diet between Towercrest Drive/Sirente Drive and Limeridge Road, the traffic is expected to decrease by 10%, as this section of the road will become less desirable for by-pass trips which will be diverted to parallel streets that have more available lanes and capacity (Upper James Street and Upper Wentworth Street).

Based on the feedback from the City staff, while the analysis in this report reflects a 2031 planning horizon, the findings and recommended cross-section is consistent with 2041 and 2051 EMME forecasts reflected in the 2023 Strategic Transportation Network Review and 2024 Development Charge Study Update.

11.4 Safety Analysis and Field Investigation

A safety analysis was conducted, consisting of an in-office review of historical collision data followed by a field investigation.

Overall, the corridor of Upper Wellington Street between Stone Church Road East and Limeridge Road East operates at a satisfactory operational safety level based on historical collision records and site observations.

The majority of vehicular collisions occurred during the day between 9:00 AM and 5:00 PM when traffic is the heaviest. There were no collisions resulting in fatalities along the corridor during the five-year study period. Collisions resulted predominantly in property damage only (76%), while fewer (24%) resulted in non-fatal injuries.

The collision analysis indicated that the intersection of Upper Wellington Street and Stone Church Road East experienced a relatively high frequency of collisions, compared to the other study intersections.

In regard to midblock collisions, the segment of Upper Wellington Street just north of the intersection with Stone Church Road East was identified as a potential hotspot.

Opportunities to flatten the vertical grade south of the intersection of Upper Wellington Street and Towercrest Drive/Sirente Drive shall be explored, in order to improve desirable stopping sight distance to this intersection.

11.5 Complete Streets

The multimodal review of the corridor was conducted qualitatively based on the Complete-Livable-Better (CLB) Streets appraoches. Along with the road widening, improved pedestrian walkways with buffers and dedicated cycling lanes with buffers are recommended along the study corridor. This would significantly improve the connectivity of pedestrian and cycling network within and to the outside of the study area. No specific improvements on transit service and infrastructure are recommended at this point, given that bus stops along the study corridor are assumed to remain sheltered after road widening.

The three-lane cross section will allow for continuity of the cycling lanes along the Upper Wellington Street between Stone Church Road and Limeridge Road. Also based on the 1% growth adopted for the future analysis, three-lanes cross section over Lincoln Alexander Parkway on Upper Wellington can be supported and the new cross section will provide continuity for cycling facilities along Upper Wellington Street study area.

The three-lane cross section will also allow to City to consider centre medians with plantings where possible (where there are no accesses) as a beautification measures.

Appendix A

Signal Timing Plans

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases		**X**														
	Interval	**0**	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)														
	Flash	**10**	(0-255 seconds start-up flash time)														
	Red	**0**	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	**2**	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		**X**		**X**												
	Ring 2																
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		**X**														
	CO PH 2				**X**												
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL		X														
	PED RCL		X														
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL		X														
	PED RCL		X														
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL		X														
	PED RCL		X														
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1																
	CNA 2																
	CNA 3																
	CNA 4																
	WRM																
	INH MAX																
	PED RECY		X														
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

Limeridge / Upper Wellington

CONTROLLER DATA

11/19/2020

PHASE TIMES (MM-3-1-3-PGDN, etc.)

USE 1 TO ALL 4 TIMING PLANS

		TP1															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**30**		**10**												
	Passage				**2.0**												
	Yellow		**3.3**		**3.3**												
	Red		**3.1**		**2.9**												
	Walk		**10**		**10**												
	Ped Clr		**22**		**20**												
	Max 1		**50**		**40**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**30**		**10**												
	Passage				**2.0**												
	Yellow		**3.3**		**3.3**												
	Red		**3.1**		**2.9**												
	Walk		**10**		**10**												
	Ped Clr		**22**		**20**												
	Max 1		**50**		**40**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**30**		**10**												
	Passage				**2.0**												
	Yellow		**3.3**		**3.3**												
	Red		**3.1**		**2.9**												
	Walk		**10**		**10**												
	Ped Clr		**22**		**20**												
	Max 1		**50**		**40**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																

	Max In																

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH	1																
DET	2																
ASSIGN-	3				**X**												
MENTS	4				**X**												
	5																
	6																
	7				**X**												
	8				**X**												

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2		**X**														
ASSIGN-	3																
MENTS	4				**X**												
	5																
	6																
	7																
	8																

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	Mode			**0**	**2**			**0**	**2**								
MODES																	

DETECTOR TIMES (MM-3-1-4-4) USE 1 TO ALL 3 DETECTOR TIMING PLANS

TP1

	DET	1	2	3	4	5	6	7	8
DET	Delay			**0**	**5**			**0**	**5**
TIMES	Str/Stp								

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**1**	0=TOD, 1=CL, 2=INT
Split Source:	**1**	0=TOD, 1=CL, 2=INT
Offset Source:	**1**	0=TOD, 1=CL, 2=INT

Free Source:	**1**	0=TOD, 1=CL, 2=INT
Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	**255**	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	**N**	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	**N**	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	**N**	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	**Y**	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	**1**	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	**1**	**2**	**3**			
	SPLIT 2						
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

	Cycle #	1/1	2/1	3/1			
CYCLE & OFFSETS	Length	**80**	**90**	**90**			
	Offset 1	**25**	**55**	**75**			
	Offset 2						
	Offset 3						
	Offset 4						
	Offset 5						
	Max Dwell	**32**	**32**	**32**			

COORD PHASES (MM-3-2-5)

	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD PHASES	**1-1**		**X**				**X**										
	2-1		**X**				**X**										
	3-1		**X**				**X**										

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeeling Mode:	**1**

Mode

0 Add only, cycle times 20% slow only to get in sync

1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step

2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	**Y**	Y/N: See note	Invert Free In:	**N**	Y/N: See note
Central Override:	**N**	Y/N: See note	Split Matrix:	**N**	Y/N: See note
No PCL Offset Adjust:	**N**	Y/N: See note	4 Splits/Cycle:	**Y**	Y/N: See note
			No Early Coord Ped:	**N**	Y/N: See note

Yeil Percent	**0**	0-10%: See note
EGB%	**0**	0-100%: See note
RGB%	**0**	0-100%: See note
# Cycles to out of step:	**0**	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	**0**	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute

Charts below only For City Zero offfsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	**0**	Cycle 2:	**0**	Cycle 3:	**0**
Cycle 4:	**0**	Cycle 5:	**0**	Cycle 6:	**0**

MANUAL/AUTO FORCE OFFS & PERMS

SET MANUAL MODE (MM-3-2-9-3-1)

Auto Perm and FO:	**N**	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	**0**	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

LOAD MANUAL PERMISSIVES (MM-3-2-9-3-2) ONLY USED IF AUTO PERM & FO MODE = N

Cycle 1	Split 1/PH	1	2	3	4	5	6	7	8
	Start				**20**				
MANUAL	End				**57**				
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 2	Split 1/PH	1	2	3	4	5	6	7	8
	Start				**30**				
MANUAL	End				**67**				
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 3	Split 1/PH	1	2	3	4	5	6	7	8
	Start				**30**				
MANUAL	End				**67**				
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 4	Split 1/PH	1	2	3	4	5	6	7	8
	Start								
MANUAL	End								
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

CONTROLLER DATA

LOAD MANUAL FORCE OFFS (MM-3-2-9-3-3) ONLY USED IF AUTO PERM & FO MODE = N

Cycle 1	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1		**36**		**73**				
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 2	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1		**46**		**83**				
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 3	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1		**46**		**83**				
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	OFF
	00	00		1	1	1		
2	00	00					11(FRE)	OFF
	00	00		1	1	1		
	06	30		2	1	1		
	09	30		1	1	1		
	15	30		3	1	1		
	18	00		1	1	1		

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	81	82	83	84	85	86	**87**	88
	Function	TIA	TIB	TIC	N/U	N/U	N/U	**PR1**	PR2
	State							**ON**	
	Circuit	89	90	91	92	93	94	95	96
	Function	OR1	OR2	RR1	RR2	M21	M22	DM3	GR2
	State								
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES		HH	MM		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:			CYC 5:			CYC 6:		

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID		0-255
	Master Identification		0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:		1200, 2400, 4800, 9600, 14400, 19200
	Parity		0 = None, 1 = Odd, 2=Even
	Data bits		0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:		1200, 2400, 4800, 9600, 14400, 19200
	Parity		0 = None, 1 = Odd, 2=Even
	Data bits		0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

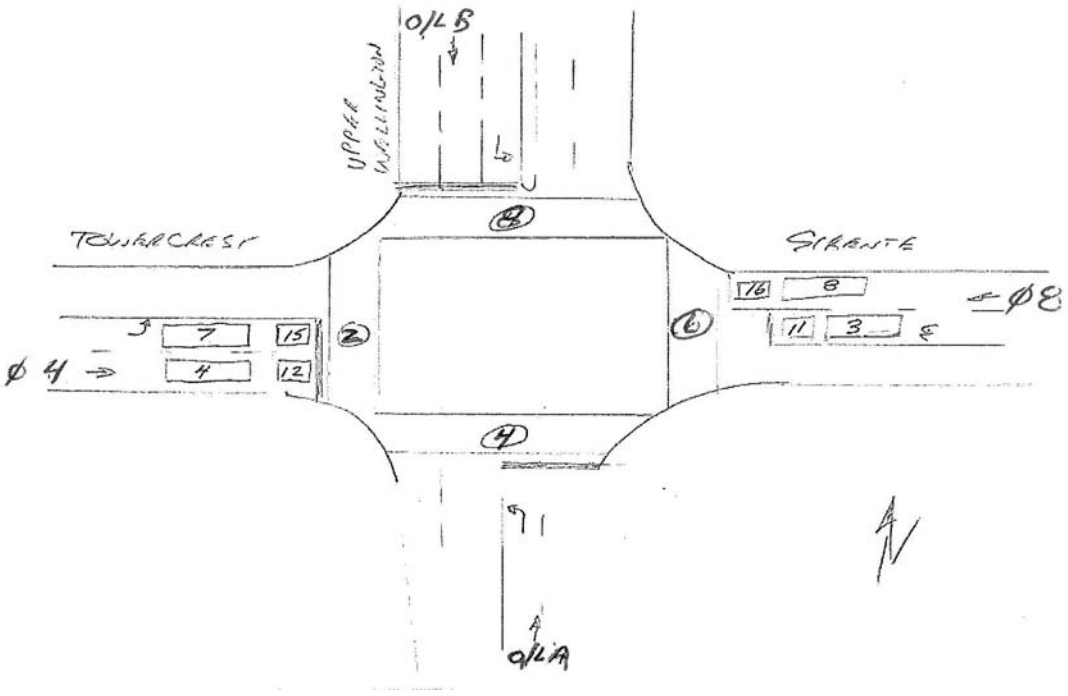
City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **Sirente & Towercrest & Upper Wellington**

Controller Type: **3000E** Page **1** of **19**

Programmed By: **RDG** Installed By:

Date: **Sept 4/13** Date:



O/L A steered to ϕ6
O/L B steered to ϕ2

ϕ1:
O/L B as ϕ2: Upper Wellingon - SB, West Xwalk
ϕ3:
ϕ4: **Towercrest - EB, South Xwalk**
ϕ5:
O/L A as ϕ6: Upper Wellingon - NB, East Xwalk
ϕ7:
ϕ8: **Sirente - WB, North Xwalk**

Flash Operation: Red: Upper Wellington
Red: Sirente/Towercrest
NB Advance Warning O/L A - Output MSD pin 59

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases		X				X										
	Interval	0	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)														
	Flash	10	(0-255 seconds start-up flash time)														
	Red	5.0	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	2	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		X		X												
	Ring 2						X		X								
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		X				X										
	CO PH 2				X				X								
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL		X				X										
	PED RCL		X				X										
	SOFT REC																
	NON-LOCK				X				X								
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL		X				X										
	PED RCL		X				X										
	SOFT REC																
	NON-LOCK				X				X								
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL		X				X										
	PED RCL		X				X										
	SOFT REC																
	NON-LOCK				X				X								
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1																
	CNA 2																
	CNA 3																
	CNA 4																
	WRM																
	INH MAX																
	PED RECY		**X**				**X**										
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

PHASE TIMES (MM-3-1-3-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**		**20**		**10**								
	Passage				**1.0**				**1.0**								
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**2.4**		**2.9**		**2.4**		**2.9**								
	Walk		**7**		**12**		**7**		**12**								
	Ped Clr		**9**		**17**		**13**		**17**								
	Max 1		**45**		**35**		**45**		**35**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**		**20**		**10**								
	Passage				**1.0**				**1.0**								
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**2.4**		**2.9**		**2.4**		**2.9**								
	Walk		**7**		**12**		**7**		**12**								
	Ped Clr		**9**		**17**		**13**		**17**								
	Max 1		**45**		**35**		**45**		**35**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**10**		**20**		**10**								
	Passage				**1.0**				**1.0**								
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**2.4**		**2.9**		**2.4**		**2.9**								
	Walk		**7**		**12**		**7**		**12**								
	Ped Clr		**9**		**17**		**13**		**17**								
	Max 1		**45**		**35**		**45**		**35**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET ASSIGN-MENTS	1																
	2																
	3								X								
	4				X												
	5																
	6																
	7				X												
	8								X								
VEH DET ASSIGN-MENTS	9																
	10																
	11								X								
	12				X												
	13																
	14																
	15				X												
	16								X								

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED DET ASSIGN-MENTS	1																
	2		X														
	3																
	4				X				X								
	5																
	6						X										
	7																
	8				X				X								

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	Mode	**0**		**2**	**2**			**2**	**2**			**2**	**2**			**2**	**2**
MODES																	

DETECTOR TIMES (MM-3-1-4-4)

USE 1 TO ALL 3 DETECTOR TIMING PLANS

TP1

	DET	1	2	3	4	5	6	7	8
DET	Delay	**0**		**2**	**5**			**2**	**5**
TIMES	Str/Stp	**0**		**0**	**0**			**0**	**0**
	DET	9	10	11	12	13	14	15	16
DET	Delay	**0**		**2**	**5**			**2**	**5**
TIMES	Str/Stp	**0**		**0**	**0**			**0**	**0**

OVERLAP ASSIGNMENT & TYPE (MM-3-1-5-1)

NOTE: WHEN ENTERING VIA COMPUTER, SPECIFY TYPE FIRST SO THIRD ROW ASSIGNMENTS WILL DISPLAY CORRECT DESCRIPTION.

(X = ENABLE)

O/L A	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
O/L	Parents						**X**										
ASSIGN-	FL Enable																
MENT	N/A																

O/L Type:	**0**
Green:	**8**

Flash code:	
Yellow:	**3.3**

Red:	**2.4**

OVERLAP START-UP, CARD, AND ALTERNATE FLASH RATE (MM-3-1-5-2)

Start-up Interval:	**0**	Determines O/L color at start-up for O/L's with parents that are start-up phases. 0=R, 1=Y, 2=G
Overlap card Enable:		Y/N; Y = Enable, Overlap card is used for O/L's A-D. N=Keyboard. O/L's E-P are always keyboard.
Alternate Flash Rate:		0-300 FPM (Flashes Per Minute) Typical values are 60, 120, 150, and 180 (**Note**: 0=60 FPM)

DOUBLE CLEAR OVERLAPS (MM-3-1-5-3)

O/L A

Delay Green:	**8**	0-255 secs		O/L Yellow:	**3.3**	0.0-25.5 secs		O/L Red:	**2.4**	0.0-25.5 secs						
Enable:	**Y**	Y/N; Y= Double Clear Enabled														

	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DOUBLE CLEAR ENABLES	PH YEL						**X**										
	PH NXT				**X**				**X**								
	GRP YEL																
	GRP NXT																

(X = ENABLE)

O/L B

	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
O/L ASSIGN-MENT	Parents		**X**														
	FL Enable																
	N/A																

O/L Type:	**0**	Flash code:			
Green:	**8**	Yellow:	**3.3**	Red:	**2.4**

OVERLAP START-UP, CARD, AND ALTERNATE FLASH RATE (MM-3-1-5-2)

Start-up Interval:	**0**	Determines O/L color at start-up for O/L's with parents that are start-up phases. 0=R, 1=Y, 2=G
Overlap card Enable:		Y/N; Y = Enable, Overlap card is used for O/L's A-D. N=Keyboard. O/L's E-P are always keyboard.
Alternate Flash Rate:		0-300 FPM (Flashes Per Minute) Typical values are 60, 120, 150, and 180 (**Note**: 0=60 FPM)

DOUBLE CLEAR OVERLAPS (MM-3-1-5-3)

O/L B	Delay Green:	8	0-255 secs	O/L Yellow:	3.3	0.0-25.5 secs	O/L Red:	2.4	0.0-25.5 secs
	Enable:	Y	Y/N; Y= Double Clear Enabled						

	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DOUBLE CLEAR ENABLES	PH YEL		X														
	PH NXT				X				X								
	GRP YEL																
	GRP NXT																

ADVANCE WARNING OVERLAPS (MM-3-1-5-5)

PG1	FUNC/O/L	A	B	C	D	E	F	G	H	
AD-VANCE WARN-ING	Enable	X								Y/N: Y=Enable Overlap for Advance Warning Logic
	ADV Deact-Delay									0-99 secs
	Cond Overlap									0 = none, 1-8 = O/L A-H
	Cond Overlap									0 = none, 1-8 = O/L A-H

DUAL ENTRY (MM-3-1-6)

DUAL ENTRY ENABLE:	Y	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL ENTRY ASSIGN-MENTS	1																
	2						X										
	3																
	4								X								
	5																
	6		X														
	7																
	8				X												

Dual Entry = Left column phase automatically places call on selected phase(s) if no other real calls within selected phases ring and co-phase group

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**1**	0=TOD, 1=CL, 2=INT
Split Source:	**1**	0=TOD, 1=CL, 2=INT
Offset Source:	**1**	0=TOD, 1=CL, 2=INT

Free Source:	**1**	0=TOD, 1=CL, 2=INT
Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	**255**	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	**N**	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	**N**	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	**N**	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	**Y**	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	**1**	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	**1**	**2**	**3**			
	SPLIT 2						
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

	Cycle #	1/1	2/1	3/1	4/1		
CYCLE & OFFSETS	Length	**80**	**90**	**90**			
	Offset 1	**57**	**13**	**12**			
	Offset 2						
	Offset 3						
	Offset 4						
	Offset 5						
	Max Dwell	**32**	**32**	**32**			

COORD PHASES (MM-3-2-5)

	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD PHASES	**1-1**		**X**				**X**										
	2-1		**X**				**X**										
	3-1		**X**				**X**										

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeeling Mode:	**0**

Mode

0 Add only, cycle times 20% slow only to get in sync

1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step

2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	**Y**	Y/N: See note	Invert Free In:	**N**	Y/N: See note
Central Override:	**N**	Y/N: See note	Split Matrix:	**N**	Y/N: See note
No PCL Offset Adjust:	**N**	Y/N: See note	4 Splits/Cycle:	**Y**	Y/N: See note
			No Early Coord Ped:	**N**	Y/N: See note

Yeil Percent	**0**	0-10%: See note
EGB%	**0**	0-100%: See note
RGB%	**0**	0-100%: See note
# Cycles to out of step:	**0**	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	**0**	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute

Charts below only For City Zero offfsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	**0**	Cycle 2:	**0**	Cycle 3:	**0**
Cycle 4:	**0**	Cycle 5:	**0**	Cycle 6:	**0**

MANUAL/AUTO FORCE OFFS & PERMS

SET MANUAL MODE (MM-3-2-9-3-1)

Auto Perm and FO:	**N**	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	**0**	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

LOAD MANUAL PERMISSIVES (MM-3-2-9-3-2) ONLY USED IF AUTO PERM & FO MODE = N

Cycle 1	Split 1/PH	1	2	3	4	5	6	7	8
	Start				**23**				**23**
MANUAL	End				**43**				**43**
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 2	Split 1/PH	1	2	3	4	5	6	7	8
	Start				**33**				**33**
MANUAL	End				**53**				**53**
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 3	Split 1/PH	1	2	3	4	5	6	7	8
	Start				**33**				**33**
MANUAL	End				**53**				**53**
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

Cycle 4	Split 1/PH	1	2	3	4	5	6	7	8
	Start								
MANUAL	End								
PERMS	Split 2/PH	1	2	3	4	5	6	7	8
	Start								
	End								

LOAD MANUAL FORCE OFFS (MM-3-2-9-3-3) ONLY USED IF AUTO PERM & FO MODE = N

Cycle 1	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1		**24**		**73**		**24**		**73**
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 2	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1		**34**		**83**		**34**		**83**
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 3	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1		**34**		**83**		**34**		**83**
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

Cycle 4	PHASE	1	2	3	4	5	6	7	8
FO's	SPLIT 1								
	PHASE	1	2	3	4	5	6	7	8
	SPLIT 2								

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	ON
	06	30					11(FRE)	OFF
	06	30		1	1	1		
	23	00					11(FRE)	ON
2	00	00					11(FRE)	ON
	06	30					11(FRE)	OFF
	06	30		2	1	1		
	09	30		1	1	1		
	15	30		3	1	1		
	18	00		1	1	1		
	23	00					11(FRE)	ON

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	81	82	83	84	85	86	**87**	**88**
	Function	TIA	TIB	TIC	N/U	N/U	N/U	**PR1**	**PR2**
	State							**ON**	**ON**
	Circuit	89	90	91	92	93	94	95	96
	Function	OR1	OR2	RR1	RR2	M21	M22	DM3	GR2
	State								
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES		HH	MM		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**00**	**00**	CYC 6:	**00**	**00**

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CONTROLLER DATA

SIGNAL HEAD STEERING (MM-3-7)

PHASE SIG HEADS		1		2	**50**	3		4	
		5		6	**49**	7		8	
		9		10		11		12	
		13		14		15		16	
PED SIG HEADS		1		2		3		4	
		5		6		7		8	
		9		10		11		12	
		13		14		15		16	

O/L SIG HEADS		A		B		C		D	
		E		F		G		H	
		I		J		K		L	
		M		N		O		P	
PED O/L SIG HEADS		A		B		C		D	
		E		F		G		H	
		I		J		K		L	
		M		N		O		P	

CHECK NEXT ON		1		2		3		4	
		5		6		7		8	
		9		10		11		12	
		13		14		15		16	

Fixed numbers in the shaded area are the steering destinations, or where signal is going to be output after steering. Enter 0-80 for the source of signal to be output (3 colors each). Leave blank (0) if the destination is to have its normal default output assignment.

0 (blnk) = normal outputs
1-16 = Phase 1-16 (R, Y, G)
17-32 = Ped phase (D, PC, W)
33-48 = Check, Nxt, On ph 1-16
49-64 = O/L A-P (R, Y, G)
65-80 = PED O/L A-P (D, PC, W)

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID		0-255
	Master Identification		0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	**9600**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	**1200**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

City of Hamilton - Traffic
Traffic Signal Controller Timing Data

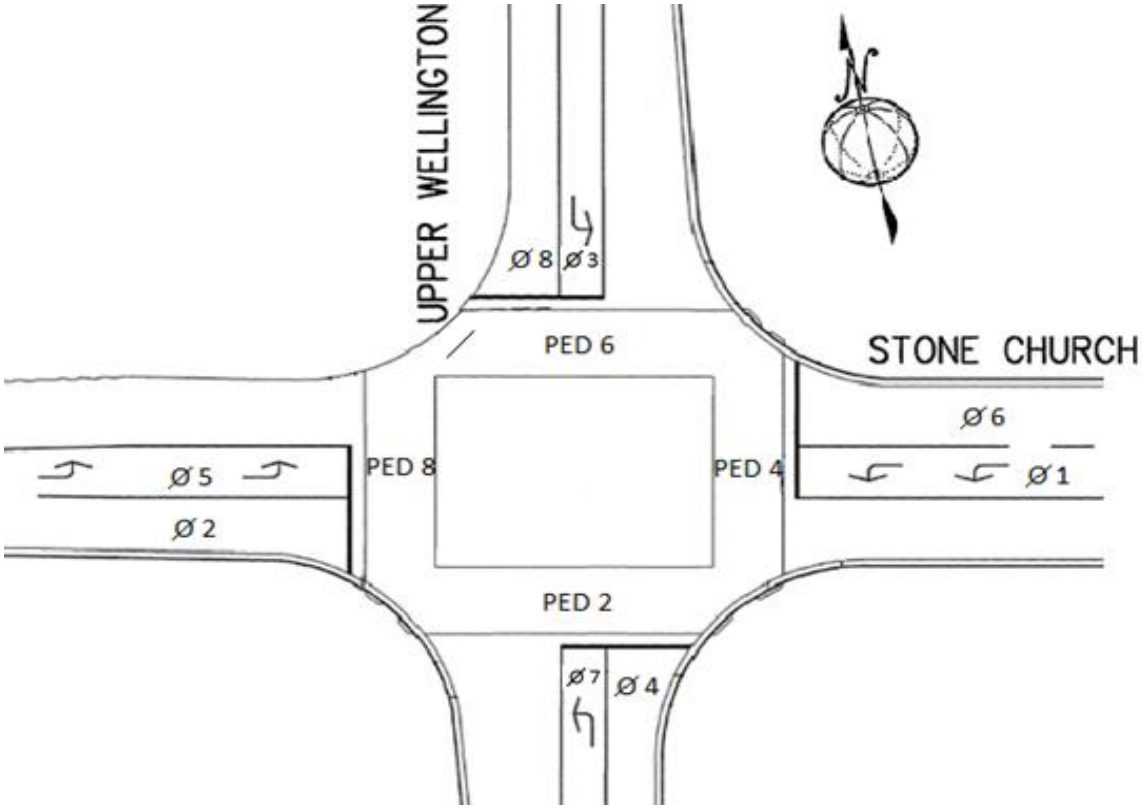
Intersection: **Stone Church & Upper Wellington**

Controller Type: **3000E** Page **1** of **17**

Programmed By: **DLB** Installed By:

Date: **12-Nov-18** Date: **21-Nov-18**

Reason for Timing Change: **Implementation of WBLT, NBLT, SBLT**



ϕ1: **Stone Church - WBLT**
ϕ2: **Stone Church - EB, South Xwalk**
ϕ3: **Upper Wellington - SBLT**
ϕ4: **Upper Wellington - NB, East Xwalk**
ϕ5: **Stone Church - EBLT**
ϕ6: **Stone Church - WB, North Xwalk**
ϕ7: **Upper Wellington - NBLT**
ϕ8: **Upper Wellington - SB, West Xwalk**

Flash Operation: **Red: Stone Church**
Red: Upper Wellington

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases				X				X								
	Interval	0	######														
	Flash	10															
	Red	5.0	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	3	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1	X	X	X	X												
	Ring 2					X	X	X	X								
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1	X	X			X	X										
	CO PH 2			X	X			X	X								
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK	X		X		X		X									
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK	X		X		X		X									
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK	X		X		X		X									
	VEH OMIT																
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP4 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK																
	VEH OMIT	X		X		X		X									
	PED OMIT																
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1		X		X		X		X								
	CNA 2																
	CNA 3																
	CNA 4		X		X		X		X								
	WRM																
	INH MAX																
	PED RECY																
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

PHASE TIMES (MM-3-1-3-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

		TP1															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	5	20	5	20	5	20	5	20								
	Passage	2.0		2.0		2.0		2.0									
	Yellow	3.0	3.3	3.0	3.3	3.0	3.3	3.0	3.3								
	Red	0.0	2.6	0.0	2.3	0.0	2.6	0.0	2.3								
	Walk		12		12		12		12								
	Ped Clr		19		14		19		14								
	Max 1	10	50	10	50	10	50	10	50								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	5	20	5	20	5	20	5	20								
	Passage	2.0		2.0		2.0		2.0									
	Yellow	3.0	3.3	3.0	3.3	3.0	3.3	3.0	3.3								
	Red	0.0	2.6	0.0	2.3	0.0	2.6	0.0	2.3								
	Walk		12		12		12		12								
	Ped Clr		19		14		19		14								
	Max 1	10	60	10	60	10	60	10	60								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial	5	20	5	20	5	20	5	20								
	Passage	2.0		2.0		2.0		2.0									
	Yellow	3.0	3.3	3.0	3.3	3.0	3.3	3.0	3.3								
	Red	0.0	2.6	0.0	2.3	0.0	2.6	0.0	2.3								
	Walk		12		12		12		12								
	Ped Clr		19		14		19		14								
	Max 1	10	60	10	60	10	60	10	60								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

		TP4															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**20**		**20**		**20**		**20**								
	Passage																
	Yellow		**3.3**		**3.3**		**3.3**		**3.3**								
	Red		**2.6**		**2.3**		**2.6**		**2.3**								
	Walk		**12**		**12**		**12**		**12**								
	Ped Clr		**19**		**14**		**19**		**14**								
	Max 1		**50**		**50**		**50**		**50**								
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	Al/Act																
	Max In																

DUAL ENTRY (MM-3-1-6)

DUAL ENTRY ENABLE:	Y	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL	1						X										
ENTRY	2						X										
ASSIGN-	3								X								
MENTS	4								X								
	5		X														
	6		X														
	7				X												
	8				X												

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH	1	X															
DET	2																
ASSIGN-	3			X													
MENTS	4																
	5					X											
	6																
	7							X									
	8																
	9																

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2																
ASSIGN-	3																
MENTS	4																
	5																
	6																
	7																
	8																

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	Mode	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**								
MODES																	

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	**Lock**																
LOCKS																	

DETECTOR TIMES (MM-3-1-4-4)

	DET	1	2	3	4	5	6	7	8
DET	Delay	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TIMES	Str/Stp								

	DET	9	10	11	12	13	14	15	16
DET	Delay	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TIMES	Str/Stp								

ENHANCED OPTIONS

DYNAMIC OMITS (MM-3-1-9-1-1)

DYNAM OMITS GP1 ENABLE:	**Y**	Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

(X = ENABLE)

GRP1-1	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS					**X**											
OMITS	IF PH ON		**X**				**X**										
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

Select phases to be dynamically omitted from OMIT PHS row. Select the PH-ONs and/or O/L GRNs that will cause those omits. Phases are omitted when controller state matches IF PH ON row or O/L GRN row.
Note that there are 2 groups of dynamic omits, each with 8 patterns. Group 1 is the default group and group 2 can be selected by input or TOD ckt 96. When a group is active, any one or all of the pattterns within that group may be true depending on the controller state.

DYNAMIC RECALLS (MM-3-1-9-1-2)

	Y	Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

DYN. RECALL GP1 ENABLE:

(X = ENABLE)

	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GRP1-1	RCL PHS		**X**				**X**										
DYNAM.	IF PH ON					**X**											
RECALLS	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
ASSIGN-	GRN																
MENTS																	

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**1**	0=TOD, 1=CL, 2=INT	Free Source:	**1**	0=TOD, 1=CL, 2=INT
Split Source:	**1**	0=TOD, 1=CL, 2=INT	Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Offset Source:	**1**	0=TOD, 1=CL, 2=INT	Inter-TOD Revert:	**255**	0-255 SECS

#####

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	**N**	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	**N**	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	**N**	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	**Y**	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	**0**	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	**1**	**2**	**3**	**4**		
	SPLIT 2						
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

	Cycle #	1/1	2/1	3/1	4/1			
	Length	**100**	**110**	**110**	**90**			
CYCLE	Offset 1	**0**	**92**	**72**	**45**			**Secs**
&	Offset 2							
OFFSETS	Offset 3							
	Offset 4							
	Offset 5							
	Max Dwell	**32**	**32**	**32**	**32**			

COORD PHASES (MM-3-2-5)

	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1-1		**X**				**X**										
	2-1		**X**				**X**										
COORD	**3-1**		**X**				**X**										
PHASES	**4-1**		**X**				**X**										

PHASE ALLOCATION (MM-3-2-6)

ENTRY IN:	Secs	% or Secs: Not a controller entry--for reference only. Controller entry is under

	PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE ALLO-CATION	**C1 S1**	**9**	**41**	**9**	**41**	**9**	**41**	**9**	**41**								
	C1 S2																
	C1 S3																
	C1 S4																
	C2 S1	**10**	**45**	**10**	**45**	**10**	**45**	**10**	**45**								
	C2 S2																
	C2 S3																
	C2 S4																
	C3 S1	**10**	**45**	**10**	**45**	**10**	**45**	**10**	**45**								
	C3 S2																
	C3 S3																
	C3 S4																
	C4 S1		**45**		**45**		**45**		**45**								
	C4 S2																
	C4 S3																
	C4 S4																

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeeling Mode:	0

Mode

0 Add only, cycle times 20% slow only to get in sync

1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step

2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	**Y**	Y/N: See note	Invert Free In:	**N**	Y/N: See note
Central Override:	**N**	Y/N: See note	Split Matrix:	**N**	Y/N: See note
No PCL Offset Adjust:	**N**	Y/N: See note	4 Splits/Cycle:	**Y**	Y/N: See note
			No Early Coord Ped:	**N**	Y/N: See note

Yield Percent	**1**	0-10%: See note
EGB%	**0**	0-100%: See note
RGB%	**0**	0-100%: See note
# Cycles to out of step:	**0**	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	**0**	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute

Charts below only For City Zero offfsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	**0**	Cycle 2:	**0**	Cycle 3:	**0**
Cycle 4:	**0**	Cycle 5:	**0**	Cycle 6:	**0**

MANUAL/AUTO FORCE OFFS & PERMS

SET MANUAL MODE (MM-3-2-9-3-1)

Auto Perm and FO:	**Y**	Y/N: Y = Perms & Force offs auto-calculated from phase allocations. N = Manually entered
Ped Perm:	**0**	0-255: 0 = Auto calculated. 1-255 = secs each ped perm, starting with vehicle permissives

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	OFF
	00	00		4	1	1		
	06	00		1	1	1		
	23	00		4	1	1		
2	00	00					11(FRE)	OFF
	00	00		4	1	1		
	06	00		2	1	1		
	10	00		1	1	1		
	14	30		3	1	1		
	18	30		1	1	1		
	23	00		4	1	1		

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	65	66	67	68	69	70	71	72
	Function	LL1	LL2	LL3	LL4	LL5	LL6	LL7	LL8
	State								
	Circuit	**73**	74	75	76	**77**	78	79	80
	Function	**CN1**	CN2	CN3	CN4	**WRM**	MIN	DIM	CVS
	State	**ON**				**ON**			
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days (typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified. Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES		HH	MM		HH	MM		HH	MM
	CYC 1:	**00**	**00**	CYC 2:	**00**	**00**	CYC 3:	**00**	**00**
	CYC 4:	**00**	**00**	CYC 5:	**00**	**00**	CYC 6:	**00**	**00**

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID		0-255
	Master Identification		0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

####

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	**9600**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	**1200**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

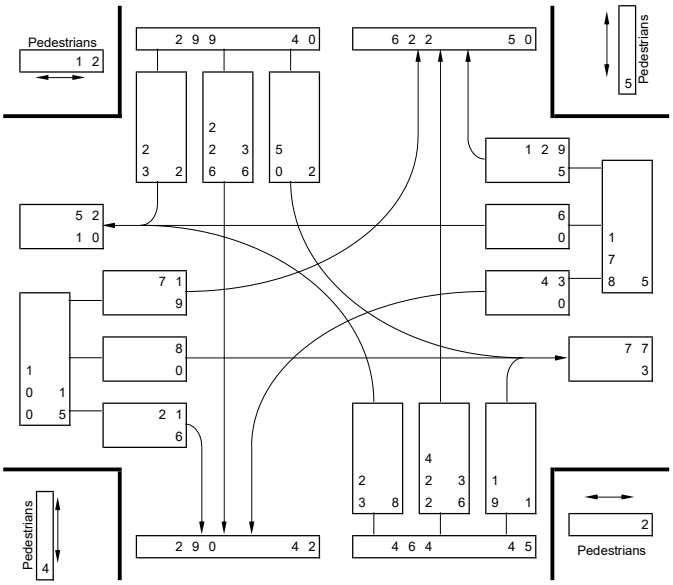
PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

Appendix B

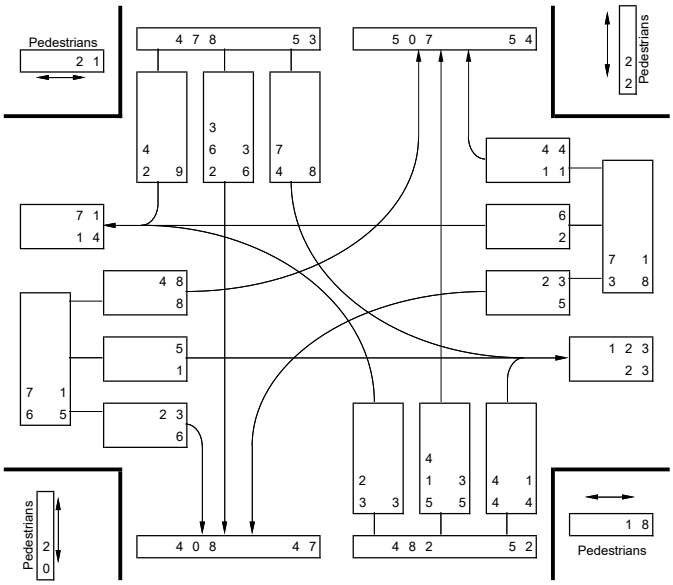
Turning Movement Counts

City of Hamilton **TURNING MOVEMENT FLOW CHART** Loc. Code: 5993

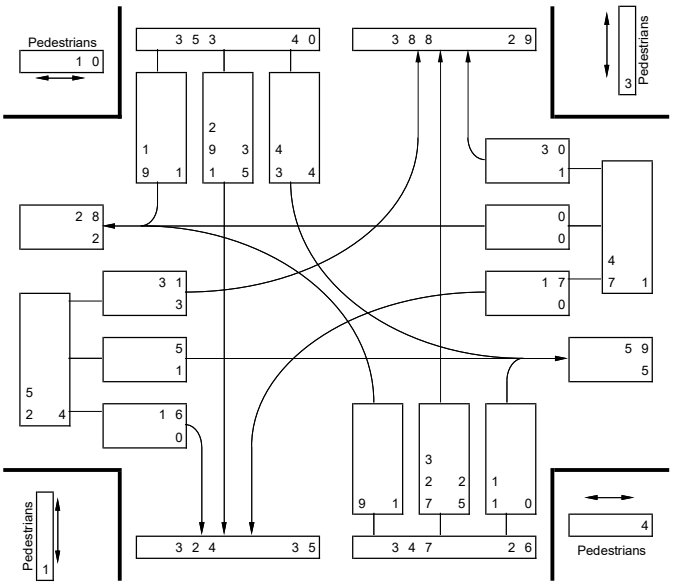
Intersection: **Sirente Dr / Towercrest Dr** **at** **Upper Wellington St** Total Vehicles: 5,749 Date: Monday
Direction: (East/West) (North/South) M.V.E./Year: 4.124 Dec 9, 2019
Road Condition: Wet Weather: Rain AWDT Factor: 2.11 Period: 7 hours
Comments:



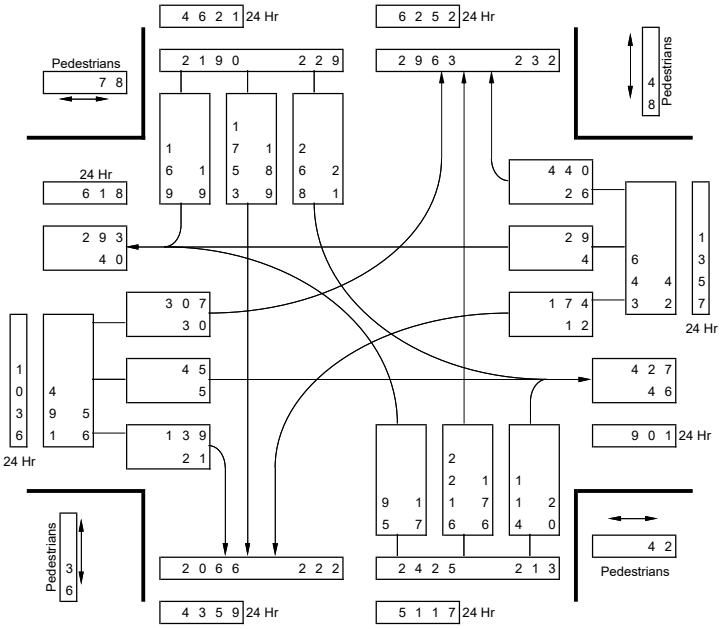
A.M. PEAK HOUR = 8:45 AM - 9:45 AM



P.M. PEAK HOUR = 4:00 PM - 5:00 PM



NORMAL HOUR = 2:30 PM - 3:30 PM



7 Hr & 24 Hr TOTAL VOLUMES

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 5993

Intersection: **Sirente/Towercrest Dr** **at** **Upper Wellington St** Total Vehicles: 5,749 Date: Monday
Direction: (East/West) (North/South) M.V.E./Year: 4.124 Dec 9, 2019
Road Condition: Wet Weather: Rain AWDT Factor: 2.11 Period: 7 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W				Pedestrians			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total Veh's	N side	E side	S side	W side
7:15	1	32	2	9	1	4	0	32	1	4	2	17	105	0	0	0	0
7:30	1	31	0	6	0	4	2	20	1	7	0	16	88	0	0	1	0
7:45	0	36	0	2	1	3	0	26	4	5	0	11	88	1	0	0	0
8:00	1	25	1	7	1	2	2	18	0	4	0	10	71	0	0	0	0
8:15	1	53	3	3	2	1	4	24	1	7	2	16	117	3	0	2	1
8:30	3	73	2	10	1	0	2	43	5	6	1	21	167	1	0	0	1
8:45	1	97	1	13	0	15	4	44	5	11	4	31	226	7	2	6	1
9:00 *	5	105	1	10	2	7	5	58	5	17	0	21	236	3	4	1	1
9:15 *	6	144	5	19	0	4	15	61	2	10	1	50	317	3	0	1	0
9:30 *	9	82	8	17	3	5	13	43	6	6	2	30	224	6	1	0	2
9:45 *	3	91	5	25	3	5	17	64	10	10	3	28	264	0	0	0	1
10:00	1	75	3	18	1	4	14	65	10	13	0	26	230	1	2	1	2
13:45	7	81	6	27	2	9	6	65	0	8	1	21	233	2	0	0	0
14:00	6	86	0	7	2	5	8	67	8	3	0	12	204	0	1	0	0
14:15	3	79	3	13	3	5	8	69	7	2	1	13	206	2	0	0	0
14:30	1	59	4	13	2	3	7	40	4	7	1	4	145	4	1	2	2
14:45 *	1	69	4	5	0	5	10	66	4	4	0	4	172	1	2	2	0
15:00 *	3	67	2	10	0	5	4	70	4	4	0	8	177	1	0	1	1
15:15 *	2	90	2	6	4	4	13	83	6	5	0	10	225	3	1	0	0
15:30 *	3	101	3	10	1	2	16	72	5	4	0	8	225	5	0	1	0
16:15 *	2	91	12	15	0	1	17	71	13	7	0	13	242	6	10	7	5
16:30 *	6	116	10	7	1	10	19	102	16	2	1	9	299	4	7	2	5
16:45 *	6	123	16	14	1	7	28	91	7	10	2	9	314	6	3	3	6
17:00 *	9	85	6	12	3	5	10	98	6	4	3	13	254	5	2	6	4
17:15	6	71	9	2	0	5	6	83	11	3	1	5	202	3	5	4	1
17:30	1	94	2	6	6	6	14	103	10	7	2	16	267	7	7	1	1
17:45	3	74	0	14	3	3	14	89	8	3	2	16	229	0	0	0	1
18:00	4	86	4	7	2	10	10	86	10	1	0	2	222	4	0	1	1
TOTAL	95	2,216	114	307	45	139	268	1,753	169	174	29	440		78	48	42	36
APPR.		2,425			491			2,190			643		5,749			204	

TRUCKS & BUSES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total
7:15	0	3	0	0	0	1	0	4	0	0	0	2	10
7:30	0	4	0	1	0	0	0	4	0	0	0	0	9
7:45	0	2	0	0	0	0	0	5	0	0	0	0	7
8:00	0	1	0	0	0	0	0	2	0	0	0	0	3
8:15	0	6	0	0	1	0	0	1	0	1	0	1	10
8:30	1	6	0	0	0	0	0	3	1	0	0	1	12
8:45	0	8	0	0	0	4	0	4	2	2	0	0	20
9:00 *	1	7	0	2	0	1	1	7	1	0	0	0	20
9:15 *	5	10	0	0	0	2	0	8	0	0	0	3	28
9:30 *	2	13	1	3	0	2	1	7	1	0	0	0	30
9:45 *	0	6	0	4	0	1	0	14	0	0	0	2	27
10:00	0	8	0	0	0	0	0	2	1	0	0	0	11
13:45	0	8	0	5	0	0	0	7	0	0	1	0	21
14:00	2	3	0	1	1	1	1	13	0	0	0	3	25
14:15	0	5	0	0	0	0	1	5	0	0	0	1	12
14:30	0	3	1	0	0	0	0	3	0	0	0	1	8
14:45 *	0	9	0	1	0	0	1	14	0	0	0	0	25
15:00 *	0	2	0	1	0	0	0	8	0	0	0	0	11
15:15 *	0	8	0	1	1	0	0	7	0	0	0	0	17
15:30 *	1	6	0	0	0	0	3	6	1	0	0	1	18
16:15 *	1	9	4	5	0	0	4	6	3	2	0	4	38
16:30 *	1	13	5	3	0	4	2	14	3	1	0	3	49
16:45 *	0	8	4	0	1	0	1	9	3	2	1	2	31
17:00 *	1	5	1	0	0	2	1	7	0	0	1	2	20
17:15	1	4	3	1	0	1	1	5	1	0	0	0	17
17:30	0	9	1	0	1	0	3	11	0	1	0	0	26
17:45	1	4	0	0	0	1	1	8	1	3	1	0	20
18:00	0	6	0	2	0	1	0	5	1	0	0	0	15
TOTAL	17	176	20	30	5	21	21	189	19	12	4	26	
APPR.		213			56			229			42		540

TRUCKS

7:15	0	2	0	0	0	1	0	3	0	0	0	2	8
7:30	0	2	0	1	0	0	0	3	0	0	0	0	6
7:45	0	1	0	0	0	0	0	3	0	0	0	0	4
8:00	0	0	0	0	0	0	0	1	0	0	0	0	1
8:15	0	5	0	0	1	0	0	1	0	1	0	1	9
8:30	0	4	0	0	0	0	0	1	1	0	0	1	7
8:45	0	3	0	0	0	3	0	0	2	0	0	0	8
9:00 *	0	3	0	1	0	0	0	6	0	0	0	0	10
9:15 *	2	5	0	0	0	1	0	5	0	0	0	1	14
9:30 *	2	10	0	2	0	2	1	3	1	0	0	0	21
9:45 *	0	4	0	2	0	1	0	9	0	0	0	2	18
10:00	0	4	0	0	0	0	0	1	1	0	0	0	6
13:45	0	5	0	4	0	0	0	4	0	0	0	0	13
14:00	2	2	0	1	1	1	1	8	0	0	0	3	19
14:15	0	4	0	0	0	0	1	4	0	0	0	1	10
14:30	0	1	1	0	0	0	0	2	0	0	0	1	5
14:45 *	0	8	0	1	0	0	1	12	0	0	0	0	22
15:00 *	0	1	0	1	0	0	0	6	0	0	0	0	8
15:15 *	0	6	0	1	1	0	0	5	0	0	0	0	13
15:30 *	1	4	0	0	0	0	2	4	0	0	0	1	12
16:15 *	0	5	0	2	0	0	0	4	0	0	0	0	11
16:30 *	0	7	0	0	0	0	0	6	0	0	0	0	13
16:45 *	0	5	2	0	0	0	0	6	1	0	0	1	15
17:00 *	1	2	1	0	0	1	0	5	0	0	1	1	12
17:15	0	3	2	0	0	0	0	4	0	0	0	0	9
17:30	0	5	1	0	1	0	2	8	0	0	0	0	17
17:45	1	2	0	0	0	1	1	6	1	3	1	0	16
18:00	0	5	0	2	0	1	0	3	1	0	0	0	12
TOTAL	9	108	7	18	4	12	9	123	8	4	2	15	
APPR.		124			34			140			21		319

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 5993

Intersection: **Sirente/Towercrest Dr** **at** **Upper Wellington St** Total Vehicles: 6,519 Date: Monday
Direction: (East/West) (North/South) Dec 9, 2019
Road Condition: Wet Weather: Rain Period: 8 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total	Pedestrians			
	L	S	R	L	S	R	L	S	R	L	S	R	Veh's	N side	E side	S side	W side
7:15	1	32	2	9	1	4	0	32	1	4	2	17	105	0	0	0	0
7:30	1	31	0	6	0	4	2	20	1	7	0	16	88	0	0	1	0
7:45	0	36	0	2	1	3	0	26	4	5	0	11	88	1	0	0	0
8:00	1	25	1	7	1	2	2	18	0	4	0	10	71	0	0	0	0
8:15	1	53	3	3	2	1	4	24	1	7	2	16	117	3	0	2	1
8:30	3	73	2	10	1	0	2	43	5	6	1	21	167	1	0	0	1
8:45	1	97	1	13	0	15	4	44	5	11	4	31	226	7	2	6	1
9:00	5	105	1	10	2	7	5	58	5	17	0	21	236	3	4	1	1
9:15	6	144	5	19	0	4	15	61	2	10	1	50	317	3	0	1	0
9:30	9	82	8	17	3	5	13	43	6	6	2	30	224	6	1	0	2
9:45	3	91	5	25	3	5	17	64	10	10	3	28	264	0	0	0	1
10:00	1	75	3	18	1	4	14	65	10	13	0	26	230	1	2	1	2
13:45	7	81	6	27	2	9	6	65	0	8	1	21	233	2	0	0	0
14:00	6	86	0	7	2	5	8	67	8	3	0	12	204	0	1	0	0
14:15	3	79	3	13	3	5	8	69	7	2	1	13	206	2	0	0	0
14:30	1	59	4	13	2	3	7	40	4	7	1	4	145	4	1	2	2
14:45	1	69	4	5	0	5	10	66	4	4	0	4	172	1	2	2	0
15:00	3	67	2	10	0	5	4	70	4	4	0	8	177	1	0	1	1
15:15	2	90	2	6	4	4	13	83	6	5	0	10	225	3	1	0	0
15:30	3	101	3	10	1	2	16	72	5	4	0	8	225	5	0	1	0
16:15	2	91	12	15	0	1	17	71	13	7	0	13	242	6	10	7	5
16:30	6	116	10	7	1	10	19	102	16	2	1	9	299	4	7	2	5
16:45	6	123	16	14	1	7	28	91	7	10	2	9	314	6	3	3	6
17:00	9	85	6	12	3	5	10	98	6	4	3	13	254	5	2	6	4
17:15	6	71	9	2	0	5	6	83	11	3	1	5	202	3	5	4	1
17:30	1	94	2	6	6	6	14	103	10	7	2	16	267	7	7	1	1
17:45	3	74	0	14	3	3	14	89	8	3	2	16	229	0	0	0	1
18:00	4	86	4	7	2	10	10	86	10	1	0	2	222	4	0	1	1
18:15	3	70	6	9	5	4	7	100	8	5	0	5	222	2	0	0	0
18:30	3	62	4	10	1	5	13	93	9	5	1	9	215	2	3	1	1
18:45	1	62	2	6	0	1	4	80	3	4	3	3	169	4	1	0	2
19:00	0	70	0	4	0	1	3	80	3	1	1	1	164	0	0	0	3
TOTAL	102	2,480	126	336	51	150	295	2,106	192	189	34	458		86	52	43	42
APPR.		2,708			537			2,593			681		6,519			223	

TRUCKS & BUSES

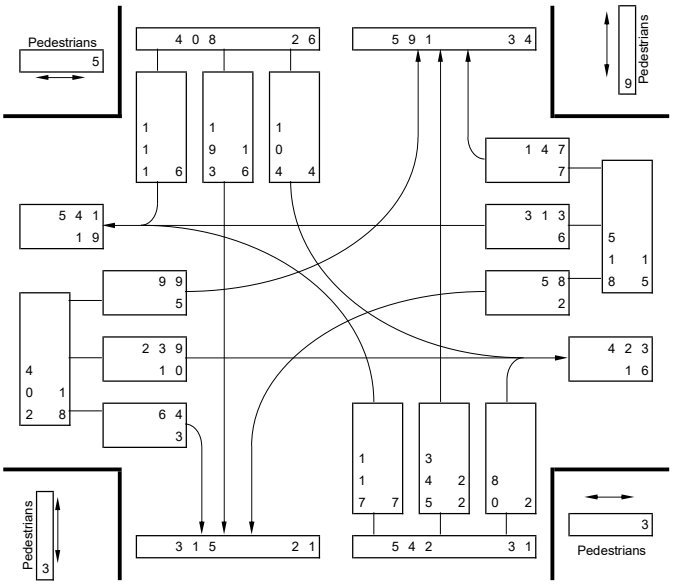
15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total
	L	S	R	L	S	R	L	S	R	L	S	R	
7:15	0	3	0	0	0	1	0	4	0	0	0	2	10
7:30	0	4	0	1	0	0	0	4	0	0	0	0	9
7:45	0	2	0	0	0	0	0	5	0	0	0	0	7
8:00	0	1	0	0	0	0	0	2	0	0	0	0	3
8:15	0	6	0	0	1	0	0	1	0	1	0	1	10
8:30	1	6	0	0	0	0	0	3	1	0	0	1	12
8:45	0	8	0	0	0	4	0	4	2	2	0	0	20
9:00	1	7	0	2	0	1	1	7	1	0	0	0	20
9:15	5	10	0	0	0	2	0	8	0	0	0	3	28
9:30	2	13	1	3	0	2	1	7	1	0	0	0	30
9:45	0	6	0	4	0	1	0	14	0	0	0	2	27
10:00	0	8	0	0	0	0	0	2	1	0	0	0	11
13:45	0	8	0	5	0	0	0	7	0	0	1	0	21
14:00	2	3	0	1	1	1	1	13	0	0	0	3	25
14:15	0	5	0	0	0	0	1	5	0	0	0	1	12
14:30	0	3	1	0	0	0	0	3	0	0	0	1	8
14:45	0	9	0	1	0	0	1	14	0	0	0	0	25
15:00	0	2	0	1	0	0	0	8	0	0	0	0	11
15:15	0	8	0	1	1	0	0	7	0	0	0	0	17
15:30	1	6	0	0	0	0	3	6	1	0	0	1	18
16:15	1	9	4	5	0	0	4	6	3	2	0	4	38
16:30	1	13	5	3	0	4	2	14	3	1	0	3	49
16:45	0	8	4	0	1	0	1	9	3	2	1	2	31
17:00	1	5	1	0	0	2	1	7	0	0	1	2	20
17:15	1	4	3	1	0	1	1	5	1	0	0	0	17
17:30	0	9	1	0	1	0	3	11	0	1	0	0	26
17:45	1	4	0	0	0	1	1	8	1	3	1	0	20
18:00	0	6	0	2	0	1	0	5	1	0	0	0	15
18:15	0	9	0	1	0	0	0	6	0	2	0	0	18
18:30	0	4	0	2	1	0	1	5	0	0	0	0	13
18:45	0	3	0	1	0	0	0	5	0	0	0	0	9
19:00	0	3	0	1	0	1	0	2	0	0	0	0	7
TOTAL	17	195	20	35	6	22	22	207	19	14	4	26	
APPR.		232			63			248			44		587

TRUCKS

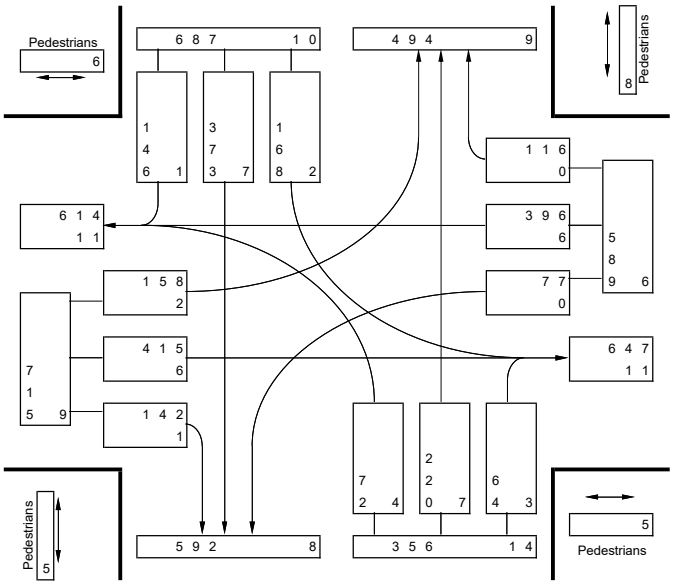
7:15	0	2	0	0	0	1	0	3	0	0	0	2	8
7:30	0	2	0	1	0	0	0	3	0	0	0	0	6
7:45	0	1	0	0	0	0	0	3	0	0	0	0	4
8:00	0	0	0	0	0	0	0	1	0	0	0	0	1
8:15	0	5	0	0	1	0	0	1	0	1	0	1	9
8:30	0	4	0	0	0	0	0	1	1	0	0	1	7
8:45	0	3	0	0	0	3	0	0	2	0	0	0	8
9:00	0	3	0	1	0	0	0	6	0	0	0	0	10
9:15	2	5	0	0	0	1	0	5	0	0	0	1	14
9:30	2	10	0	2	0	2	1	3	1	0	0	0	21
9:45	0	4	0	2	0	1	0	9	0	0	0	2	18
10:00	0	4	0	0	0	0	0	1	1	0	0	0	6
13:45	0	5	0	4	0	0	0	4	0	0	0	0	13
14:00	2	2	0	1	1	1	1	8	0	0	0	3	19
14:15	0	4	0	0	0	0	1	4	0	0	0	1	10
14:30	0	1	1	0	0	0	0	2	0	0	0	1	5
14:45	0	8	0	1	0	0	1	12	0	0	0	0	22
15:00	0	1	0	1	0	0	0	6	0	0	0	0	8
15:15	0	6	0	1	1	0	0	5	0	0	0	0	13
15:30	1	4	0	0	0	0	2	4	0	0	0	1	12
16:15	0	5	0	2	0	0	0	4	0	0	0	0	11
16:30	0	7	0	0	0	0	0	6	0	0	0	0	13
16:45	0	5	2	0	0	0	0	6	1	0	0	1	15
17:00	1	2	1	0	0	1	0	5	0	0	1	1	12
17:15	0	3	2	0	0	0	0	4	0	0	0	0	9
17:30	0	5	1	0	1	0	2	8	0	0	0	0	17
17:45	1	2	0	0	0	1	1	6	1	3	1	0	16
18:00	0	5	0	2	0	1	0	3	1	0	0	0	12
18:15	0	7	0	1	0	0	0	3	0	2	0	0	13
18:30	0	2	0	2	1	0	1	3	0	0	0	0	9
18:45	0	2	0	1	0	0	0	3	0	0	0	0	6
19:00	0	2	0	1	0	1	0	1	0	0	0	0	5
TOTAL	9	121	7	23	5	13	10	133	8	6	2	15	
APPR.		137			41			151			23		352

City of Hamilton **TURNING MOVEMENT FLOW CHART** Loc. Code: 6564

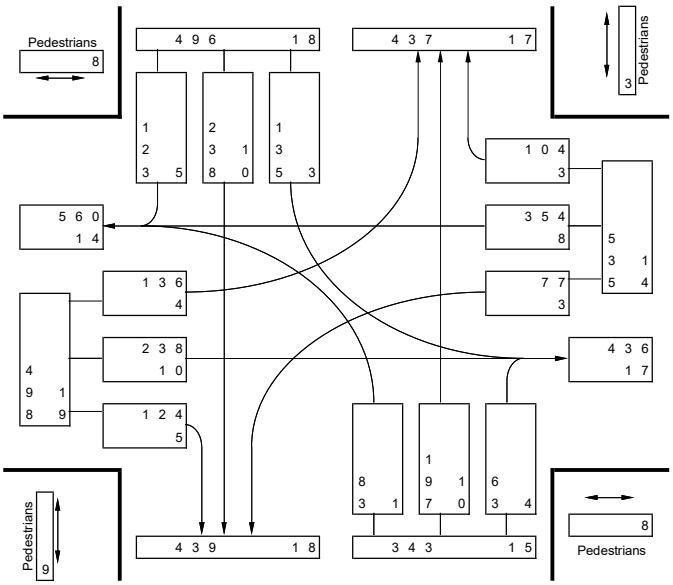
Intersection: **Stone Church Rd E** **at** **Upper Wellington St** Total Vehicles: 12,144 Date: Monday
Direction: (East/West) (North/South) M.V.E./Year: 8.836 Nov 25, 2019
Road Condition: Dry Weather: Overcast AWDT Factor: 2.14 Period: 7 hours
Comments:



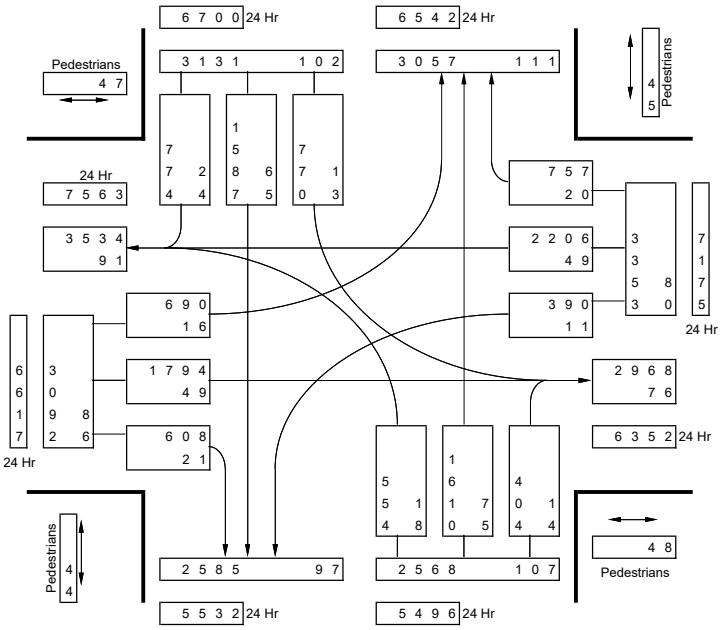
A.M. PEAK HOUR = 8:00 AM - 9:00 AM



P.M. PEAK HOUR = 4:15 PM - 5:15 PM



NORMAL HOUR = 2:30 PM - 3:30 PM



7 Hr & 24 Hr TOTAL VOLUMES

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 6564

Intersection: **Stone Church Rd E** **at** **Upper Wellington St** Total Vehicles: 12,144 Date: Monday
Direction: (East/West) (North/South) M.V.E./Year: 8.836 Nov 25, 2019
Road Condition: Dry Weather: Overcast AWDT Factor: 2.14 Period: 7 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W				Pedestrians			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total Veh's	N side	E side	S side	W side
7:15	16	34	8	6	20	4	14	22	14	4	31	18	191	0	1	0	2
7:30	17	46	11	7	25	8	13	24	9	10	30	10	210	0	0	3	2
7:45	19	62	21	16	27	8	8	26	14	4	57	32	294	5	6	1	1
8:00	24	68	17	12	43	6	20	43	26	8	79	39	385	0	0	0	0
8:15 *	31	80	23	25	47	20	30	44	32	11	66	42	451	4	1	0	1
8:30 *	33	93	14	23	61	9	17	42	32	16	79	37	456	0	5	0	0
8:45 *	26	89	27	35	59	20	26	51	27	16	65	36	477	1	2	0	0
9:00 *	27	83	16	16	72	15	31	56	20	15	103	32	486	0	1	3	2
9:15	32	67	11	16	67	15	26	63	23	9	67	33	429	5	3	3	2
9:30	24	55	12	9	55	11	16	44	24	10	70	29	359	1	2	0	1
9:45	14	43	11	10	47	12	19	38	24	8	62	13	301	0	0	3	3
10:00	14	46	18	18	61	10	18	26	22	9	62	21	325	1	0	1	1
13:45	15	39	5	28	28	24	28	28	24	10	73	15	317	3	0	0	3
14:00	12	32	7	25	37	22	25	37	22	5	76	23	323	6	2	7	5
14:15	17	43	12	18	43	24	18	43	25	18	78	15	354	0	2	3	0
14:30	12	50	14	21	52	37	21	52	37	8	87	21	412	0	1	2	0
14:45 *	22	45	12	32	37	22	32	36	23	17	75	17	370	2	0	3	3
15:00 *	15	51	23	41	58	34	40	59	33	17	104	22	497	3	1	0	3
15:15 *	26	54	16	32	56	38	32	56	38	21	83	38	490	3	1	2	3
15:30 *	20	47	12	31	87	30	31	87	29	22	92	27	515	0	1	3	0
16:15	23	74	11	33	83	33	33	82	33	17	100	39	561	1	2	3	1
16:30 *	18	49	13	51	101	37	51	101	37	25	87	27	597	1	2	0	1
16:45 *	20	42	16	33	85	36	33	85	36	19	97	28	530	1	4	3	1
17:00 *	15	76	15	44	93	33	44	93	33	18	106	28	598	1	0	2	1
17:15 *	19	53	20	30	136	36	40	94	40	15	106	33	622	3	2	0	2
17:30	17	70	15	29	132	19	43	93	33	15	102	28	596	0	0	2	2
17:45	18	69	14	21	87	27	33	90	36	21	81	27	524	2	4	2	1
18:00	8	50	10	28	95	18	28	72	28	22	88	27	474	4	2	2	3
TOTAL	554	1,610	404	690	1,794	608	770	1,587	774	390	2,206	757		47	45	48	44
APPR.		2,568			3,092			3,131			3,353		12,144			184	

TRUCKS & BUSES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total
7:15	0	2	0	0	1	0	0	2	0	0	2	0	7
7:30	0	2	0	0	3	5	0	2	0	1	1	0	14
7:45	0	1	1	1	0	2	0	3	3	1	4	4	20
8:00	2	4	1	2	2	0	1	2	3	1	2	1	21
8:15 *	3	7	2	1	4	1	1	3	0	2	1	3	28
8:30 *	2	5	0	2	3	1	1	4	4	0	3	2	27
8:45 *	1	6	0	2	1	0	1	6	1	0	1	1	20
9:00 *	1	4	0	0	2	1	1	3	1	0	1	1	15
9:15	0	2	0	0	1	0	0	4	1	2	2	0	12
9:30	0	5	1	0	3	0	0	5	0	0	4	2	20
9:45	0	2	0	1	2	0	1	1	0	0	1	0	8
10:00	1	4	0	0	2	0	1	2	0	0	1	0	11
13:45	0	1	0	0	1	1	0	1	1	0	2	0	7
14:00	0	1	0	1	1	0	1	1	0	0	0	0	5
14:15	0	1	0	0	2	0	0	2	0	0	4	0	9
14:30	0	2	1	0	0	2	0	0	2	0	4	2	13
14:45 *	0	3	0	1	2	0	1	2	0	0	2	0	11
15:00 *	0	1	1	1	2	2	0	2	2	0	2	0	13
15:15 *	1	3	0	1	2	2	1	2	2	2	2	2	20
15:30 *	0	3	3	1	4	1	1	4	1	1	2	1	22
16:15	1	2	0	0	1	0	0	1	0	1	1	0	7
16:30 *	1	2	3	0	4	1	0	4	1	0	2	0	18
16:45 *	0	1	0	2	1	0	2	1	0	0	2	0	9
17:00 *	1	3	0	0	1	0	0	1	0	0	1	0	7
17:15 *	2	1	0	0	0	0	0	1	0	0	1	0	5
17:30	0	1	0	0	1	0	0	3	1	0	0	1	7
17:45	2	3	1	0	1	2	0	1	0	0	1	0	11
18:00	0	3	0	0	2	0	0	2	1	0	0	0	8
TOTAL	18	75	14	16	49	21	13	65	24	11	49	20	
APPR.		107			86			102			80		375

TRUCKS

7:15	0	1	0	0	1	0	0	0	0	0	0	0	2
7:30	0	0	0	0	1	4	0	0	0	0	1	0	6
7:45	0	0	0	0	0	2	0	1	0	0	1	0	4
8:00	1	1	1	1	0	0	1	0	0	0	0	0	5
8:15 *	0	2	0	0	1	1	0	1	0	0	1	0	6
8:30 *	0	0	0	0	1	1	0	0	0	0	1	0	3
8:45 *	0	2	0	0	1	0	0	3	0	0	0	0	6
9:00 *	0	2	0	0	1	0	0	0	0	0	0	1	4
9:15	0	1	0	0	1	0	0	2	0	1	1	0	6
9:30	0	3	1	0	1	0	0	0	0	0	3	2	10
9:45	0	0	0	1	2	0	1	0	0	0	0	0	4
10:00	1	3	0	0	1	0	1	1	0	0	1	0	8
13:45	0	0	0	0	0	1	0	0	1	0	1	0	3
14:00	0	0	0	1	0	0	1	0	0	0	0	0	2
14:15	0	0	0	0	1	0	0	1	0	0	3	0	5
14:30	0	0	0	0	0	1	0	0	1	0	1	0	3
14:45 *	0	0	0	1	0	0	1	0	0	0	2	0	4
15:00 *	0	0	1	1	0	0	0	0	0	0	1	0	3
15:15 *	1	0	0	0	0	0	0	0	0	0	0	0	1
15:30 *	0	0	0	0	1	0	0	1	0	0	1	0	3
16:15	1	0	0	0	0	0	0	0	0	1	0	0	2
16:30 *	1	0	2	0	2	0	0	2	0	0	0	0	7
16:45 *	0	0	0	1	0	0	1	0	0	0	1	0	3
17:00 *	0	2	0	0	0	0	0	0	0	0	1	0	3
17:15 *	2	0	0	0	0	0	0	0	0	0	0	0	2
17:30	0	0	0	0	1	0	0	0	1	0	0	1	3
17:45	2	1	1	0	0	1	0	0	0	0	0	0	5
18:00	0	1	0	0	1	0	0	0	1	0	0	0	3
TOTAL	9	19	6	6	17	11	6	12	4	2	20	4	
APPR.		34			34			22			26		116

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 6564

Intersection: **Stone Church Rd E** **at** **Upper Wellington St** Total Vehicles: 13,803 Date: Monday
Direction: (East/West) (North/South) Nov 25, 2019
Road Condition: Dry Weather: Overcast Period: 8 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total	Pedestrians N side	Pedestrians E side	Pedestrians S side	Pedestrians W side
	L	S	R	L	S	R	L	S	R	L	S	R	Veh's				
7:15	16	34	8	6	20	4	14	22	14	4	31	18	191	0	1	0	2
7:30	17	46	11	7	25	8	13	24	9	10	30	10	210	0	0	3	2
7:45	19	62	21	16	27	8	8	26	14	4	57	32	294	5	6	1	1
8:00	24	68	17	12	43	6	20	43	26	8	79	39	385	0	0	0	0
8:15	31	80	23	25	47	20	30	44	32	11	66	42	451	4	1	0	1
8:30	33	93	14	23	61	9	17	42	32	16	79	37	456	0	5	0	0
8:45	26	89	27	35	59	20	26	51	27	16	65	36	477	1	2	0	0
9:00	27	83	16	16	72	15	31	56	20	15	103	32	486	0	1	3	2
9:15	32	67	11	16	67	15	26	63	23	9	67	33	429	5	3	3	2
9:30	24	55	12	9	55	11	16	44	24	10	70	29	359	1	2	0	1
9:45	14	43	11	10	47	12	19	38	24	8	62	13	301	0	0	3	3
10:00	14	46	18	18	61	10	18	26	22	9	62	21	325	1	0	1	1
13:45	15	39	5	28	28	24	28	28	24	10	73	15	317	3	0	0	3
14:00	12	32	7	25	37	22	25	37	22	5	76	23	323	6	2	7	5
14:15	17	43	12	18	43	24	18	43	25	18	78	15	354	0	2	3	0
14:30	12	50	14	21	52	37	21	52	37	8	87	21	412	0	1	2	0
14:45	22	45	12	32	37	22	32	36	23	17	75	17	370	2	0	3	3
15:00	15	51	23	41	58	34	40	59	33	17	104	22	497	3	1	0	3
15:15	26	54	16	32	56	38	32	56	38	21	83	38	490	3	1	2	3
15:30	20	47	12	31	87	30	31	87	29	22	92	27	515	0	1	3	0
16:15	23	74	11	33	83	33	33	82	33	17	100	39	561	1	2	3	1
16:30	18	49	13	51	101	37	51	101	37	25	87	27	597	1	2	0	1
16:45	20	42	16	33	85	36	33	85	36	19	97	28	530	1	4	3	1
17:00	15	76	15	44	93	33	44	93	33	18	106	28	598	1	0	2	1
17:15	19	53	20	30	136	36	40	94	40	15	106	33	622	3	2	0	2
17:30	17	70	15	29	132	19	43	93	33	15	102	28	596	0	0	2	2
17:45	18	69	14	21	87	27	33	90	36	21	81	27	524	2	4	2	1
18:00	8	50	10	28	95	18	28	72	28	22	88	27	474	4	2	2	3
18:15	15	48	9	19	74	25	21	57	50	19	78	31	446	2	3	0	0
18:30	16	50	19	23	100	19	29	51	25	9	76	24	441	0	0	1	1
18:45	20	34	20	27	66	21	34	35	35	13	61	24	390	2	0	1	0
19:00	20	48	9	21	56	15	29	41	26	15	81	21	382	1	0	1	0
TOTAL	625	1,790	461	780	2,090	688	883	1,771	910	446	2,502	857		52	48	51	45
APPR.		2,876			3,558			3,564			3,805		13,803			196	

TRUCKS & BUSES

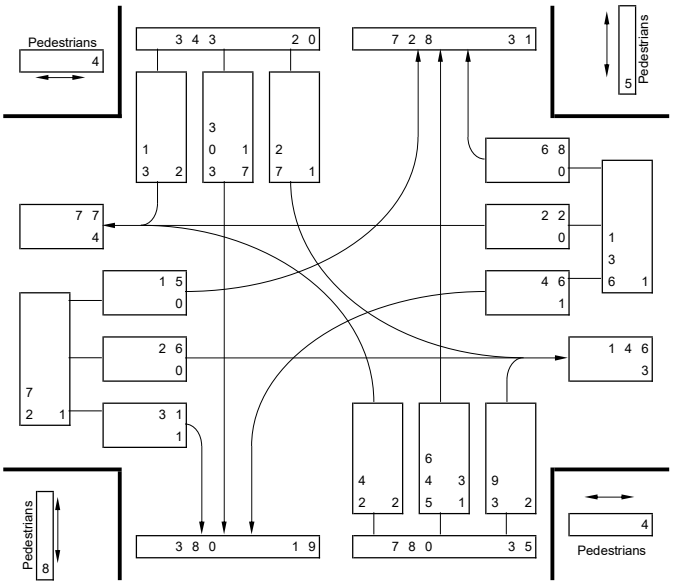
15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total
	L	S	R	L	S	R	L	S	R	L	S	R	
7:15	0	2	0	0	1	0	0	2	0	0	2	0	7
7:30	0	2	0	0	3	5	0	2	0	1	1	0	14
7:45	0	1	1	1	0	2	0	3	3	1	4	4	20
8:00	2	4	1	2	2	0	1	2	3	1	2	1	21
8:15	3	7	2	1	4	1	1	3	0	2	1	3	28
8:30	2	5	0	2	3	1	1	4	4	0	3	2	27
8:45	1	6	0	2	1	0	1	6	1	0	1	1	20
9:00	1	4	0	0	2	1	1	3	1	0	1	1	15
9:15	0	2	0	0	1	0	0	4	1	2	2	0	12
9:30	0	5	1	0	3	0	0	5	0	0	4	2	20
9:45	0	2	0	1	2	0	1	1	0	0	1	0	8
10:00	1	4	0	0	2	0	1	2	0	0	1	0	11
13:45	0	1	0	0	1	1	0	1	1	0	2	0	7
14:00	0	1	0	1	1	0	1	1	0	0	0	0	5
14:15	0	1	0	0	2	0	0	2	0	0	4	0	9
14:30	0	2	1	0	0	2	0	0	2	0	4	2	13
14:45	0	3	0	1	2	0	1	2	0	0	2	0	11
15:00	0	1	1	1	2	2	0	2	2	0	2	0	13
15:15	1	3	0	1	2	2	1	2	2	2	2	2	20
15:30	0	3	3	1	4	1	1	4	1	1	2	1	22
16:15	1	2	0	0	1	0	0	1	0	1	1	0	7
16:30	1	2	3	0	4	1	0	4	1	0	2	0	18
16:45	0	1	0	2	1	0	2	1	0	0	2	0	9
17:00	1	3	0	0	1	0	0	1	0	0	1	0	7
17:15	2	1	0	0	0	0	0	1	0	0	1	0	5
17:30	0	1	0	0	1	0	0	3	1	0	0	1	7
17:45	2	3	1	0	1	2	0	1	0	0	1	0	11
18:00	0	3	0	0	2	0	0	2	1	0	0	0	8
18:15	0	1	0	0	0	0	0	2	0	0	3	0	6
18:30	0	1	0	0	1	0	0	1	0	0	0	0	3
18:45	0	1	0	0	0	0	0	1	0	0	1	0	3
19:00	1	2	0	0	1	0	0	1	0	0	3	0	8
TOTAL	19	80	14	16	51	21	13	70	24	11	56	20	
APPR.		113			88			107			87		395

TRUCKS

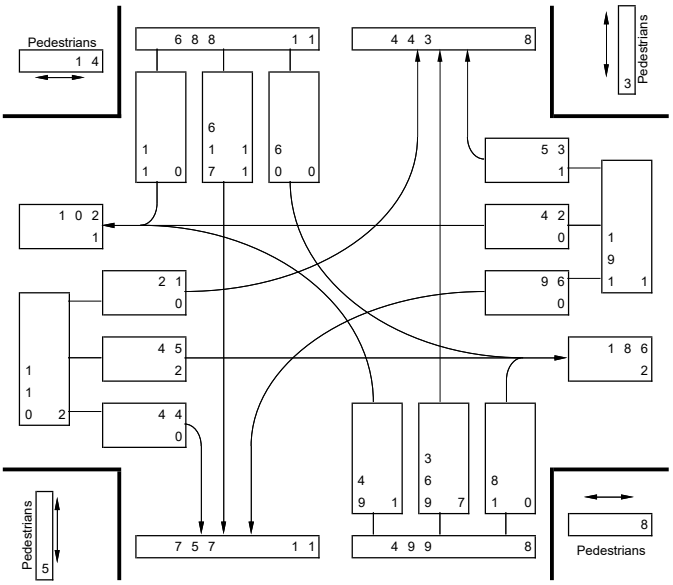
7:15	0	1	0	0	1	0	0	0	0	0	0	0	2
7:30	0	0	0	0	1	4	0	0	0	0	1	0	6
7:45	0	0	0	0	0	2	0	1	0	0	1	0	4
8:00	1	1	1	1	0	0	1	0	0	0	0	0	5
8:15	0	2	0	0	1	1	0	1	0	0	1	0	6
8:30	0	0	0	0	1	1	0	0	0	0	1	0	3
8:45	0	2	0	0	1	0	0	3	0	0	0	0	6
9:00	0	2	0	0	1	0	0	0	0	0	0	1	4
9:15	0	1	0	0	1	0	0	2	0	1	1	0	6
9:30	0	3	1	0	1	0	0	0	0	0	3	2	10
9:45	0	0	0	1	2	0	1	0	0	0	0	0	4
10:00	1	3	0	0	1	0	1	1	0	0	1	0	8
13:45	0	0	0	0	0	1	0	0	1	0	1	0	3
14:00	0	0	0	1	0	0	1	0	0	0	0	0	2
14:15	0	0	0	0	1	0	0	1	0	0	3	0	5
14:30	0	0	0	0	0	1	0	0	1	0	1	0	3
14:45	0	0	0	1	0	0	1	0	0	0	2	0	4
15:00	0	0	1	1	0	0	0	0	0	0	1	0	3
15:15	1	0	0	0	0	0	0	0	0	0	0	0	1
15:30	0	0	0	0	1	0	0	1	0	0	1	0	3
16:15	1	0	0	0	0	0	0	0	0	1	0	0	2
16:30	1	0	2	0	2	0	0	2	0	0	0	0	7
16:45	0	0	0	1	0	0	1	0	0	0	1	0	3
17:00	0	2	0	0	0	0	0	0	0	0	1	0	3
17:15	2	0	0	0	0	0	0	0	0	0	0	0	2
17:30	0	0	0	0	1	0	0	0	1	0	0	1	3
17:45	2	1	1	0	0	1	0	0	0	0	0	0	5
18:00	0	1	0	0	1	0	0	0	1	0	0	0	3
18:15	0	0	0	0	0	0	0	1	0	0	2	0	3
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0
19:00	1	1	0	0	0	0	0	0	0	0	1	0	3
TOTAL	10	20	6	6	17	11	6	13	4	2	23	4	
APPR.		36			34			23			29		122

City of Hamilton **TURNING MOVEMENT FLOW CHART** Loc. Code: 6293

Intersection: **Limeridge Rd E** **at** **Upper Wellington St** Total Vehicles: 8,125 Date: Wednesday
Direction: (East/West) (North/South) M.V.E./Year: 6.354 Mar 4, 2020
Road Condition: Dry Weather: Cloudy AWDT Factor: 2.3 Period: 7 hours
Comments:

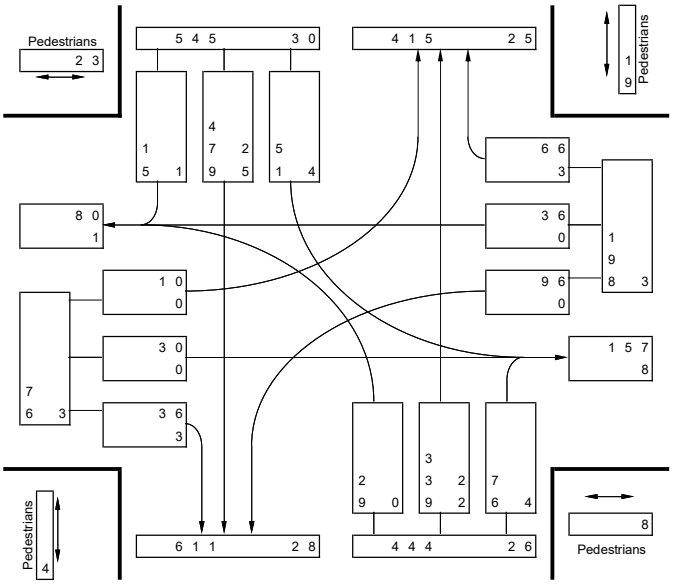


A.M. PEAK HOUR = 8:00 AM - 9:00 AM

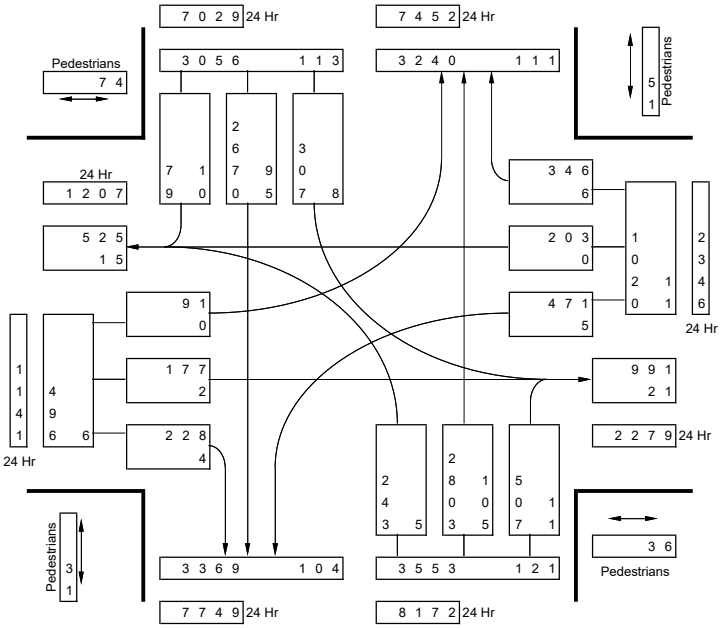


P.M. PEAK HOUR = 4:30 PM - 5:30 PM

N



NORMAL HOUR = 2:30 PM - 3:30 PM



7 Hr & 24 Hr TOTAL VOLUMES

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 6293

Intersection: **Limeridge Rd E** **at** **Upper Wellington St** Total Vehicles: 8,125 Date: Wednesday
Direction: (East/West) (North/South) M.V.E./Year: 6.354 Mar 4, 2020
Road Condition: Dry Weather: Cloudy AWDT Factor: 2.3 Period: 7 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W				Pedestrians			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total Veh's	N side	E side	S side	W side
7:15	3	67	4	1	3	2	6	24	0	1	3	5	119	1	1	1	1
7:30	2	92	4	2	2	5	5	38	1	2	4	5	162	2	0	0	2
7:45	6	134	9	4	4	2	7	49	5	7	2	16	245	7	2	2	1
8:00	3	133	13	0	4	6	5	53	1	10	3	14	245	3	9	1	0
8:15 *	8	177	26	5	9	8	8	59	2	12	2	16	332	3	0	0	4
8:30 *	12	177	26	2	9	8	6	64	4	15	6	21	350	1	2	0	0
8:45 *	14	159	23	4	3	9	5	92	3	8	6	20	346	0	1	4	3
9:00 *	8	132	18	4	5	6	8	88	4	11	8	11	303	0	2	0	1
9:15	9	100	13	5	4	7	13	80	5	10	4	6	256	4	1	1	2
9:30	4	70	16	0	9	3	7	63	2	14	7	11	206	0	0	1	0
9:45	5	85	14	1	2	5	12	73	1	6	4	17	225	2	0	0	0
10:00	5	79	20	3	7	3	8	60	4	11	4	6	210	0	0	0	0
13:45	5	76	16	4	6	11	15	90	2	12	6	10	253	0	2	1	1
14:00	9	56	26	3	3	8	9	79	3	26	10	11	243	1	1	0	0
14:15	13	87	24	4	1	8	16	89	2	16	9	9	278	1	1	0	0
14:30	5	99	31	2	6	6	9	79	3	14	3	10	267	1	1	1	1
14:45 *	11	91	26	2	9	4	10	111	3	23	11	10	311	1	2	1	0
15:00 *	6	72	14	3	6	11	11	110	4	27	9	18	291	1	0	0	0
15:15 *	7	104	22	4	8	7	19	120	3	21	9	17	341	14	16	6	3
15:30 *	5	72	14	1	7	14	11	138	5	25	7	21	320	7	1	1	1
16:15	17	93	21	7	8	12	15	133	2	21	9	6	344	3	2	2	0
16:30	15	91	16	2	3	15	14	131	3	33	15	12	350	4	2	4	3
16:45 *	11	78	18	2	6	11	12	152	1	22	11	11	335	2	2	1	0
17:00 *	14	90	19	5	6	8	13	176	4	21	5	12	373	0	0	4	3
17:15 *	9	91	20	10	24	13	17	157	3	21	11	12	388	6	1	3	1
17:30 *	15	110	24	4	9	12	18	132	3	32	15	18	392	6	0	0	1
17:45	10	87	11	3	9	16	17	120	2	29	11	8	323	2	2	1	1
18:00	12	101	19	4	5	8	11	110	4	21	9	13	317	2	0	1	2
TOTAL	243	2,803	507	91	177	228	307	2,670	79	471	203	346		74	51	36	31
APPR.		3,553			496			3,056			1,020		8,125			192	

TRUCKS & BUSES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			
(Pk.Hr.*)	L	S	R	L	S	R	L	S	R	L	S	R	Total
7:15	0	3	0	0	0	0	0	1	0	0	0	0	4
7:30	0	2	0	0	0	0	1	2	0	1	0	0	6
7:45	0	6	0	0	0	0	0	3	0	1	0	0	10
8:00	0	5	2	0	0	0	0	4	0	0	0	1	12
8:15 *	1	7	1	0	0	1	0	3	1	0	0	0	14
8:30 *	1	11	1	0	0	0	1	5	0	1	0	0	20
8:45 *	0	9	0	0	0	0	0	5	0	0	0	0	14
9:00 *	0	4	0	0	0	0	0	4	1	0	0	0	9
9:15	0	2	0	0	0	0	0	3	3	0	0	1	9
9:30	0	1	1	0	0	0	0	3	1	0	0	0	6
9:45	0	3	0	0	0	0	0	3	0	0	0	0	6
10:00	0	1	1	0	0	0	0	1	1	1	0	0	5
13:45	0	3	0	0	0	0	0	3	0	0	0	0	6
14:00	1	2	0	0	0	0	0	4	1	0	0	0	8
14:15	0	4	0	0	0	0	1	4	0	0	0	0	9
14:30	1	6	1	0	0	0	0	2	0	0	0	0	10
14:45 *	0	4	1	0	0	0	1	5	0	0	0	0	11
15:00 *	0	4	1	0	0	0	0	5	0	0	0	1	11
15:15 *	0	8	1	0	0	0	2	6	1	0	0	2	20
15:30 *	0	6	1	0	0	3	1	9	0	0	0	0	20
16:15	0	2	0	0	0	0	1	3	1	0	0	0	7
16:30	0	2	0	0	0	0	0	4	0	1	0	0	7
16:45 *	0	1	0	0	0	0	0	5	0	0	0	0	6
17:00 *	1	4	0	0	0	0	0	1	0	0	0	1	7
17:15 *	0	1	0	0	1	0	0	3	0	0	0	0	5
17:30 *	0	1	0	0	1	0	0	2	0	0	0	0	4
17:45	0	2	0	0	0	0	0	1	0	0	0	0	3
18:00	0	1	0	0	0	0	0	1	0	0	0	0	2
TOTAL	5	105	11	0	2	4	8	95	10	5	0	6	
APPR.		121			6			113			11		251

TRUCKS

7:15	0	1	0	0	0	0	0	0	0	0	0	0	1
7:30	0	1	0	0	0	0	0	0	0	0	0	0	1
7:45	0	1	0	0	0	0	0	0	0	0	0	0	1
8:00	0	1	0	0	0	0	0	0	0	0	0	0	1
8:15 *	1	2	0	0	0	1	0	0	0	0	0	0	4
8:30 *	1	1	0	0	0	0	0	0	0	0	0	0	2
8:45 *	0	3	0	0	0	0	0	1	0	0	0	0	4
9:00 *	0	1	0	0	0	0	0	0	0	0	0	0	1
9:15	0	1	0	0	0	0	0	1	0	0	0	1	3
9:30	0	0	1	0	0	0	0	1	1	0	0	0	3
9:45	0	1	0	0	0	0	0	1	0	0	0	0	2
10:00	0	0	1	0	0	0	0	0	1	1	0	0	3
13:45	0	2	0	0	0	0	0	1	0	0	0	0	3
14:00	1	0	0	0	0	0	0	2	0	0	0	0	3
14:15	0	1	0	0	0	0	0	1	0	0	0	0	2
14:30	0	1	0	0	0	0	0	1	0	0	0	0	2
14:45 *	0	2	0	0	0	0	1	3	0	0	0	0	6
15:00 *	0	0	0	0	0	0	0	1	0	0	0	0	1
15:15 *	0	1	0	0	0	0	1	2	0	0	0	1	5
15:30 *	0	2	0	0	0	3	1	0	0	0	0	0	6
16:15	0	0	0	0	0	0	0	1	0	0	0	0	1
16:30	0	0	0	0	0	0	0	1	0	1	0	0	2
16:45 *	0	0	0	0	0	0	0	4	0	0	0	0	4
17:00 *	1	2	0	0	0	0	0	0	0	0	0	1	4
17:15 *	0	0	0	0	1	0	0	2	0	0	0	0	3
17:30 *	0	0	0	0	1	0	0	0	0	0	0	0	1
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	24	2	0	2	4	3	23	2	2	0	3	
APPR.		30			6			28			5		69

City of Hamilton **TURNING MOVEMENT COUNT** Loc. Code: 6293

Intersection: **Limeridge Rd E** **at** **Upper Wellington St** Total Vehicles: 9,230 Date: Wednesday
Direction: (East/West) (North/South) Mar 4, 2020
Road Condition: Dry Weather: Cloudy Period: 8 hours
Comments:

TOTAL VEHICLES

15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total	Pedestrians N side	Pedestrians E side	Pedestrians S side	Pedestrians W side
	L	S	R	L	S	R	L	S	R	L	S	R	Veh's				
7:15	3	67	4	1	3	2	6	24	0	1	3	5	119	1	1	1	1
7:30	2	92	4	2	2	5	5	38	1	2	4	5	162	2	0	0	2
7:45	6	134	9	4	4	2	7	49	5	7	2	16	245	7	2	2	1
8:00	3	133	13	0	4	6	5	53	1	10	3	14	245	3	9	1	0
8:15	8	177	26	5	9	8	8	59	2	12	2	16	332	3	0	0	4
8:30	12	177	26	2	9	8	6	64	4	15	6	21	350	1	2	0	0
8:45	14	159	23	4	3	9	5	92	3	8	6	20	346	0	1	4	3
9:00	8	132	18	4	5	6	8	88	4	11	8	11	303	0	2	0	1
9:15	9	100	13	5	4	7	13	80	5	10	4	6	256	4	1	1	2
9:30	4	70	16	0	9	3	7	63	2	14	7	11	206	0	0	1	0
9:45	5	85	14	1	2	5	12	73	1	6	4	17	225	2	0	0	0
10:00	5	79	20	3	7	3	8	60	4	11	4	6	210	0	0	0	0
13:45	5	76	16	4	6	11	15	90	2	12	6	10	253	0	2	1	1
14:00	9	56	26	3	3	8	9	79	3	26	10	11	243	1	1	0	0
14:15	13	87	24	4	1	8	16	89	2	16	9	9	278	1	1	0	0
14:30	5	99	31	2	6	6	9	79	3	14	3	10	267	1	1	1	1
14:45	11	91	26	2	9	4	10	111	3	23	11	10	311	1	2	1	0
15:00	6	72	14	3	6	11	11	110	4	27	9	18	291	1	0	0	0
15:15	7	104	22	4	8	7	19	120	3	21	9	17	341	14	16	6	3
15:30	5	72	14	1	7	14	11	138	5	25	7	21	320	7	1	1	1
16:15	17	93	21	7	8	12	15	133	2	21	9	6	344	3	2	2	0
16:30	15	91	16	2	3	15	14	131	3	33	15	12	350	4	2	4	3
16:45	11	78	18	2	6	11	12	152	1	22	11	11	335	2	2	1	0
17:00	14	90	19	5	6	8	13	176	4	21	5	12	373	0	0	4	3
17:15	9	91	20	10	24	13	17	157	3	21	11	12	388	6	1	3	1
17:30	15	110	24	4	9	12	18	132	3	32	15	18	392	6	0	0	1
17:45	10	87	11	3	9	16	17	120	2	29	11	8	323	2	2	1	1
18:00	12	101	19	4	5	8	11	110	4	21	9	13	317	2	0	1	2
18:15	4	82	15	6	3	9	15	108	0	20	6	13	281	3	4	1	1
18:30	5	75	18	4	2	8	13	99	1	21	7	9	262	0	0	0	0
18:45	14	74	28	3	6	6	12	81	2	15	7	19	267	0	0	0	0
19:00	9	81	16	7	14	18	15	80	3	27	10	15	295	2	1	0	0
TOTAL	275	3,115	584	111	202	269	362	3,038	85	554	233	402		79	56	37	32
APPR.		3,974			582			3,485			1,189		9,230			204	

TRUCKS & BUSES

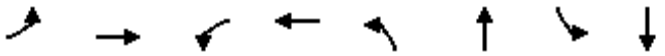
15 mins. Ending	North Bd. on N/S			East Bd. on E/W			South Bd. on N/S			West Bd. on E/W			Total
	L	S	R	L	S	R	L	S	R	L	S	R	
7:15	0	3	0	0	0	0	0	1	0	0	0	0	4
7:30	0	2	0	0	0	0	1	2	0	1	0	0	6
7:45	0	6	0	0	0	0	0	3	0	1	0	0	10
8:00	0	5	2	0	0	0	0	4	0	0	0	1	12
8:15	1	7	1	0	0	1	0	3	1	0	0	0	14
8:30	1	11	1	0	0	0	1	5	0	1	0	0	20
8:45	0	9	0	0	0	0	0	5	0	0	0	0	14
9:00	0	4	0	0	0	0	0	4	1	0	0	0	9
9:15	0	2	0	0	0	0	0	3	3	0	0	1	9
9:30	0	1	1	0	0	0	0	3	1	0	0	0	6
9:45	0	3	0	0	0	0	0	3	0	0	0	0	6
10:00	0	1	1	0	0	0	0	1	1	1	0	0	5
13:45	0	3	0	0	0	0	0	3	0	0	0	0	6
14:00	1	2	0	0	0	0	0	4	1	0	0	0	8
14:15	0	4	0	0	0	0	1	4	0	0	0	0	9
14:30	1	6	1	0	0	0	0	2	0	0	0	0	10
14:45	0	4	1	0	0	0	1	5	0	0	0	0	11
15:00	0	4	1	0	0	0	0	5	0	0	0	1	11
15:15	0	8	1	0	0	0	2	6	1	0	0	2	20
15:30	0	6	1	0	0	3	1	9	0	0	0	0	20
16:15	0	2	0	0	0	0	1	3	1	0	0	0	7
16:30	0	2	0	0	0	0	0	4	0	1	0	0	7
16:45	0	1	0	0	0	0	0	5	0	0	0	0	6
17:00	1	4	0	0	0	0	0	1	0	0	0	1	7
17:15	0	1	0	0	1	0	0	3	0	0	0	0	5
17:30	0	1	0	0	1	0	0	2	0	0	0	0	4
17:45	0	2	0	0	0	0	0	1	0	0	0	0	3
18:00	0	1	0	0	0	0	0	1	0	0	0	0	2
18:15	0	1	0	0	0	0	0	2	0	0	0	0	3
18:30	0	1	1	0	0	0	0	1	0	0	0	0	3
18:45	0	1	0	0	0	0	0	1	0	1	0	0	3
19:00	0	1	0	0	0	0	0	1	0	0	0	1	3
TOTAL	5	109	12	0	2	4	8	100	10	6	0	7	
APPR.		126			6			118			13		263

TRUCKS

7:15	0	1	0	0	0	0	0	0	0	0	0	0	1
7:30	0	1	0	0	0	0	0	0	0	0	0	0	1
7:45	0	1	0	0	0	0	0	0	0	0	0	0	1
8:00	0	1	0	0	0	0	0	0	0	0	0	0	1
8:15	1	2	0	0	0	1	0	0	0	0	0	0	4
8:30	1	1	0	0	0	0	0	0	0	0	0	0	2
8:45	0	3	0	0	0	0	0	1	0	0	0	0	4
9:00	0	1	0	0	0	0	0	0	0	0	0	0	1
9:15	0	1	0	0	0	0	0	1	0	0	0	1	3
9:30	0	0	1	0	0	0	0	1	1	0	0	0	3
9:45	0	1	0	0	0	0	0	1	0	0	0	0	2
10:00	0	0	1	0	0	0	0	0	1	1	0	0	3
13:45	0	2	0	0	0	0	0	1	0	0	0	0	3
14:00	1	0	0	0	0	0	0	2	0	0	0	0	3
14:15	0	1	0	0	0	0	0	1	0	0	0	0	2
14:30	0	1	0	0	0	0	0	1	0	0	0	0	2
14:45	0	2	0	0	0	0	1	3	0	0	0	0	6
15:00	0	0	0	0	0	0	0	1	0	0	0	0	1
15:15	0	1	0	0	0	0	1	2	0	0	0	1	5
15:30	0	2	0	0	0	3	1	0	0	0	0	0	6
16:15	0	0	0	0	0	0	0	1	0	0	0	0	1
16:30	0	0	0	0	0	0	0	1	0	1	0	0	2
16:45	0	0	0	0	0	0	0	4	0	0	0	0	4
17:00	1	2	0	0	0	0	0	0	0	0	0	1	4
17:15	0	0	0	0	1	0	0	2	0	0	0	0	3
17:30	0	0	0	0	1	0	0	0	0	0	0	0	1
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30	0	0	1	0	0	0	0	0	0	0	0	0	1
18:45	0	0	0	0	0	0	0	0	0	1	0	0	1
19:00	0	0	0	0	0	0	0	0	0	0	0	1	1
TOTAL	4	24	3	0	2	4	3	23	2	3	0	4	
APPR.		31			6			28			7		72

Appendix C

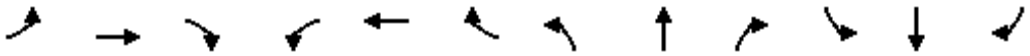
Synchro Reports – Existing Conditions (2020)



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	103	316	60	479	122	442	108	317
v/c Ratio	0.50	0.58	0.17	0.93	0.27	0.71	0.31	0.52
Control Delay	26.4	33.7	18.2	60.1	17.1	36.0	17.6	27.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	33.7	18.2	60.1	17.1	36.0	17.6	27.7
Queue Length 50th (m)	12.8	53.5	7.3	93.0	13.6	80.0	11.9	48.6
Queue Length 95th (m)	22.1	78.7	14.2	#142.0	25.4	#133.1	22.8	78.8
Internal Link Dist (m)		584.2		654.0		403.4		630.7
Turn Bay Length (m)	40.0		20.0		70.0		50.0	
Base Capacity (vph)	210	583	364	584	450	621	357	608
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.54	0.16	0.82	0.27	0.71	0.30	0.52

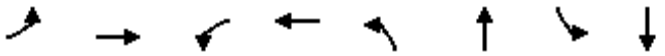
Intersection Summary

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



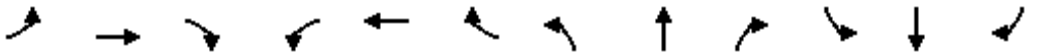
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	99	239	64	58	313	147	117	345	80	104	193	111
Future Volume (vph)	99	239	64	58	313	147	117	345	80	104	193	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.95		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	1616		1692	1602		1644	1515		1674	1467	
Flt Permitted	0.17	1.00		0.43	1.00		0.46	1.00		0.33	1.00	
Satd. Flow (perm)	306	1616		761	1602		793	1515		581	1467	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	103	249	67	60	326	153	122	359	83	108	201	116
RTOR Reduction (vph)	0	9	0	0	17	0	0	7	0	0	17	0
Lane Group Flow (vph)	103	307	0	60	462	0	122	435	0	108	300	0
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	42.4	35.7		39.6	34.3		51.7	44.6		51.3	44.4	
Effective Green, g (s)	42.4	35.7		39.6	34.3		51.7	44.6		51.3	44.4	
Actuated g/C Ratio	0.39	0.32		0.36	0.31		0.47	0.41		0.47	0.40	
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Lane Grp Cap (vph)	200	524		318	499		427	614		339	592	
v/s Ratio Prot	c0.03	0.19		0.01	c0.29		0.02	c0.29		c0.02	0.20	
v/s Ratio Perm	0.17			0.06			0.12			0.13		
v/c Ratio	0.52	0.59		0.19	0.93		0.29	0.71		0.32	0.51	
Uniform Delay, d1	24.9	31.0		23.7	36.6		17.1	27.3		18.0	24.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	4.7		0.1	25.7		0.1	6.8		0.2	3.1	
Delay (s)	25.8	35.7		23.8	62.3		17.2	34.0		18.2	27.7	
Level of Service	C	D		C	E		B	C		B	C	
Approach Delay (s)		33.3			58.0			30.4			25.3	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	37.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



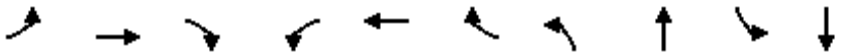
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	36	52	164	28	749	61	428
v/c Ratio	0.67	0.17	0.28	0.65	0.06	0.60	0.15	0.19
Control Delay	61.3	17.8	37.1	36.7	4.7	9.0	4.8	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.3	17.8	37.1	36.7	4.7	9.0	4.8	3.7
Queue Length 50th (m)	14.8	1.6	8.4	18.7	1.0	47.0	2.3	8.8
Queue Length 95th (m)	25.1	7.8	15.6	31.1	3.9	85.2	5.8	13.6
Internal Link Dist (m)		165.9		291.6		630.7		357.0
Turn Bay Length (m)	60.0		25.0		70.0		45.0	
Base Capacity (vph)	499	734	728	826	494	1254	402	2196
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.05	0.07	0.20	0.06	0.60	0.15	0.19

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	8	21	43	6	129	23	595	19	50	328	23
Future Volume (vph)	71	8	21	43	6	129	23	595	19	50	328	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	0.86		1.00	1.00		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)	1531	1332		1740	1482		1284	1724		1673	3017	
Flt Permitted	0.57	1.00		0.73	1.00		0.50	1.00		0.31	1.00	
Satd. Flow (perm)	922	1332		1343	1482		680	1724		551	3017	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	87	10	26	52	7	157	28	726	23	61	400	28
RTOR Reduction (vph)	0	22	0	0	45	0	0	1	0	0	2	0
Lane Group Flow (vph)	87	14	0	52	119	0	28	748	0	61	426	0
Confl. Peds. (#/hr)	12		2	2		12	4		5	5		4
Heavy Vehicles (%)	13%	0%	29%	0%	0%	4%	35%	6%	5%	4%	11%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	12.6	12.6		12.6	12.6		65.5	65.5		65.5	65.5	
Effective Green, g (s)	12.6	12.6		12.6	12.6		65.5	65.5		65.5	65.5	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	129	186		188	207		494	1254		401	2195	
v/s Ratio Prot		0.01			0.08			c0.43			0.14	
v/s Ratio Perm	c0.09			0.04			0.04			0.11		
v/c Ratio	0.67	0.07		0.28	0.58		0.06	0.60		0.15	0.19	
Uniform Delay, d1	36.8	33.6		34.6	36.2		3.5	5.9		3.7	3.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.84	0.83	
Incremental Delay, d2	10.4	0.1		0.3	2.4		0.2	2.1		0.8	0.2	
Delay (s)	47.2	33.7		34.9	38.6		3.7	8.0		3.9	3.4	
Level of Service	D	C		C	D		A	A		A	A	
Approach Delay (s)		43.2			37.7			7.8			3.5	
Approach LOS		D			D			A			A	

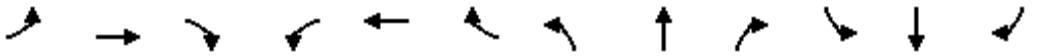
Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	16	27	33	48	23	72	44	793	28	355
v/c Ratio	0.10	0.13	0.16	0.32	0.11	0.30	0.06	0.33	0.06	0.15
Control Delay	37.1	37.2	11.5	42.5	36.9	12.9	4.0	4.0	3.5	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.1	37.2	11.5	42.5	36.9	12.9	4.0	4.0	3.5	3.1
Queue Length 50th (m)	2.5	4.3	0.0	7.8	3.7	0.0	1.3	14.1	1.0	7.3
Queue Length 95th (m)	8.3	11.7	6.8	18.0	10.5	11.6	m4.8	39.9	3.3	11.7
Internal Link Dist (m)		415.8			541.8			357.0		323.8
Turn Bay Length (m)	45.0		50.0	30.0		40.0	30.0		50.0	
Base Capacity (vph)	464	628	537	454	628	573	744	2425	493	2367
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.04	0.06	0.11	0.04	0.13	0.06	0.33	0.06	0.15

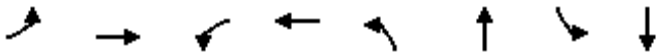
Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	26	31	46	22	68	42	660	93	27	324	13
Future Volume (vph)	15	26	31	46	22	68	42	660	93	27	324	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	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		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1739	1837	1492	1705	1837	1537	1650	3042		1674	2973	
Flt Permitted	0.74	1.00	1.00	0.74	1.00	1.00	0.54	1.00		0.35	1.00	
Satd. Flow (perm)	1359	1837	1492	1327	1837	1537	937	3042		620	2973	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	27	33	48	23	72	44	695	98	28	341	14
RTOR Reduction (vph)	0	0	30	0	0	65	0	6	0	0	2	0
Lane Group Flow (vph)	16	27	3	48	23	7	44	787	0	28	353	0
Confl. Peds. (#/hr)	4		4	4		4	8		5	5		8
Heavy Vehicles (%)	0%	0%	3%	2%	0%	0%	5%	7%	2%	4%	12%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	26	0	0	19	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		
Actuated Green, G (s)	8.3	8.3	8.3	8.3	8.3	8.3	69.1	69.1		69.1	69.1	
Effective Green, g (s)	8.3	8.3	8.3	8.3	8.3	8.3	69.1	69.1		69.1	69.1	
Actuated g/C Ratio	0.09	0.09	0.09	0.09	0.09	0.09	0.77	0.77		0.77	0.77	
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	125	169	137	122	169	141	719	2335		476	2282	
v/s Ratio Prot		0.01			0.01			c0.26			0.12	
v/s Ratio Perm	0.01		0.00	c0.04		0.00	0.05			0.05		
v/c Ratio	0.13	0.16	0.02	0.39	0.14	0.05	0.06	0.34		0.06	0.15	
Uniform Delay, d1	37.5	37.6	37.2	38.5	37.6	37.2	2.5	3.3		2.5	2.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.18	1.08		1.00	1.00	
Incremental Delay, d2	0.2	0.2	0.0	0.8	0.1	0.1	0.1	0.3		0.2	0.1	
Delay (s)	37.7	37.8	37.2	39.2	37.7	37.3	3.1	3.9		2.8	2.9	
Level of Service	D	D	D	D	D	D	A	A		A	A	
Approach Delay (s)		37.5			38.0			3.9			2.9	
Approach LOS		D			D			A			A	

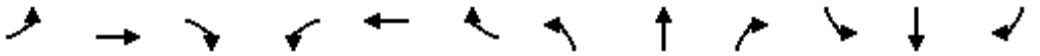
Intersection Summary					
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A		
HCM 2000 Volume to Capacity ratio	0.34				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.6		
Intersection Capacity Utilization	61.1%	ICU Level of Service	B		
Analysis Period (min)	15				
c Critical Lane Group					



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	168	592	82	544	77	302	179	552
v/c Ratio	0.83	0.95	0.46	0.92	0.32	0.49	0.41	0.83
Control Delay	52.3	59.6	24.8	55.2	19.8	28.9	20.6	43.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.3	59.6	24.8	55.2	19.8	28.9	20.6	43.4
Queue Length 50th (m)	20.4	120.8	9.4	106.1	8.9	47.7	21.9	108.1
Queue Length 95th (m)	#49.7	#192.1	18.0	#168.0	17.3	73.6	36.0	#172.8
Internal Link Dist (m)		584.2		654.0		403.4		630.7
Turn Bay Length (m)	40.0		20.0		70.0		50.0	
Base Capacity (vph)	202	624	187	616	247	622	432	662
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.95	0.44	0.88	0.31	0.49	0.41	0.83

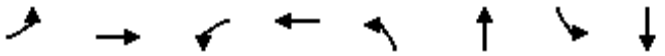
Intersection Summary

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



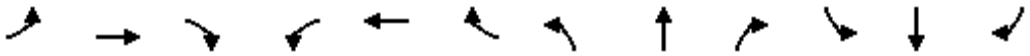
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	415	142	77	396	116	72	220	64	168	373	146
Future Volume (vph)	158	415	142	77	396	116	72	220	64	168	373	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1727	1694		1745	1708		1645	1654		1721	1667	
Flt Permitted	0.14	1.00		0.11	1.00		0.21	1.00		0.45	1.00	
Satd. Flow (perm)	248	1694		208	1708		360	1654		807	1667	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	168	441	151	82	421	123	77	234	68	179	397	155
RTOR Reduction (vph)	0	11	0	0	10	0	0	9	0	0	12	0
Lane Group Flow (vph)	168	581	0	82	534	0	77	293	0	179	540	0
Confl. Peds. (#/hr)	6		5	5		6	5		8	8		5
Heavy Vehicles (%)	1%	1%	1%	0%	2%	0%	6%	3%	5%	1%	2%	1%
Bus Blockages (#/hr)	0	6	0	0	4	0	0	7	0	0	7	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	45.6	38.6		42.6	37.1		46.9	41.4		49.9	42.9	
Effective Green, g (s)	45.6	38.6		42.6	37.1		46.9	41.4		49.9	42.9	
Actuated g/C Ratio	0.41	0.35		0.39	0.34		0.43	0.38		0.45	0.39	
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Lane Grp Cap (vph)	196	594		157	576		217	622		424	650	
v/s Ratio Prot	c0.05	c0.34		0.03	0.31		0.02	0.18		c0.03	c0.32	
v/s Ratio Perm	0.30			0.18			0.13			0.16		
v/c Ratio	0.86	0.98		0.52	0.93		0.35	0.47		0.42	0.83	
Uniform Delay, d1	25.1	35.3		25.5	35.1		21.6	26.0		18.8	30.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	28.0	31.9		1.4	23.3		0.4	2.5		0.2	11.8	
Delay (s)	53.1	67.2		27.0	58.4		21.9	28.5		19.1	42.0	
Level of Service	D	E		C	E		C	C		B	D	
Approach Delay (s)		64.1			54.3			27.2			36.4	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	47.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



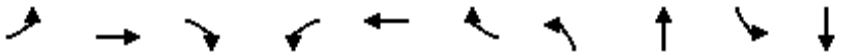
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	55	32	26	57	26	565	84	824
v/c Ratio	0.42	0.19	0.21	0.30	0.06	0.43	0.15	0.32
Control Delay	47.1	19.2	39.7	17.2	3.6	5.1	3.0	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.1	19.2	39.7	17.2	3.6	5.1	3.0	2.6
Queue Length 50th (m)	9.0	0.9	4.2	1.1	0.9	28.4	2.6	15.0
Queue Length 95th (m)	19.4	8.5	11.2	11.2	3.2	49.8	5.9	20.1
Internal Link Dist (m)		165.9		291.6		630.7		357.0
Turn Bay Length (m)	60.0		25.0		70.0		45.0	
Base Capacity (vph)	379	442	368	454	431	1308	557	2562
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.07	0.07	0.13	0.06	0.43	0.15	0.32

Intersection Summary



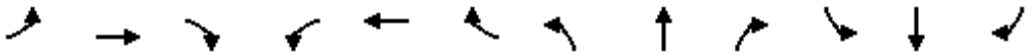
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	5	23	23	6	44	23	453	44	74	683	42
Future Volume (vph)	48	5	23	23	6	44	23	453	44	74	683	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.97		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		0.97	1.00		0.98	1.00		0.98	1.00	
Frt	1.00	0.88		1.00	0.87		1.00	0.99		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)	1464	1242		1392	1231		1517	1636		1540	3206	
Flt Permitted	0.72	1.00		0.74	1.00		0.34	1.00		0.43	1.00	
Satd. Flow (perm)	1110	1242		1079	1231		539	1636		694	3206	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	55	6	26	26	7	50	26	515	50	84	776	48
RTOR Reduction (vph)	0	24	0	0	45	0	0	2	0	0	2	0
Lane Group Flow (vph)	55	8	0	26	12	0	26	563	0	84	822	0
Confl. Peds. (#/hr)	21		18	18		21	20		22	22		20
Heavy Vehicles (%)	17%	20%	26%	22%	33%	25%	13%	8%	32%	11%	5%	21%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	7	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	8.6	8.6		8.6	8.6		69.5	69.5		69.5	69.5	
Effective Green, g (s)	8.6	8.6		8.6	8.6		69.5	69.5		69.5	69.5	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.77	0.77		0.77	0.77	
Clearance Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	106	118		103	117		416	1263		535	2475	
v/s Ratio Prot		0.01			0.01			c0.34			0.26	
v/s Ratio Perm	c0.05			0.02			0.05			0.12		
v/c Ratio	0.52	0.07		0.25	0.10		0.06	0.45		0.16	0.33	
Uniform Delay, d1	38.7	37.1		37.7	37.2		2.5	3.6		2.7	3.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.69	0.65	
Incremental Delay, d2	1.8	0.1		0.5	0.1		0.3	1.1		0.6	0.4	
Delay (s)	40.5	37.2		38.2	37.3		2.7	4.7		2.4	2.4	
Level of Service	D	D		D	D		A	A		A	A	
Approach Delay (s)		39.3			37.6			4.6			2.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	22	47	46	101	44	56	52	522	63	706
v/c Ratio	0.12	0.19	0.18	0.55	0.17	0.22	0.10	0.22	0.10	0.29
Control Delay	33.6	34.7	11.7	46.8	34.3	11.3	5.2	4.1	5.0	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	34.7	11.7	46.8	34.3	11.3	5.2	4.1	5.0	4.7
Queue Length 50th (m)	3.4	7.4	0.0	16.8	6.9	0.0	1.9	10.2	2.6	17.9
Queue Length 95th (m)	9.4	15.8	8.6	30.1	15.1	9.5	7.3	23.0	8.0	33.0
Internal Link Dist (m)		415.8			541.8			357.0		323.8
Turn Bay Length (m)	45.0		50.0	30.0		40.0	30.0		50.0	
Base Capacity (vph)	496	663	603	497	689	595	530	2343	648	2461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.07	0.08	0.20	0.06	0.09	0.10	0.22	0.10	0.29

Intersection Summary

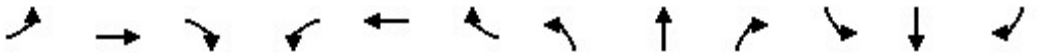


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	45	44	96	42	53	49	415	81	60	659	11
Future Volume (vph)	21	45	44	96	42	53	49	415	81	60	659	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	0.99	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	0.98		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1724	1766	1531	1733	1837	1493	1706	3028		1741	3193	
Flt Permitted	0.73	1.00	1.00	0.73	1.00	1.00	0.38	1.00		0.46	1.00	
Satd. Flow (perm)	1322	1766	1531	1325	1837	1493	688	3028		841	3193	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	47	46	101	44	56	52	437	85	63	694	12
RTOR Reduction (vph)	0	0	41	0	0	49	0	9	0	0	1	0
Lane Group Flow (vph)	22	47	5	101	44	7	52	513	0	63	705	0
Confl. Peds. (#/hr)	14		8	8		14	5		3	3		5
Heavy Vehicles (%)	0%	4%	0%	0%	0%	2%	2%	13%	0%	0%	8%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	5	0	0	5	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		
Actuated Green, G (s)	10.5	10.5	10.5	10.5	10.5	10.5	66.9	66.9		66.9	66.9	
Effective Green, g (s)	10.5	10.5	10.5	10.5	10.5	10.5	66.9	66.9		66.9	66.9	
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.12	0.12	0.74	0.74		0.74	0.74	
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	154	206	178	154	214	174	511	2250		625	2373	
v/s Ratio Prot		0.03			0.02			0.17			c0.22	
v/s Ratio Perm	0.02		0.00	c0.08		0.00	0.08			0.07		
v/c Ratio	0.14	0.23	0.03	0.66	0.21	0.04	0.10	0.23		0.10	0.30	
Uniform Delay, d1	35.7	36.1	35.2	38.0	36.0	35.3	3.2	3.6		3.2	3.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.02	0.98		1.00	1.00	
Incremental Delay, d2	0.2	0.2	0.0	7.4	0.2	0.0	0.4	0.2		0.3	0.3	
Delay (s)	35.9	36.3	35.3	45.5	36.1	35.3	3.7	3.7		3.5	4.1	
Level of Service	D	D	D	D	D	D	A	A		A	A	
Approach Delay (s)		35.8			40.6			3.7			4.1	
Approach LOS		D			D			A			A	

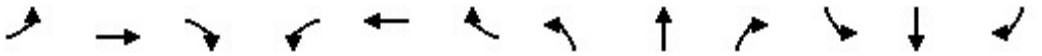
Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Appendix D

Synchro Reports –
Future Conditions (2031)
“Do Nothing”



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Future Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	20.0		0.0	70.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor		0.99		1.00	0.99		1.00	0.99		0.99	0.99	
Frt		0.968			0.952			0.972			0.945	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	1616	0	1694	1602	0	1646	1516	0	1678	1467	0
Flt Permitted	0.145			0.402			0.401			0.251		
Satd. Flow (perm)	254	1616	0	715	1602	0	693	1516	0	441	1467	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			24			12			29	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		608.2			678.0			427.4			654.7	
Travel Time (s)		43.8			48.8			30.8			47.1	
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Adj. Flow (vph)	115	278	74	68	364	171	136	401	93	121	224	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	352	0	68	535	0	136	494	0	121	353	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.04	1.11	1.04	1.04	1.11	1.04	1.04	1.19	1.04	1.04	1.17	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



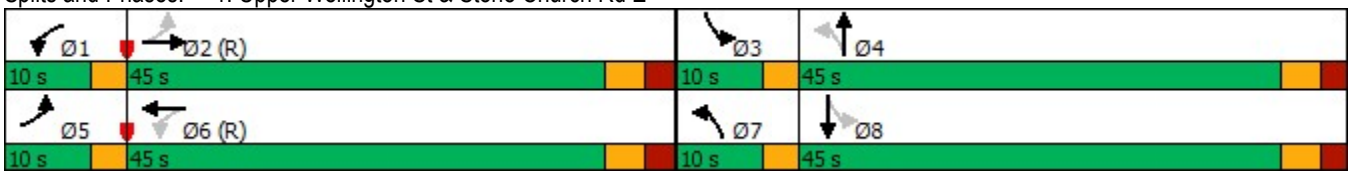
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		1	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	36.9		8.0	36.9		8.0	31.6		8.0	31.6	
Total Split (s)	10.0	45.0		10.0	45.0		10.0	45.0		10.0	45.0	
Total Split (%)	9.1%	40.9%		9.1%	40.9%		9.1%	40.9%		9.1%	40.9%	
Maximum Green (s)	7.0	39.1		7.0	39.1		7.0	39.4		7.0	39.4	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.6		0.0	2.6		0.0	2.3		0.0	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Recall Mode	None	C-Min		None	C-Min		None	Max		None	Max	
Walk Time (s)		12.0			12.0			12.0			12.0	
Flash Dont Walk (s)		19.0			19.0			14.0			14.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	47.6	39.1		46.3	37.0		51.4	41.8		51.0	41.6	
Actuated g/C Ratio	0.43	0.36		0.42	0.34		0.47	0.38		0.46	0.38	
v/c Ratio	0.58	0.60		0.19	0.97		0.35	0.85		0.43	0.62	
Control Delay	29.7	33.2		17.7	65.2		19.3	46.7		21.3	31.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	29.7	33.2		17.7	65.2		19.3	46.7		21.3	31.8	
LOS	C	C		B	E		B	D		C	C	
Approach Delay		32.3			59.8			40.8			29.1	
Approach LOS		C			E			D			C	
Queue Length 50th (m)	13.6	59.0		7.8	104.7		16.3	97.2		14.3	57.7	
Queue Length 95th (m)	24.1	89.5		15.6	#169.8		28.0	#159.0		25.4	90.0	
Internal Link Dist (m)		584.2			654.0			403.4			630.7	
Turn Bay Length (m)	40.0			20.0			70.0			50.0		
Base Capacity (vph)	199	586		367	584		387	583		285	573	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.58	0.60		0.19	0.92		0.35	0.85		0.42	0.62	

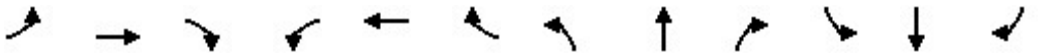
Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 92 (84%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	

Intersection Signal Delay: 41.7	Intersection LOS: D
Intersection Capacity Utilization 83.1%	ICU Level of Service E
Analysis Period (min) 15	

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

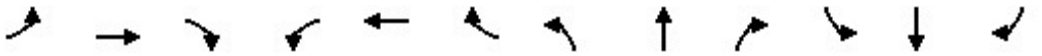
Splits and Phases: 1: Upper Wellington St & Stone Church Rd E



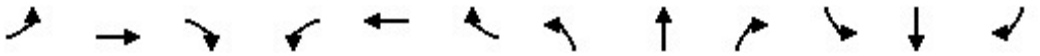


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Future Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.95		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	1616		1692	1602		1644	1515		1676	1467	
Flt Permitted	0.15	1.00		0.40	1.00		0.40	1.00		0.25	1.00	
Satd. Flow (perm)	254	1616		716	1602		695	1515		442	1467	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	278	74	68	364	171	136	401	93	121	224	129
RTOR Reduction (vph)	0	9	0	0	16	0	0	7	0	0	18	0
Lane Group Flow (vph)	115	343	0	68	519	0	136	487	0	121	335	0
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	45.4	38.5		42.4	37.0		48.8	41.8		48.4	41.6	
Effective Green, g (s)	45.4	38.5		42.4	37.0		48.8	41.8		48.4	41.6	
Actuated g/C Ratio	0.41	0.35		0.39	0.34		0.44	0.38		0.44	0.38	
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Lane Grp Cap (vph)	193	565		323	538		368	575		270	554	
v/s Ratio Prot	c0.04	0.21		0.01	c0.32		0.02	c0.32		c0.03	0.23	
v/s Ratio Perm	0.21			0.07			0.14			0.17		
v/c Ratio	0.60	0.61		0.21	0.96		0.37	0.85		0.45	0.60	
Uniform Delay, d1	24.1	29.5		22.1	35.9		19.2	31.2		20.7	27.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.3	4.8		0.1	31.0		0.2	14.3		0.4	4.8	
Delay (s)	27.4	34.3		22.2	66.9		19.5	45.4		21.1	32.4	
Level of Service	C	C		C	E		B	D		C	C	
Approach Delay (s)		32.6			61.8			39.8			29.5	
Approach LOS		C			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	42.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Future Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	25.0		0.0	70.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor	0.99	0.98		1.00	0.98		1.00	1.00			1.00	
Frt		0.892			0.857			0.995			0.990	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1544	1334	0	1745	1483	0	1292	1723	0	1678	3016	0
Flt Permitted	0.526			0.732			0.479			0.259		
Satd. Flow (perm)	848	1334	0	1340	1483	0	649	1723	0	457	3016	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28			36			2			9	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		189.9			315.6			654.7			381.0	
Travel Time (s)		13.7			22.7			47.1			27.4	
Confl. Peds. (#/hr)	12		2	2		12	4		5	5		4
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	13%	0%	29%	0%	0%	4%	35%	6%	5%	4%	11%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	0
Adj. Flow (vph)	96	11	28	59	9	176	32	810	26	68	446	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	39	0	59	185	0	32	836	0	68	478	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.09	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												

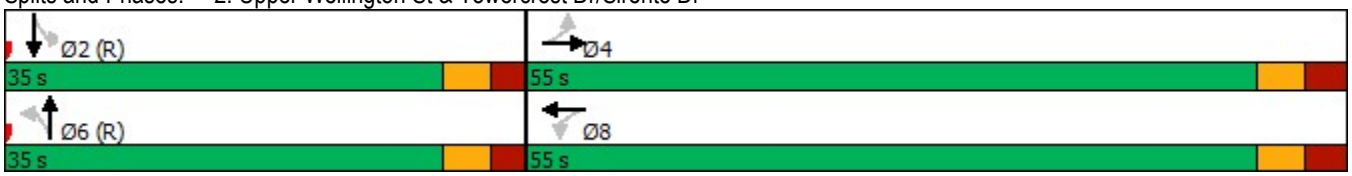


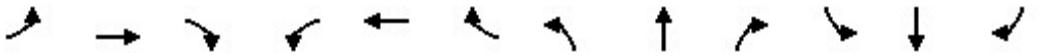
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	35.2	35.2		35.2	35.2		25.7	25.7		25.7	25.7	
Total Split (s)	55.0	55.0		55.0	55.0		35.0	35.0		35.0	35.0	
Total Split (%)	61.1%	61.1%		61.1%	61.1%		38.9%	38.9%		38.9%	38.9%	
Maximum Green (s)	48.8	48.8		48.8	48.8		29.3	29.3		29.3	29.3	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.9	2.9		2.9	2.9		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	12.0	12.0		12.0	12.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	17.0	17.0		17.0	17.0		13.0	13.0		9.0	9.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	14.0	14.0		14.0	14.0		64.1	64.1		64.1	64.1	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.71	0.71		0.71	0.71	
v/c Ratio	0.73	0.17		0.28	0.71		0.07	0.68		0.21	0.22	
Control Delay	65.5	16.5		35.4	43.4		5.6	11.9		6.8	4.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	65.5	16.5		35.4	43.4		5.6	11.9		6.8	4.4	
LOS	E	B		D	D		A	B		A	A	
Approach Delay		51.4			41.5			11.7			4.7	
Approach LOS		D			D			B			A	
Queue Length 50th (m)	16.3	1.7		9.3	25.1		1.4	64.4		2.9	10.4	
Queue Length 95th (m)	26.7	8.0		16.7	37.3		4.8	114.3		6.6	15.3	
Internal Link Dist (m)		165.9			291.6			630.7			357.0	
Turn Bay Length (m)	60.0			25.0			70.0			45.0		
Base Capacity (vph)	459	736		726	820		462	1228		325	2151	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.21	0.05		0.08	0.23		0.07	0.68		0.21	0.22	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	

Intersection Signal Delay: 16.6	Intersection LOS: B
Intersection Capacity Utilization 84.9%	ICU Level of Service E
Analysis Period (min) 15	

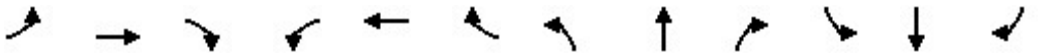
Splits and Phases: 2: Upper Wellington St & Towercrest Dr/Sirente Dr



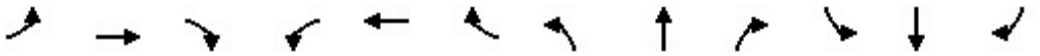


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Future Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	0.86		1.00	1.00		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)	1531	1334		1740	1484		1285	1723		1674	3016	
Flt Permitted	0.53	1.00		0.73	1.00		0.48	1.00		0.26	1.00	
Satd. Flow (perm)	848	1334		1340	1484		648	1723		457	3016	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	96	11	28	59	9	176	32	810	26	68	446	32
RTOR Reduction (vph)	0	24	0	0	30	0	0	1	0	0	3	0
Lane Group Flow (vph)	96	15	0	59	155	0	32	835	0	68	475	0
Confl. Peds. (#/hr)	12		2	2		12	4		5	5		4
Heavy Vehicles (%)	13%	0%	29%	0%	0%	4%	35%	6%	5%	4%	11%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	14.0	14.0		14.0	14.0		64.1	64.1		64.1	64.1	
Effective Green, g (s)	14.0	14.0		14.0	14.0		64.1	64.1		64.1	64.1	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	131	207		208	230		461	1227		325	2148	
v/s Ratio Prot		0.01			0.10			c0.48			0.16	
v/s Ratio Perm	c0.11			0.04			0.05			0.15		
v/c Ratio	0.73	0.07		0.28	0.67		0.07	0.68		0.21	0.22	
Uniform Delay, d1	36.2	32.5		33.6	35.8		3.9	7.2		4.4	4.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.87	0.84	
Incremental Delay, d2	16.6	0.1		0.3	6.0		0.3	3.1		1.5	0.2	
Delay (s)	52.8	32.5		33.8	41.8		4.2	10.3		5.3	4.0	
Level of Service	D	C		C	D		A	B		A	A	
Approach Delay (s)		46.9			39.9			10.1			4.1	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Future Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	45.0		50.0	30.0		40.0	30.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00		0.98	1.00		0.98	0.99	1.00		1.00	1.00	
Frt			0.850			0.850		0.982			0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1745	1837	1516	1711	1837	1561	1662	3044	0	1678	2972	0
Flt Permitted	0.740			0.737			0.518			0.317		
Satd. Flow (perm)	1354	1837	1492	1323	1837	1537	901	3044	0	559	2972	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41			80		25			7	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		439.8			565.8			381.0			347.8	
Travel Time (s)		31.7			40.7			27.4			25.0	
Confl. Peds. (#/hr)	4		4	4		4	8		5	5		8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	3%	2%	0%	0%	5%	7%	2%	4%	12%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	26	0	0	19	0
Adj. Flow (vph)	18	31	37	54	26	80	49	775	109	32	380	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	31	37	54	26	80	49	884	0	32	396	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.12	1.04	1.04	1.10	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



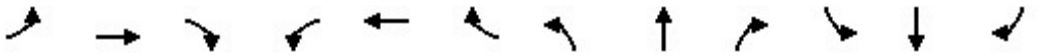
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		
Detector Phase	4	4	4	4	4	4	2	2		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	30.0	30.0		30.0	30.0	
Minimum Split (s)	36.2	36.2	36.2	36.2	36.2	36.2	38.4	38.4		38.4	38.4	
Total Split (s)	37.0	37.0	37.0	37.0	37.0	37.0	53.0	53.0		53.0	53.0	
Total Split (%)	41.1%	41.1%	41.1%	41.1%	41.1%	41.1%	58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	30.8	30.8	30.8	30.8	30.8	30.8	46.6	46.6		46.6	46.6	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	3.1	3.1		3.1	3.1	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	22.0	22.0		22.0	22.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	10.4	10.4	10.4	10.4	10.4	10.4	71.5	71.5		71.5	71.5	
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.12	0.12	0.79	0.79		0.79	0.79	
v/c Ratio	0.11	0.15	0.18	0.35	0.12	0.32	0.07	0.36		0.07	0.17	
Control Delay	37.1	37.2	12.7	43.3	36.8	12.6	4.3	4.7		3.8	3.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	37.1	37.2	12.7	43.3	36.8	12.6	4.3	4.7		3.8	3.2	
LOS	D	D	B	D	D	B	A	A		A	A	
Approach Delay		26.6			26.9			4.6			3.3	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	2.9	4.9	0.0	8.8	4.1	0.0	1.7	18.9		1.2	8.2	
Queue Length 95th (m)	8.9	12.7	7.7	19.5	11.2	12.1	m4.5	47.2		3.8	13.6	
Internal Link Dist (m)		415.8			541.8			357.0			323.8	
Turn Bay Length (m)	45.0		50.0	30.0		40.0	30.0			50.0		
Base Capacity (vph)	463	628	537	452	628	578	715	2422		443	2361	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.04	0.05	0.07	0.12	0.04	0.14	0.07	0.36		0.07	0.17	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 2:NBSB and 6:, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.36	

Intersection Signal Delay: 7.7	Intersection LOS: A
Intersection Capacity Utilization 61.1%	ICU Level of Service B
Analysis Period (min) 15	

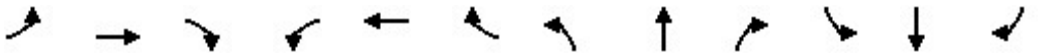
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Upper Wellington St & Limeridge Rd E

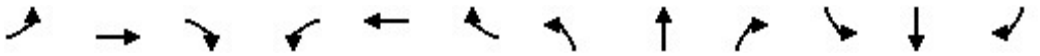


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Future Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	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		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1739	1837	1492	1705	1837	1537	1651	3042		1674	2972	
Flt Permitted	0.74	1.00	1.00	0.74	1.00	1.00	0.52	1.00		0.32	1.00	
Satd. Flow (perm)	1355	1837	1492	1322	1837	1537	901	3042		559	2972	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	31	37	54	26	80	49	775	109	32	380	16
RTOR Reduction (vph)	0	0	34	0	0	73	0	6	0	0	2	0
Lane Group Flow (vph)	18	31	3	54	26	7	49	878	0	32	394	0
Confl. Peds. (#/hr)	4		4	4		4	8		5	5		8
Heavy Vehicles (%)	0%	0%	3%	2%	0%	0%	5%	7%	2%	4%	12%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	26	0	0	19	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		
Actuated Green, G (s)	8.4	8.4	8.4	8.4	8.4	8.4	69.0	69.0		69.0	69.0	
Effective Green, g (s)	8.4	8.4	8.4	8.4	8.4	8.4	69.0	69.0		69.0	69.0	
Actuated g/C Ratio	0.09	0.09	0.09	0.09	0.09	0.09	0.77	0.77		0.77	0.77	
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	126	171	139	123	171	143	690	2332		428	2278	
v/s Ratio Prot		0.02			0.01			c0.29			0.13	
v/s Ratio Perm	0.01		0.00	c0.04		0.00	0.05			0.06		
v/c Ratio	0.14	0.18	0.02	0.44	0.15	0.05	0.07	0.38		0.07	0.17	
Uniform Delay, d1	37.5	37.6	37.1	38.6	37.5	37.2	2.6	3.4		2.6	2.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.21	1.18		1.00	1.00	
Incremental Delay, d2	0.2	0.2	0.0	0.9	0.2	0.1	0.2	0.4		0.3	0.2	
Delay (s)	37.7	37.8	37.1	39.5	37.7	37.2	3.3	4.4		2.9	3.0	
Level of Service	D	D	D	D	D	D	A	A		A	A	
Approach Delay (s)		37.5			38.1			4.4			3.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Future Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	20.0		0.0	70.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor		0.99			0.99			0.99		0.99	0.99	
Frt		0.962			0.966			0.966			0.958	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1728	1695	0	1745	1707	0	1646	1653	0	1728	1667	0
Flt Permitted	0.100			0.104			0.124			0.396		
Satd. Flow (perm)	182	1695	0	191	1707	0	215	1653	0	714	1667	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			15			15			20	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		608.2			678.0			427.4			654.7	
Travel Time (s)		43.8			48.8			30.8			47.1	
Confl. Peds. (#/hr)	6		5	5		6	5		8	8		5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	0%	2%	0%	6%	3%	5%	1%	2%	1%
Bus Blockages (#/hr)	0	6	0	0	4	0	0	7	0	0	7	0
Adj. Flow (vph)	187	493	168	91	470	137	85	261	76	199	443	173
Shared Lane Traffic (%)												
Lane Group Flow (vph)	187	661	0	91	607	0	85	337	0	199	616	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.04	1.08	1.04	1.04	1.07	1.04	1.04	1.08	1.04	1.04	1.08	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		1	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	36.9		8.0	36.9		8.0	31.6		8.0	31.6	
Total Split (s)	10.0	45.0		10.0	45.0		10.0	45.0		10.0	45.0	
Total Split (%)	9.1%	40.9%		9.1%	40.9%		9.1%	40.9%		9.1%	40.9%	
Maximum Green (s)	7.0	39.1		7.0	39.1		7.0	39.4		7.0	39.4	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.6		0.0	2.6		0.0	2.3		0.0	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Recall Mode	None	C-Min		None	C-Min		None	Max		None	Max	
Walk Time (s)		12.0			12.0			12.0			12.0	
Flash Dont Walk (s)		19.0			19.0			14.0			14.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	49.7	41.2		48.6	39.1		48.5	39.4		49.7	41.5	
Actuated g/C Ratio	0.45	0.37		0.44	0.36		0.44	0.36		0.45	0.38	
v/c Ratio	1.04	1.02		0.52	0.99		0.47	0.56		0.51	0.96	
Control Delay	102.3	76.8		26.9	68.1		25.3	31.4		23.5	61.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	102.3	76.8		26.9	68.1		25.3	31.4		23.5	61.5	
LOS	F	E		C	E		C	C		C	E	
Approach Delay		82.4			62.8			30.1			52.2	
Approach LOS		F			E			C			D	
Queue Length 50th (m)	~27.5	~156.5		10.6	125.6		9.8	54.9		24.7	~130.9	
Queue Length 95th (m)	#71.7	#225.8		19.7	#199.0		18.8	83.6		39.8	#204.3	
Internal Link Dist (m)		584.2			654.0			403.4			630.7	
Turn Bay Length (m)	40.0			20.0			70.0			50.0		
Base Capacity (vph)	180	645		183	616		186	601		387	641	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	1.04	1.02		0.50	0.99		0.46	0.56		0.51	0.96	

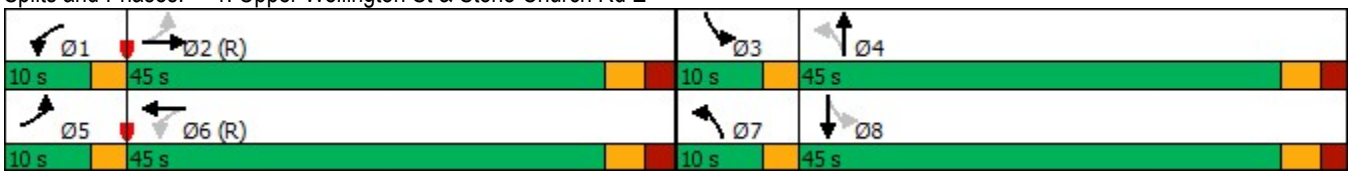
Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 72 (65%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.04	

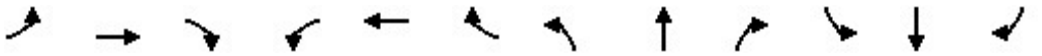
Intersection Signal Delay: 60.7	Intersection LOS: E
Intersection Capacity Utilization 93.7%	ICU Level of Service F
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

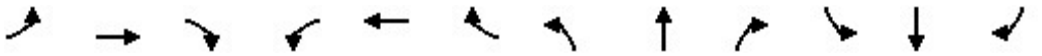
Splits and Phases: 1: Upper Wellington St & Stone Church Rd E



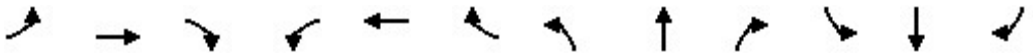


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Future Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1695		1745	1708		1646	1654		1722	1667	
Flt Permitted	0.10	1.00		0.10	1.00		0.12	1.00		0.40	1.00	
Satd. Flow (perm)	182	1695		191	1708		214	1654		718	1667	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	187	493	168	91	470	137	85	261	76	199	443	173
RTOR Reduction (vph)	0	11	0	0	10	0	0	10	0	0	12	0
Lane Group Flow (vph)	187	650	0	91	597	0	85	327	0	199	604	0
Confl. Peds. (#/hr)	6		5	5		6	5		8	8		5
Heavy Vehicles (%)	1%	1%	1%	0%	2%	0%	6%	3%	5%	1%	2%	1%
Bus Blockages (#/hr)	0	6	0	0	4	0	0	7	0	0	7	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	47.0	40.0		44.0	38.5		45.5	40.0		48.5	41.5	
Effective Green, g (s)	47.0	40.0		44.0	38.5		45.5	40.0		48.5	41.5	
Actuated g/C Ratio	0.43	0.36		0.40	0.35		0.41	0.36		0.44	0.38	
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Lane Grp Cap (vph)	176	616		154	597		160	601		380	628	
v/s Ratio Prot	c0.07	0.38		0.03	0.35		0.03	0.20		c0.03	c0.36	
v/s Ratio Perm	c0.39			0.21			0.19			0.20		
v/c Ratio	1.06	1.06		0.59	1.00		0.53	0.54		0.52	0.96	
Uniform Delay, d1	26.3	35.0		26.3	35.8		24.1	27.8		21.4	33.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	85.4	51.8		4.0	36.9		1.7	3.5		0.6	27.5	
Delay (s)	111.7	86.8		30.3	72.7		25.8	31.3		22.0	61.0	
Level of Service	F	F		C	E		C	C		C	E	
Approach Delay (s)		92.3			67.2			30.2			51.5	
Approach LOS		F			E			C			D	

Intersection Summary			
HCM 2000 Control Delay	64.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	93.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Future Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	25.0		0.0	70.0		0.0	45.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor	0.98	0.96		0.97	0.97		0.99	0.99		0.99	1.00	
Frt		0.878			0.869			0.987			0.991	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1491	1242	0	1430	1232	0	1544	1636	0	1572	3205	0
Flt Permitted	0.715			0.733			0.302			0.392		
Satd. Flow (perm)	1103	1242	0	1074	1232	0	487	1636	0	641	3205	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30			56			8			10	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		189.9			315.6			654.7			381.0	
Travel Time (s)		13.7			22.7			47.1			27.4	
Confl. Peds. (#/hr)	21		18	18		21	20		22	22		20
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	17%	20%	26%	22%	33%	25%	13%	8%	32%	11%	5%	21%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	7	0
Adj. Flow (vph)	61	7	30	30	8	56	30	574	56	94	866	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	37	0	30	64	0	30	630	0	94	919	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.06	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												

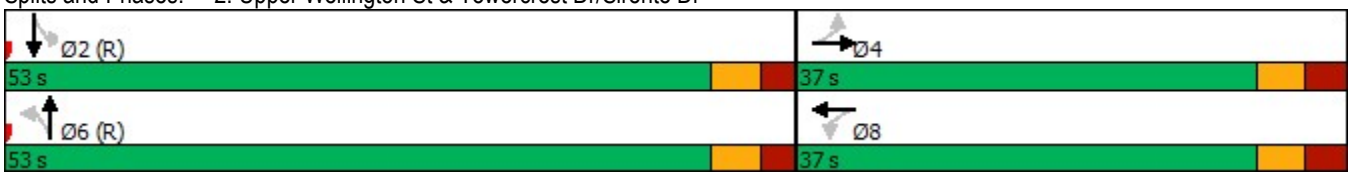


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	35.2	35.2		35.2	35.2		25.7	25.7		25.7	25.7	
Total Split (s)	37.0	37.0		37.0	37.0		53.0	53.0		53.0	53.0	
Total Split (%)	41.1%	41.1%		41.1%	41.1%		58.9%	58.9%		58.9%	58.9%	
Maximum Green (s)	30.8	30.8		30.8	30.8		47.3	47.3		47.3	47.3	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.9	2.9		2.9	2.9		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	12.0	12.0		12.0	12.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	17.0	17.0		17.0	17.0		13.0	13.0		9.0	9.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	10.9	10.9		10.9	10.9		71.6	71.6		71.6	71.6	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.80		0.80	0.80	
v/c Ratio	0.46	0.21		0.23	0.32		0.08	0.48		0.18	0.36	
Control Delay	48.1	18.5		39.8	16.9		4.0	5.9		3.3	2.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	48.1	18.5		39.8	16.9		4.0	5.9		3.3	2.7	
LOS	D	B		D	B		A	A		A	A	
Approach Delay		36.9			24.2			5.8			2.7	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	10.1	1.1		4.8	1.3		1.1	33.9		2.9	16.7	
Queue Length 95th (m)	20.9	9.0		12.3	11.5		3.8	62.1		6.7	22.2	
Internal Link Dist (m)		165.9			291.6			630.7			357.0	
Turn Bay Length (m)	60.0			25.0			70.0			45.0		
Base Capacity (vph)	377	444		367	458		387	1303		510	2551	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.08		0.08	0.14		0.08	0.48		0.18	0.36	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 3 (3%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	

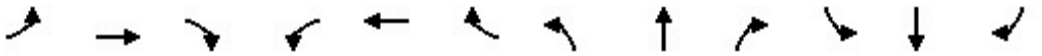
Intersection Signal Delay: 6.7	Intersection LOS: A
Intersection Capacity Utilization 77.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: Upper Wellington St & Towercrest Dr/Sirente Dr

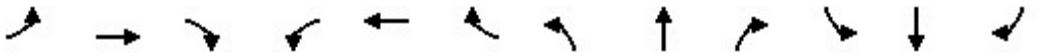


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Future Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.97		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		0.97	1.00		0.99	1.00		0.98	1.00	
Frt	1.00	0.88		1.00	0.87		1.00	0.99		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)	1465	1242		1392	1232		1521	1635		1544	3206	
Flt Permitted	0.72	1.00		0.73	1.00		0.30	1.00		0.39	1.00	
Satd. Flow (perm)	1103	1242		1074	1232		483	1635		637	3206	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	61	7	30	30	8	56	30	574	56	94	866	53
RTOR Reduction (vph)	0	27	0	0	50	0	0	2	0	0	2	0
Lane Group Flow (vph)	61	10	0	30	14	0	30	628	0	94	917	0
Confl. Peds. (#/hr)	21		18	18		21	20		22	22		20
Heavy Vehicles (%)	17%	20%	26%	22%	33%	25%	13%	8%	32%	11%	5%	21%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	7	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	8.9	8.9		8.9	8.9		69.2	69.2		69.2	69.2	
Effective Green, g (s)	8.9	8.9		8.9	8.9		69.2	69.2		69.2	69.2	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.77	0.77		0.77	0.77	
Clearance Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	109	122		106	121		371	1257		489	2465	
v/s Ratio Prot		0.01			0.01			c0.38			0.29	
v/s Ratio Perm	c0.06			0.03			0.06			0.15		
v/c Ratio	0.56	0.08		0.28	0.11		0.08	0.50		0.19	0.37	
Uniform Delay, d1	38.7	36.8		37.6	36.9		2.6	3.9		2.8	3.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.66	0.62	
Incremental Delay, d2	3.5	0.1		0.5	0.1		0.4	1.4		0.9	0.4	
Delay (s)	42.2	36.9		38.1	37.1		3.0	5.3		2.7	2.5	
Level of Service	D	D		D	D		A	A		A	A	
Approach Delay (s)		40.2			37.4			5.2			2.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Future Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	45.0		50.0	30.0		40.0	30.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.99		0.98	0.99		0.98	1.00	1.00		1.00	1.00	
Frt			0.850			0.850		0.976			0.998	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1745	1766	1561	1745	1837	1531	1711	3029	0	1745	3195	0
Flt Permitted	0.725			0.722			0.350			0.433		
Satd. Flow (perm)	1316	1766	1531	1317	1837	1493	629	3029	0	794	3195	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			52			62		35			3	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		439.8			565.8			381.0			347.8	
Travel Time (s)		31.7			40.7			27.4			25.0	
Confl. Peds. (#/hr)	14		8	8		14	5		3	3		5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	4%	0%	0%	0%	2%	2%	13%	0%	0%	8%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	5	0	0	5	0
Adj. Flow (vph)	24	53	52	113	49	62	58	487	95	71	774	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	24	53	52	113	49	62	58	582	0	71	787	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.06	1.04	1.04	1.06	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



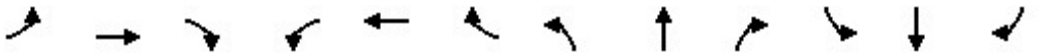
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		
Detector Phase	4	4	4	4	4	4	2	2		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	30.0	30.0		30.0	30.0	
Minimum Split (s)	36.2	36.2	36.2	36.2	36.2	36.2	38.4	38.4		38.4	38.4	
Total Split (s)	40.0	40.0	40.0	40.0	40.0	40.0	50.0	50.0		50.0	50.0	
Total Split (%)	44.4%	44.4%	44.4%	44.4%	44.4%	44.4%	55.6%	55.6%		55.6%	55.6%	
Maximum Green (s)	33.8	33.8	33.8	33.8	33.8	33.8	43.6	43.6		43.6	43.6	
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	3.1	3.1		3.1	3.1	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		10.0	10.0	
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	22.0	22.0		22.0	22.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	13.2	13.2	13.2	13.2	13.2	13.2	68.7	68.7		68.7	68.7	
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.15	0.76	0.76		0.76	0.76	
v/c Ratio	0.12	0.20	0.19	0.59	0.18	0.23	0.12	0.25		0.12	0.32	
Control Delay	32.8	34.1	10.8	47.6	33.6	10.6	6.3	4.9		5.5	5.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	32.8	34.1	10.8	47.6	33.6	10.6	6.3	4.9		5.5	5.3	
LOS	C	C	B	D	C	B	A	A		A	A	
Approach Delay		24.5			34.3			5.0			5.3	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	3.7	8.3	0.0	18.7	7.6	0.0	2.3	12.2		3.1	21.7	
Queue Length 95th (m)	9.8	17.0	8.9	32.7	16.1	9.8	m9.6	31.6		9.5	39.6	
Internal Link Dist (m)		415.8			541.8			357.0			323.8	
Turn Bay Length (m)	45.0		50.0	30.0		40.0	30.0			50.0		
Base Capacity (vph)	494	663	607	494	689	599	480	2321		606	2440	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.05	0.08	0.09	0.23	0.07	0.10	0.12	0.25		0.12	0.32	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 75 (83%), Referenced to phase 2:NBSB and 6:, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	

Intersection Signal Delay: 10.0	Intersection LOS: B
Intersection Capacity Utilization 83.4%	ICU Level of Service E
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Upper Wellington St & Limeridge Rd E

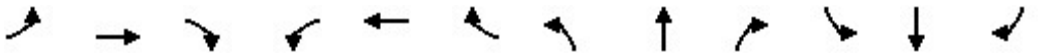


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Future Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	0.99	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	0.98		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1724	1766	1531	1733	1837	1493	1707	3028		1742	3193	
Flt Permitted	0.73	1.00	1.00	0.72	1.00	1.00	0.35	1.00		0.43	1.00	
Satd. Flow (perm)	1316	1766	1531	1318	1837	1493	629	3028		793	3193	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	24	53	52	113	49	62	58	487	95	71	774	13
RTOR Reduction (vph)	0	0	46	0	0	54	0	9	0	0	1	0
Lane Group Flow (vph)	24	53	6	113	49	8	58	573	0	71	786	0
Confl. Peds. (#/hr)	14		8	8		14	5		3	3		5
Heavy Vehicles (%)	0%	4%	0%	0%	0%	2%	2%	13%	0%	0%	8%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	5	0	0	5	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		
Actuated Green, G (s)	11.2	11.2	11.2	11.2	11.2	11.2	66.2	66.2		66.2	66.2	
Effective Green, g (s)	11.2	11.2	11.2	11.2	11.2	11.2	66.2	66.2		66.2	66.2	
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.12	0.12	0.74	0.74		0.74	0.74	
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	163	219	190	164	228	185	462	2227		583	2348	
v/s Ratio Prot		0.03			0.03			0.19			c0.25	
v/s Ratio Perm	0.02		0.00	c0.09		0.01	0.09			0.09		
v/c Ratio	0.15	0.24	0.03	0.69	0.21	0.04	0.13	0.26		0.12	0.33	
Uniform Delay, d1	35.1	35.6	34.6	37.7	35.4	34.7	3.5	3.9		3.5	4.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.12	1.07		1.00	1.00	
Incremental Delay, d2	0.2	0.2	0.0	9.2	0.2	0.0	0.5	0.3		0.4	0.4	
Delay (s)	35.3	35.8	34.7	46.9	35.6	34.7	4.4	4.4		3.9	4.6	
Level of Service	D	D	C	D	D	C	A	A		A	A	
Approach Delay (s)		35.2			41.1			4.4			4.5	
Approach LOS		D			D			A			A	

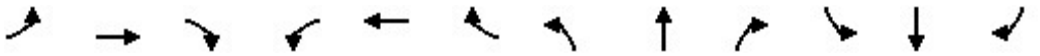
Intersection Summary				
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.39			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	83.4%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Appendix E

Synchro Reports -
Future Conditions (2031)
“Three-lane Cross Section”



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Future Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	20.0		0.0	70.0		35.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor	1.00	0.99		1.00	0.99		1.00	0.99		0.99	0.99	
Frt		0.968			0.952			0.972			0.945	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	1616	0	1694	1603	0	1646	1517	0	1678	1467	0
Flt Permitted	0.201			0.420			0.397			0.219		
Satd. Flow (perm)	351	1616	0	747	1603	0	686	1517	0	385	1467	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			32			14			35	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		608.2			678.0			427.4			654.7	
Travel Time (s)		43.8			48.8			30.8			47.1	
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Adj. Flow (vph)	115	278	74	68	364	171	136	401	93	121	224	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	352	0	68	535	0	136	494	0	121	353	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.11	1.04	1.04	1.11	1.04	1.04	1.19	1.04	1.04	1.17	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		1	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	36.9		8.0	36.9		8.0	31.6		8.0	31.6	
Total Split (s)	8.0	37.4		8.0	37.4		8.0	31.6		8.0	31.6	
Total Split (%)	9.4%	44.0%		9.4%	44.0%		9.4%	37.2%		9.4%	37.2%	
Maximum Green (s)	5.0	31.5		5.0	31.5		5.0	26.0		5.0	26.0	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.6		0.0	2.6		0.0	2.3		0.0	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Recall Mode	None	Min		None	Min		None	Max		None	Max	
Walk Time (s)		12.0			12.0			12.0			12.0	
Flash Dont Walk (s)		19.0			19.0			14.0			14.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	34.8	28.0		34.8	28.0		33.0	26.6		33.0	26.6	
Actuated g/C Ratio	0.44	0.36		0.44	0.36		0.42	0.34		0.42	0.34	
v/c Ratio	0.48	0.60		0.17	0.90		0.39	0.94		0.49	0.68	
Control Delay	19.0	25.1		12.4	43.9		18.9	57.6		22.6	30.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.0	25.1		12.4	43.9		18.9	57.6		22.6	30.6	
LOS	B	C		B	D		B	E		C	C	
Approach Delay		23.6			40.3			49.2			28.6	
Approach LOS		C			D			D			C	
Queue Length 50th (m)	9.6	42.6		5.5	75.1		13.3	~86.4		11.7	46.3	
Queue Length 95th (m)	18.3	69.2		11.8	#133.3		24.6	#144.3		22.1	#85.7	
Internal Link Dist (m)		584.2			654.0			403.4			630.7	
Turn Bay Length (m)	60.0			20.0			70.0			50.0		
Base Capacity (vph)	240	674		392	677		351	523		246	521	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.48	0.52		0.17	0.79		0.39	0.94		0.49	0.68	

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 78.4			
Natural Cycle: 85			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 36.7		Intersection LOS: D	

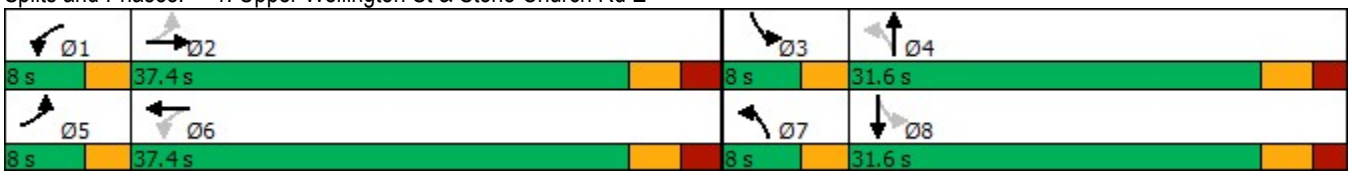
Intersection Capacity Utilization 83.1% ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

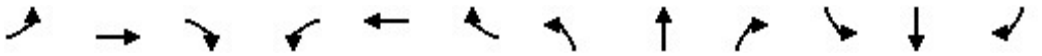
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Upper Wellington St & Stone Church Rd E

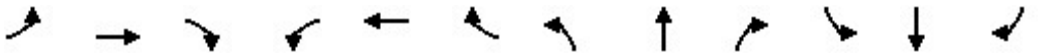


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Future Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.95		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	1617		1693	1603		1645	1517		1676	1468	
Flt Permitted	0.20	1.00		0.42	1.00		0.40	1.00		0.22	1.00	
Satd. Flow (perm)	351	1617		748	1603		688	1517		387	1468	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	278	74	68	364	171	136	401	93	121	224	129
RTOR Reduction (vph)	0	12	0	0	21	0	0	9	0	0	23	0
Lane Group Flow (vph)	115	340	0	68	514	0	136	485	0	121	330	0
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	31.9	28.1		31.9	28.1		30.4	26.6		30.4	26.6	
Effective Green, g (s)	31.9	28.1		31.9	28.1		30.4	26.6		30.4	26.6	
Actuated g/C Ratio	0.40	0.35		0.40	0.35		0.38	0.33		0.38	0.33	
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Lane Grp Cap (vph)	202	569		344	564		307	505		208	489	
v/s Ratio Prot	c0.03	0.21		0.01	c0.32		0.02	c0.32		c0.03	0.22	
v/s Ratio Perm	0.20			0.07			0.15			0.19		
v/c Ratio	0.57	0.60		0.20	0.91		0.44	0.96		0.58	0.67	
Uniform Delay, d1	17.3	21.2		15.3	24.7		17.9	26.1		18.1	22.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.2	1.1		0.1	18.8		0.4	31.2		2.7	7.3	
Delay (s)	19.5	22.3		15.4	43.4		18.2	57.3		20.8	30.1	
Level of Service	B	C		B	D		B	E		C	C	
Approach Delay (s)		21.6			40.3			48.9			27.7	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	17.5
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Future Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	25.0		0.0	60.0		0.0	60.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor	0.98	0.98		1.00	0.96		1.00	1.00			1.00	
Frt		0.892			0.857			0.995			0.990	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1544	1333	0	1745	1458	0	1292	1723	0	1678	1538	0
Flt Permitted	0.480			0.732			0.465			0.270		
Satd. Flow (perm)	768	1333	0	1340	1458	0	630	1723	0	477	1538	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28			176			3			6	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		189.9			315.6			654.7			381.0	
Travel Time (s)		13.7			22.7			47.1			27.4	
Confl. Peds. (#/hr)	12		2	2		12	4		5	5		4
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	13%	0%	29%	0%	0%	4%	35%	6%	5%	4%	11%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	0
Adj. Flow (vph)	96	11	28	59	9	176	32	810	26	68	446	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	39	0	59	185	0	32	836	0	68	478	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.13	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												

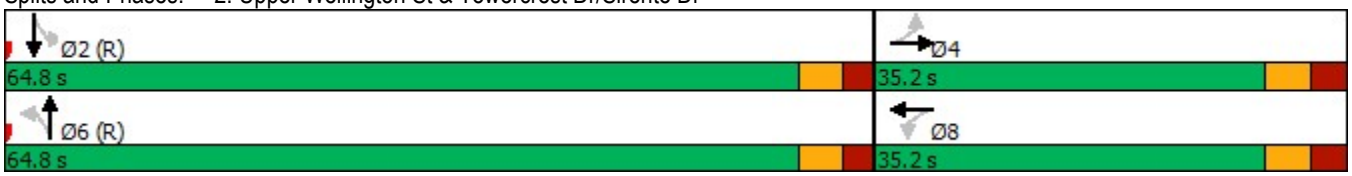


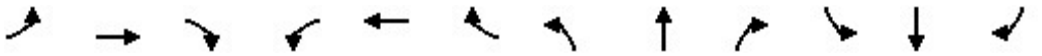
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	35.2	35.2		35.2	35.2		25.7	25.7		25.7	25.7	
Total Split (s)	35.2	35.2		35.2	35.2		64.8	64.8		64.8	64.8	
Total Split (%)	35.2%	35.2%		35.2%	35.2%		64.8%	64.8%		64.8%	64.8%	
Maximum Green (s)	29.0	29.0		29.0	29.0		59.1	59.1		59.1	59.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.9	2.9		2.9	2.9		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	12.0	12.0		12.0	12.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	17.0	17.0		17.0	17.0		13.0	13.0		9.0	9.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	14.4	14.4		14.4	14.4		73.7	73.7		73.7	73.7	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.74	0.74		0.74	0.74	
v/c Ratio	0.87	0.18		0.31	0.51		0.07	0.66		0.19	0.42	
Control Delay	97.2	18.6		40.6	11.7		5.2	10.9		5.9	6.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	97.2	18.6		40.6	11.7		5.2	10.9		5.9	6.0	
LOS	F	B		D	B		A	B		A	A	
Approach Delay		74.5			18.7			10.7			6.0	
Approach LOS		E			B			B			A	
Queue Length 50th (m)	18.6	1.9		10.5	1.5		1.4	66.6		2.9	24.4	
Queue Length 95th (m)	30.5	8.8		18.5	14.0		4.7	113.6		7.9	41.2	
Internal Link Dist (m)		165.9			291.6			630.7			357.0	
Turn Bay Length (m)	60.0			25.0			60.0			60.0		
Base Capacity (vph)	222	406		388	547		464	1269		351	1134	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.43	0.10		0.15	0.34		0.07	0.66		0.19	0.42	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 78 (78%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	

Intersection Signal Delay: 15.1	Intersection LOS: B
Intersection Capacity Utilization 84.9%	ICU Level of Service E
Analysis Period (min) 15	

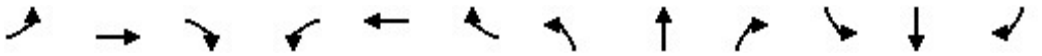
Splits and Phases: 2: Upper Wellington St & Towercrest Dr/Sirente Dr



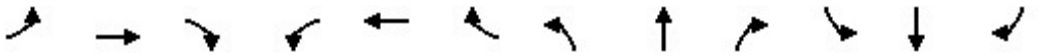


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Future Volume (vph)	79	9	23	48	7	144	26	664	21	56	366	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	0.86		1.00	1.00		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)	1521	1334		1739	1459		1285	1723		1674	1538	
Flt Permitted	0.48	1.00		0.73	1.00		0.46	1.00		0.27	1.00	
Satd. Flow (perm)	769	1334		1339	1459		629	1723		475	1538	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	96	11	28	59	9	176	32	810	26	68	446	32
RTOR Reduction (vph)	0	24	0	0	151	0	0	1	0	0	2	0
Lane Group Flow (vph)	96	15	0	59	34	0	32	835	0	68	476	0
Confl. Peds. (#/hr)	12		2	2		12	4		5	5		4
Heavy Vehicles (%)	13%	0%	29%	0%	0%	4%	35%	6%	5%	4%	11%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	14.4	14.4		14.4	14.4		73.7	73.7		73.7	73.7	
Effective Green, g (s)	14.4	14.4		14.4	14.4		73.7	73.7		73.7	73.7	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.74	0.74		0.74	0.74	
Clearance Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	110	192		192	210		463	1269		350	1133	
v/s Ratio Prot		0.01			0.02			c0.48			0.31	
v/s Ratio Perm	c0.12			0.04			0.05			0.14		
v/c Ratio	0.87	0.08		0.31	0.16		0.07	0.66		0.19	0.42	
Uniform Delay, d1	41.9	37.1		38.3	37.5		3.6	6.7		4.0	5.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.85	0.82	
Incremental Delay, d2	47.1	0.1		0.3	0.1		0.3	2.7		1.2	1.1	
Delay (s)	89.0	37.1		38.7	37.7		3.9	9.4		4.7	5.3	
Level of Service	F	D		D	D		A	A		A	A	
Approach Delay (s)		74.0			37.9			9.2			5.2	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Future Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	45.0		50.0	30.0		40.0	60.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor	0.99		0.97	0.99		0.97	0.99	1.00				0.97
Frt			0.850			0.850		0.982				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1745	1837	1516	1711	1837	1561	1662	1514	0	1678	1515	1358
Flt Permitted	0.740			0.737			0.536			0.276		
Satd. Flow (perm)	1350	1837	1475	1319	1837	1520	931	1514	0	487	1515	1314
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			37			80		12				35
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		439.8			565.8			381.0			347.8	
Travel Time (s)		31.7			40.7			27.4			25.0	
Confl. Peds. (#/hr)	4		4	4		4	8		5	5		8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	3%	2%	0%	0%	5%	7%	2%	4%	12%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	26	0	0	19	0
Adj. Flow (vph)	18	31	37	54	26	80	49	775	109	32	380	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	31	37	54	26	80	49	884	0	32	380	16
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes				
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.20	1.04	1.04	1.16	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5		6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8		6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



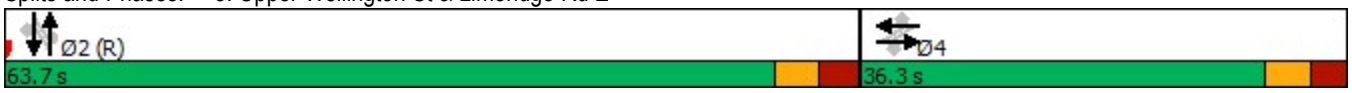
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		2
Detector Phase	4	4	4	4	4	4	2	2		2	2	2
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	30.0	30.0		30.0	30.0	30.0
Minimum Split (s)	36.2	36.2	36.2	36.2	36.2	36.2	38.4	38.4		38.4	38.4	38.4
Total Split (s)	36.3	36.3	36.3	36.3	36.3	36.3	63.7	63.7		63.7	63.7	63.7
Total Split (%)	36.3%	36.3%	36.3%	36.3%	36.3%	36.3%	63.7%	63.7%		63.7%	63.7%	63.7%
Maximum Green (s)	30.1	30.1	30.1	30.1	30.1	30.1	57.3	57.3		57.3	57.3	57.3
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	3.1	3.1		3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	-1.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	5.4
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max	C-Max
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	22.0	22.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	0
Act Effct Green (s)	10.6	10.6	10.6	10.6	10.6	10.6	81.3	81.3		81.3	81.3	82.1
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11	0.11	0.81	0.81		0.81	0.81	0.82
v/c Ratio	0.13	0.16	0.20	0.39	0.13	0.34	0.06	0.72		0.08	0.31	0.01
Control Delay	42.2	42.2	15.7	50.0	41.8	13.8	2.4	6.3		3.7	4.1	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	42.2	42.2	15.7	50.0	41.8	13.8	2.4	6.3		3.7	4.1	0.4
LOS	D	D	B	D	D	B	A	A		A	A	A
Approach Delay		30.8			30.5			6.1			3.9	
Approach LOS		C			C			A			A	
Queue Length 50th (m)	3.3	5.6	0.0	10.0	4.7	0.0	1.2	41.8		1.2	17.8	0.0
Queue Length 95th (m)	9.7	13.8	8.9	21.4	12.1	12.8	m2.6	60.9		3.9	31.9	0.6
Internal Link Dist (m)		415.8			541.8			357.0			323.8	
Turn Bay Length (m)	45.0		50.0	30.0		40.0	60.0			50.0		
Base Capacity (vph)	406	552	469	397	552	513	757	1233		395	1232	1085
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.04	0.06	0.08	0.14	0.05	0.16	0.06	0.72		0.08	0.31	0.01

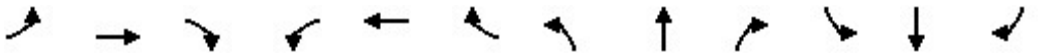
Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 96 (96%), Referenced to phase 2:NBSB and 6:, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	

Intersection Signal Delay: 9.3	Intersection LOS: A
Intersection Capacity Utilization 79.5%	ICU Level of Service D
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

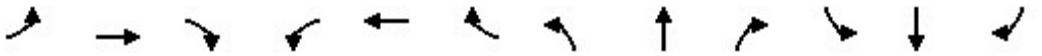
Splits and Phases: 3: Upper Wellington St & Limeridge Rd E



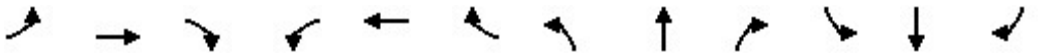


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Future Volume (vph)	17	29	35	51	25	76	47	736	104	30	361	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	5.4
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.99	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		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)	1734	1837	1475	1700	1837	1520	1649	1513		1675	1515	1314
Flt Permitted	0.74	1.00	1.00	0.74	1.00	1.00	0.54	1.00		0.28	1.00	1.00
Satd. Flow (perm)	1351	1837	1475	1319	1837	1520	931	1513		487	1515	1314
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	31	37	54	26	80	49	775	109	32	380	16
RTOR Reduction (vph)	0	0	34	0	0	73	0	3	0	0	0	3
Lane Group Flow (vph)	18	31	3	54	26	7	49	881	0	32	380	13
Confl. Peds. (#/hr)	4		4	4		4	8		5	5		8
Heavy Vehicles (%)	0%	0%	3%	2%	0%	0%	5%	7%	2%	4%	12%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	26	0	0	19	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		2
Actuated Green, G (s)	8.6	8.6	8.6	8.6	8.6	8.6	78.8	78.8		78.8	78.8	78.8
Effective Green, g (s)	8.6	8.6	8.6	8.6	8.6	8.6	78.8	78.8		78.8	78.8	79.8
Actuated g/C Ratio	0.09	0.09	0.09	0.09	0.09	0.09	0.79	0.79		0.79	0.79	0.80
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	6.4
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	116	157	126	113	157	130	733	1192		383	1193	1048
v/s Ratio Prot		0.02			0.01			c0.58			0.25	
v/s Ratio Perm	0.01		0.00	c0.04		0.00	0.05			0.07		0.01
v/c Ratio	0.16	0.20	0.03	0.48	0.17	0.05	0.07	0.74		0.08	0.32	0.01
Uniform Delay, d1	42.3	42.5	41.9	43.6	42.4	42.0	2.4	5.4		2.4	3.0	2.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.50		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.2	0.0	1.2	0.2	0.1	0.1	3.4		0.4	0.7	0.0
Delay (s)	42.6	42.7	41.9	44.7	42.6	42.0	1.9	6.1		2.8	3.7	2.1
Level of Service	D	D	D	D	D	D	A	A		A	A	A
Approach Delay (s)		42.3			43.0			5.8			3.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Future Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	20.0		0.0	70.0		35.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor		0.99			0.99			0.99		0.99	0.99	
Frt		0.962			0.966			0.966			0.958	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	1603	0	1694	1634	0	1646	1505	0	1678	1486	0
Flt Permitted	0.101			0.117			0.146			0.356		
Satd. Flow (perm)	177	1603	0	209	1634	0	253	1505	0	623	1486	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			12			12			17	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		608.2			678.0			427.4			654.7	
Travel Time (s)		43.8			48.8			30.8			47.1	
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Adj. Flow (vph)	187	493	168	91	470	137	85	261	76	199	443	173
Shared Lane Traffic (%)												
Lane Group Flow (vph)	187	661	0	91	607	0	85	337	0	199	616	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.11	1.04	1.04	1.11	1.04	1.04	1.19	1.04	1.04	1.17	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	5	2		1	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	36.9		8.0	36.9		8.0	31.6		8.0	31.6	
Total Split (s)	13.0	60.6		8.0	55.6		8.0	51.4		15.0	58.4	
Total Split (%)	9.6%	44.9%		5.9%	41.2%		5.9%	38.1%		11.1%	43.3%	
Maximum Green (s)	10.0	54.7		5.0	49.7		5.0	45.8		12.0	52.8	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.6		0.0	2.6		0.0	2.3		0.0	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Recall Mode	None	Min		None	Min		None	Max		None	Max	
Walk Time (s)		12.0			12.0			12.0			12.0	
Flash Dont Walk (s)		19.0			19.0			14.0			14.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	65.6	54.7		57.6	49.7		53.9	46.3		63.4	52.8	
Actuated g/C Ratio	0.49	0.41		0.43	0.37		0.40	0.34		0.47	0.39	
v/c Ratio	0.95	1.00		0.63	1.00		0.56	0.64		0.52	1.04	
Control Delay	80.2	75.4		41.3	77.4		36.9	42.9		27.0	87.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	80.2	75.4		41.3	77.4		36.9	42.9		27.0	87.6	
LOS	F	E		D	E		D	D		C	F	
Approach Delay		76.5			72.7			41.7			72.8	
Approach LOS		E			E			D			E	
Queue Length 50th (m)	29.5	~173.5		12.9	158.4		12.4	73.4		31.3	~174.4	
Queue Length 95th (m)	#76.7	#254.1		#25.9	#236.5		22.4	107.5		48.0	#246.4	
Internal Link Dist (m)		584.2			654.0			403.4			630.7	
Turn Bay Length (m)	60.0			20.0			70.0			50.0		
Base Capacity (vph)	196	658		144	609		152	524		386	591	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.95	1.00		0.63	1.00		0.56	0.64		0.52	1.04	

Intersection Summary			
Area Type:	Other		
Cycle Length: 135			
Actuated Cycle Length: 135			
Natural Cycle: 135			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.04			
Intersection Signal Delay: 69.2		Intersection LOS: E	

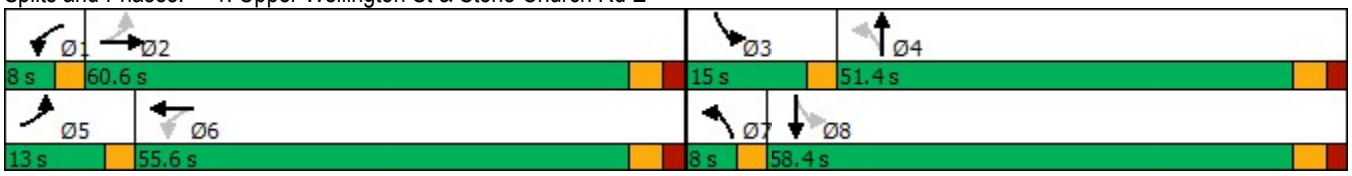
Intersection Capacity Utilization 93.6% ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

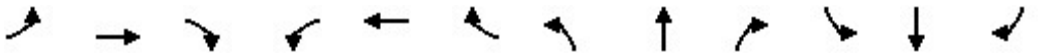
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Upper Wellington St & Stone Church Rd E

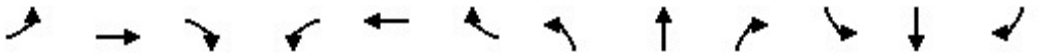


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Future Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1602		1694	1634		1646	1505		1673	1486	
Flt Permitted	0.10	1.00		0.12	1.00		0.15	1.00		0.36	1.00	
Satd. Flow (perm)	176	1602		208	1634		252	1505		627	1486	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	187	493	168	91	470	137	85	261	76	199	443	173
RTOR Reduction (vph)	0	9	0	0	8	0	0	8	0	0	10	0
Lane Group Flow (vph)	187	652	0	91	599	0	85	329	0	199	606	0
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	62.7	54.7		54.7	49.7		51.3	46.3		60.8	52.8	
Effective Green, g (s)	62.7	54.7		54.7	49.7		51.3	46.3		60.8	52.8	
Actuated g/C Ratio	0.46	0.41		0.41	0.37		0.38	0.34		0.45	0.39	
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	
Lane Grp Cap (vph)	191	649		139	601		147	516		371	581	
v/s Ratio Prot	c0.07	c0.41		0.02	0.37		0.02	0.22		c0.05	c0.41	
v/s Ratio Perm	0.38			0.24			0.20			0.20		
v/c Ratio	0.98	1.00		0.65	1.00		0.58	0.64		0.54	1.04	
Uniform Delay, d1	31.7	40.1		30.6	42.6		31.3	37.3		24.6	41.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	58.1	36.5		8.2	35.7		3.4	5.9		0.7	48.8	
Delay (s)	89.9	76.6		38.8	78.3		34.7	43.2		25.4	89.9	
Level of Service	F	E		D	E		C	D		C	F	
Approach Delay (s)		79.6			73.2			41.5			74.2	
Approach LOS		E			E			D			E	

Intersection Summary			
HCM 2000 Control Delay	70.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Future Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	25.0		0.0	60.0		0.0	60.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor	0.98	0.98		1.00	0.97			1.00		1.00	1.00	
Frt		0.878			0.869			0.987			0.991	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1544	1281	0	1745	1490	0	1292	1707	0	1678	1540	0
Flt Permitted	0.715			0.733			0.251			0.393		
Satd. Flow (perm)	1142	1281	0	1342	1490	0	341	1707	0	692	1540	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30			56			9			5	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		189.9			315.6			654.7			381.0	
Travel Time (s)		13.7			22.7			47.1			27.4	
Confl. Peds. (#/hr)	12		2	2		12	4		5	5		4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	13%	0%	29%	0%	0%	4%	35%	6%	5%	4%	11%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	0
Adj. Flow (vph)	61	7	30	30	8	56	30	574	56	94	866	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	37	0	30	64	0	30	630	0	94	919	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.13	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												



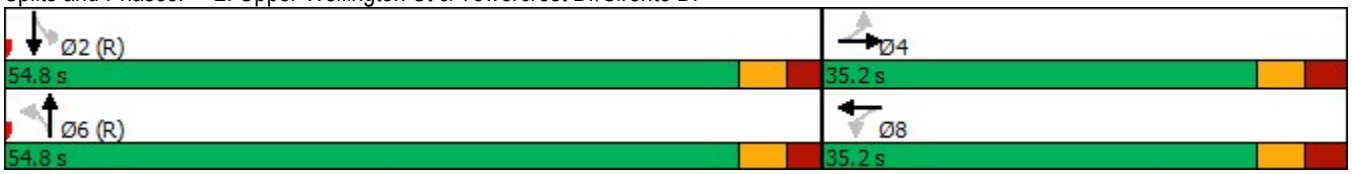
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phase	4	4		8	8		6	6		2	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	35.2	35.2		35.2	35.2		25.7	25.7		25.7	25.7	
Total Split (s)	35.2	35.2		35.2	35.2		54.8	54.8		54.8	54.8	
Total Split (%)	39.1%	39.1%		39.1%	39.1%		60.9%	60.9%		60.9%	60.9%	
Maximum Green (s)	29.0	29.0		29.0	29.0		49.1	49.1		49.1	49.1	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.9	2.9		2.9	2.9		2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	12.0	12.0		12.0	12.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	17.0	17.0		17.0	17.0		13.0	13.0		9.0	9.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	10.7	10.7		10.7	10.7		71.7	71.7		71.7	71.7	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.80		0.80	0.80	
v/c Ratio	0.45	0.21		0.19	0.28		0.11	0.46		0.17	0.75	
Control Delay	47.6	18.5		38.1	15.7		4.5	5.5		3.6	8.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	47.6	18.5		38.1	15.7		4.5	5.5		3.6	8.3	
LOS	D	B		D	B		A	A		A	A	
Approach Delay		36.6			22.9			5.4			7.9	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	10.1	1.1		4.8	1.3		1.1	32.9		2.3	40.6	
Queue Length 95th (m)	20.9	9.1		12.2	11.5		4.1	58.4		m6.8	63.3	
Internal Link Dist (m)		165.9			291.6			630.7			357.0	
Turn Bay Length (m)	60.0			25.0			60.0			60.0		
Base Capacity (vph)	367	433		432	518		272	1362		551	1228	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.17	0.09		0.07	0.12		0.11	0.46		0.17	0.75	

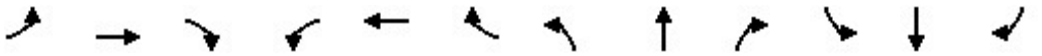
Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 16 (18%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.75	

Intersection Signal Delay: 9.3	Intersection LOS: A
Intersection Capacity Utilization 87.9%	ICU Level of Service E
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

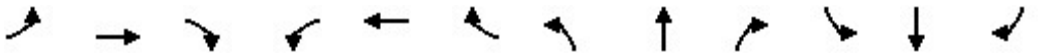
Splits and Phases: 2: Upper Wellington St & Towercrest Dr/Sirente Dr



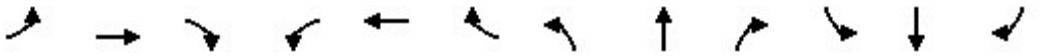


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Future Volume (vph)	54	6	26	26	7	49	26	505	49	83	762	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.88		1.00	0.87		1.00	0.99		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)	1518	1282		1740	1490		1290	1706		1671	1541	
Flt Permitted	0.72	1.00		0.73	1.00		0.25	1.00		0.39	1.00	
Satd. Flow (perm)	1143	1282		1342	1490		341	1706		691	1541	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	61	7	30	30	8	56	30	574	56	94	866	53
RTOR Reduction (vph)	0	27	0	0	51	0	0	2	0	0	1	0
Lane Group Flow (vph)	61	10	0	30	13	0	30	628	0	94	918	0
Confl. Peds. (#/hr)	12		2	2		12	4		5	5		4
Heavy Vehicles (%)	13%	0%	29%	0%	0%	4%	35%	6%	5%	4%	11%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	8.7	8.7		8.7	8.7		69.4	69.4		69.4	69.4	
Effective Green, g (s)	8.7	8.7		8.7	8.7		69.4	69.4		69.4	69.4	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.77	0.77		0.77	0.77	
Clearance Time (s)	6.2	6.2		6.2	6.2		5.7	5.7		5.7	5.7	
Vehicle Extension (s)	1.0	1.0		1.0	1.0		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	110	123		129	144		262	1315		532	1188	
v/s Ratio Prot		0.01			0.01			0.37			c0.60	
v/s Ratio Perm	c0.05			0.02			0.09			0.14		
v/c Ratio	0.55	0.08		0.23	0.09		0.11	0.48		0.18	0.77	
Uniform Delay, d1	38.8	37.0		37.6	37.1		2.6	3.7		2.7	5.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.83	0.56	
Incremental Delay, d2	3.4	0.1		0.3	0.1		0.9	1.2		0.6	4.2	
Delay (s)	42.2	37.1		37.9	37.2		3.5	5.0		2.9	7.5	
Level of Service	D	D		D	D		A	A		A	A	
Approach Delay (s)		40.3			37.4			4.9			7.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Future Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	45.0		50.0	30.0		40.0	60.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor	0.99		0.97	0.99		0.97	1.00	1.00		1.00		0.97
Frt			0.850			0.850		0.976				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1745	1837	1516	1711	1837	1561	1662	1506	0	1678	1515	1358
Flt Permitted	0.725			0.722			0.307			0.411		
Satd. Flow (perm)	1324	1837	1476	1293	1837	1521	536	1506	0	724	1515	1315
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			52			62		16				39
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		439.8			565.8			381.0			347.8	
Travel Time (s)		31.7			40.7			27.4			25.0	
Confl. Peds. (#/hr)	4		4	4		4	8		5	5		8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	3%	2%	0%	0%	5%	7%	2%	4%	12%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	26	0	0	19	0
Adj. Flow (vph)	24	53	52	113	49	62	58	487	95	71	774	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	24	53	52	113	49	62	58	582	0	71	774	13
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes				
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.20	1.04	1.04	1.16	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5		6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8		6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												

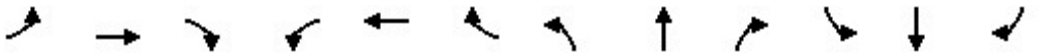


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		2
Detector Phase	4	4	4	4	4	4	2	2		2	2	2
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	30.0	30.0		30.0	30.0	30.0
Minimum Split (s)	36.2	36.2	36.2	36.2	36.2	36.2	38.4	38.4		38.4	38.4	38.4
Total Split (s)	36.2	36.2	36.2	36.2	36.2	36.2	53.8	53.8		53.8	53.8	53.8
Total Split (%)	40.2%	40.2%	40.2%	40.2%	40.2%	40.2%	59.8%	59.8%		59.8%	59.8%	59.8%
Maximum Green (s)	30.0	30.0	30.0	30.0	30.0	30.0	47.4	47.4		47.4	47.4	47.4
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	3.1	3.1		3.1	3.1	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	-1.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	5.4
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max	C-Max
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	22.0	22.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	0
Act Effct Green (s)	13.3	13.3	13.3	13.3	13.3	13.3	68.7	68.7		68.7	68.7	69.5
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.15	0.76	0.76		0.76	0.76	0.77
v/c Ratio	0.12	0.20	0.20	0.59	0.18	0.22	0.14	0.51		0.13	0.67	0.01
Control Delay	32.7	33.8	10.9	48.2	33.5	10.5	6.0	7.1		5.7	11.9	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	32.7	33.8	10.9	48.2	33.5	10.5	6.0	7.1		5.7	11.9	0.2
LOS	C	C	B	D	C	B	A	A		A	B	A
Approach Delay		24.4			34.6			7.0			11.2	
Approach LOS		C			C			A			B	
Queue Length 50th (m)	3.7	8.3	0.0	18.7	7.6	0.0	2.3	31.0		3.2	63.3	0.0
Queue Length 95th (m)	9.8	16.9	8.9	32.8	16.0	9.7	8.4	67.0		9.7	141.7	0.4
Internal Link Dist (m)		415.8			541.8			357.0			323.8	
Turn Bay Length (m)	45.0		50.0	30.0		40.0	60.0			50.0		
Base Capacity (vph)	441	612	526	431	612	548	408	1152		552	1155	1023
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.05	0.09	0.10	0.26	0.08	0.11	0.14	0.51		0.13	0.67	0.01

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.67	

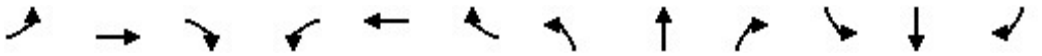
Intersection Signal Delay: 13.5	Intersection LOS: B
Intersection Capacity Utilization 80.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Upper Wellington St & Limeridge Rd E

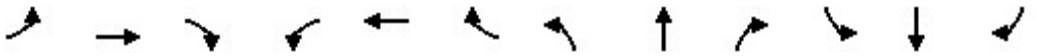


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Future Volume (vph)	23	50	49	107	47	59	55	463	90	67	735	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	5.4
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00	1.00	0.99	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	0.98		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)	1735	1837	1476	1701	1837	1521	1657	1505		1673	1515	1315
Flt Permitted	0.73	1.00	1.00	0.72	1.00	1.00	0.31	1.00		0.41	1.00	1.00
Satd. Flow (perm)	1324	1837	1476	1294	1837	1521	535	1505		724	1515	1315
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	24	53	52	113	49	62	58	487	95	71	774	13
RTOR Reduction (vph)	0	0	45	0	0	54	0	4	0	0	0	3
Lane Group Flow (vph)	24	53	7	113	49	8	58	578	0	71	774	10
Confl. Peds. (#/hr)	4		4	4		4	8		5	5		8
Heavy Vehicles (%)	0%	0%	3%	2%	0%	0%	5%	7%	2%	4%	12%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	26	0	0	19	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4		4	2			2		2
Actuated Green, G (s)	11.3	11.3	11.3	11.3	11.3	11.3	66.1	66.1		66.1	66.1	66.1
Effective Green, g (s)	11.3	11.3	11.3	11.3	11.3	11.3	66.1	66.1		66.1	66.1	67.1
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.73	0.73		0.73	0.73	0.75
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.4	6.4		6.4	6.4	6.4
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	166	230	185	162	230	190	392	1105		531	1112	980
v/s Ratio Prot		0.03			0.03			0.38			c0.51	
v/s Ratio Perm	0.02		0.00	c0.09		0.01	0.11			0.10		0.01
v/c Ratio	0.14	0.23	0.04	0.70	0.21	0.04	0.15	0.52		0.13	0.70	0.01
Uniform Delay, d1	35.0	35.4	34.6	37.7	35.4	34.6	3.6	5.2		3.5	6.5	2.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.88		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.2	0.0	10.1	0.2	0.0	0.7	1.6		0.5	3.6	0.0
Delay (s)	35.2	35.6	34.6	47.8	35.5	34.6	4.2	6.2		4.0	10.1	3.0
Level of Service	D	D	C	D	D	C	A	A		A	B	A
Approach Delay (s)		35.1			41.5			6.0			9.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Future Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	20.0		0.0	70.0		35.0	50.0		50.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor	1.00	0.99		1.00	0.99		1.00	0.99		0.99		0.98
Frt		0.968			0.952			0.972				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	1616	0	1694	1603	0	1646	1517	0	1678	1551	1487
Flt Permitted	0.201			0.420			0.573			0.219		
Satd. Flow (perm)	351	1616	0	747	1603	0	990	1517	0	385	1551	1450
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			32			14				129
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		608.2			678.0			427.4			654.7	
Travel Time (s)		43.8			48.8			30.8			47.1	
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Adj. Flow (vph)	115	278	74	68	364	171	136	401	93	121	224	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	352	0	68	535	0	136	494	0	121	224	129
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.11	1.04	1.04	1.11	1.04	1.04	1.19	1.04	1.04	1.17	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												

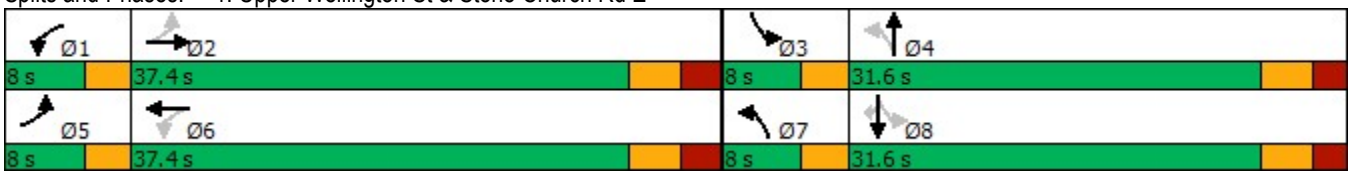


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		7	4		3	8	8
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	20.0		5.0	20.0	20.0
Minimum Split (s)	8.0	36.9		8.0	36.9		8.0	31.6		8.0	31.6	31.6
Total Split (s)	8.0	37.4		8.0	37.4		8.0	31.6		8.0	31.6	31.6
Total Split (%)	9.4%	44.0%		9.4%	44.0%		9.4%	37.2%		9.4%	37.2%	37.2%
Maximum Green (s)	5.0	31.5		5.0	31.5		5.0	26.0		5.0	26.0	26.0
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	3.3
All-Red Time (s)	0.0	2.6		0.0	2.6		0.0	2.3		0.0	2.3	2.3
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	-1.0
Total Lost Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	4.6
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	0.2
Recall Mode	None	Min		None	Min		None	Max		None	Max	Max
Walk Time (s)		12.0			12.0			12.0			12.0	12.0
Flash Dont Walk (s)		19.0			19.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	34.8	28.0		34.8	28.0		33.0	26.6		33.0	26.6	27.6
Actuated g/C Ratio	0.44	0.36		0.44	0.36		0.42	0.34		0.42	0.34	0.35
v/c Ratio	0.48	0.60		0.17	0.90		0.30	0.94		0.49	0.43	0.22
Control Delay	19.0	25.1		12.4	43.9		17.1	57.6		22.6	25.9	5.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	19.0	25.1		12.4	43.9		17.1	57.6		22.6	25.9	5.4
LOS	B	C		B	D		B	E		C	C	A
Approach Delay		23.6			40.3			48.8			19.5	
Approach LOS		C			D			D			B	
Queue Length 50th (m)	9.6	42.6		5.5	75.1		13.3	~86.4		11.7	29.3	0.0
Queue Length 95th (m)	18.3	69.2		11.8	#133.3		24.6	#144.3		22.1	49.9	11.4
Internal Link Dist (m)		584.2			654.0			403.4			630.7	
Turn Bay Length (m)	60.0			20.0			70.0			50.0		50.0
Base Capacity (vph)	240	674		392	677		459	523		246	526	594
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.48	0.52		0.17	0.79		0.30	0.94		0.49	0.43	0.22

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 78.4			
Natural Cycle: 85			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 34.7		Intersection LOS: C	

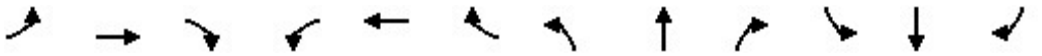
Intersection Capacity Utilization 83.1% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Upper Wellington St & Stone Church Rd E

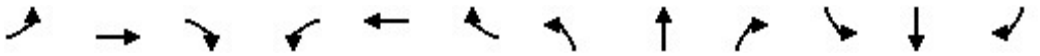


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Future Volume (vph)	110	267	71	65	349	164	131	385	89	116	215	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	4.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	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
Frt	1.00	0.97		1.00	0.95		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1661	1617		1693	1603		1643	1517		1676	1551	1450
Flt Permitted	0.20	1.00		0.42	1.00		0.57	1.00		0.22	1.00	1.00
Satd. Flow (perm)	351	1617		748	1603		991	1517		387	1551	1450
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	278	74	68	364	171	136	401	93	121	224	129
RTOR Reduction (vph)	0	12	0	0	21	0	0	9	0	0	0	84
Lane Group Flow (vph)	115	340	0	68	514	0	136	485	0	121	224	45
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	31.9	28.1		31.9	28.1		30.4	26.6		30.4	26.6	26.6
Effective Green, g (s)	31.9	28.1		31.9	28.1		30.4	26.6		30.4	26.6	27.6
Actuated g/C Ratio	0.40	0.35		0.40	0.35		0.38	0.33		0.38	0.33	0.35
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	5.6
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	0.2
Lane Grp Cap (vph)	202	569		344	564		408	505		208	517	501
v/s Ratio Prot	c0.03	0.21		0.01	c0.32		0.02	c0.32		c0.03	0.14	
v/s Ratio Perm	0.20			0.07			0.11			0.19		0.03
v/c Ratio	0.57	0.60		0.20	0.91		0.33	0.96		0.58	0.43	0.09
Uniform Delay, d1	17.3	21.2		15.3	24.7		16.9	26.1		18.1	20.7	17.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	1.1		0.1	18.8		0.2	31.2		2.7	2.6	0.4
Delay (s)	19.5	22.3		15.4	43.4		17.1	57.3		20.8	23.4	18.0
Level of Service	B	C		B	D		B	E		C	C	B
Approach Delay (s)		21.6			40.3			48.6			21.2	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	34.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	17.5
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Future Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	60.0		0.0	20.0		0.0	70.0		35.0	50.0		50.0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. 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
Ped Bike Factor		0.99			0.99		1.00	0.99		0.99		0.97
Frt		0.962			0.966			0.966				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	1603	0	1694	1634	0	1646	1505	0	1678	1551	1487
Flt Permitted	0.101			0.117			0.345			0.356		
Satd. Flow (perm)	177	1603	0	209	1634	0	596	1505	0	623	1551	1446
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			12			12				131
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		608.2			678.0			427.4			654.7	
Travel Time (s)		43.8			48.8			30.8			47.1	
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Adj. Flow (vph)	187	493	168	91	470	137	85	261	76	199	443	173
Shared Lane Traffic (%)												
Lane Group Flow (vph)	187	661	0	91	607	0	85	337	0	199	443	173
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.04	1.11	1.04	1.04	1.11	1.04	1.04	1.19	1.04	1.04	1.17	1.04
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	6.1
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	6.1
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												

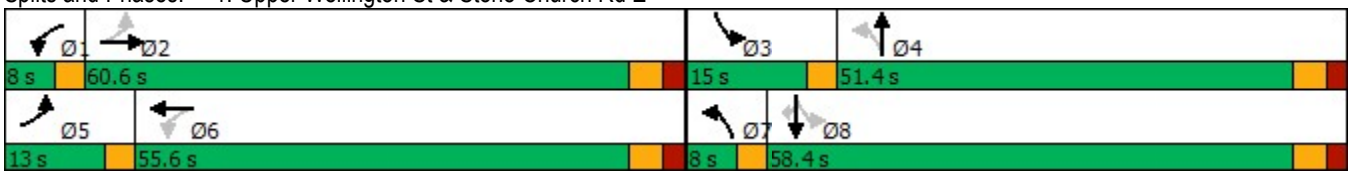


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		8
Detector Phase	5	2		1	6		7	4		3	8	8
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	20.0		5.0	20.0	20.0
Minimum Split (s)	8.0	36.9		8.0	36.9		8.0	31.6		8.0	31.6	31.6
Total Split (s)	13.0	60.6		8.0	55.6		8.0	51.4		15.0	58.4	58.4
Total Split (%)	9.6%	44.9%		5.9%	41.2%		5.9%	38.1%		11.1%	43.3%	43.3%
Maximum Green (s)	10.0	54.7		5.0	49.7		5.0	45.8		12.0	52.8	52.8
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	3.3
All-Red Time (s)	0.0	2.6		0.0	2.6		0.0	2.3		0.0	2.3	2.3
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	-1.0
Total Lost Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	4.6
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	0.2
Recall Mode	None	Min		None	Min		None	Max		None	Max	Max
Walk Time (s)		12.0			12.0			12.0			12.0	12.0
Flash Dont Walk (s)		19.0			19.0			14.0			14.0	14.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	65.6	54.7		57.6	49.7		53.9	46.3		63.4	52.8	53.8
Actuated g/C Ratio	0.49	0.41		0.43	0.37		0.40	0.34		0.47	0.39	0.40
v/c Ratio	0.95	1.00		0.63	1.00		0.31	0.64		0.52	0.73	0.26
Control Delay	80.2	75.4		41.3	77.4		24.4	42.9		27.0	43.5	8.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	80.2	75.4		41.3	77.4		24.4	42.9		27.0	43.5	8.8
LOS	F	E		D	E		C	D		C	D	A
Approach Delay		76.5			72.7			39.2			32.1	
Approach LOS		E			E			D			C	
Queue Length 50th (m)	29.5	~173.5		12.9	158.4		12.4	73.4		31.3	99.8	6.9
Queue Length 95th (m)	#76.7	#254.1		#25.9	#236.5		22.4	107.5		48.0	141.0	22.3
Internal Link Dist (m)		584.2			654.0			403.4			630.7	
Turn Bay Length (m)	60.0			20.0			70.0			50.0		50.0
Base Capacity (vph)	196	658		144	609		276	524		386	606	655
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.95	1.00		0.63	1.00		0.31	0.64		0.52	0.73	0.26

Intersection Summary			
Area Type:	Other		
Cycle Length: 135			
Actuated Cycle Length: 135			
Natural Cycle: 85			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 56.9		Intersection LOS: E	

Intersection Capacity Utilization 89.3% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Upper Wellington St & Stone Church Rd E



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Future Volume (vph)	176	463	158	86	442	129	80	245	71	187	416	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	4.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.97		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1662	1602		1694	1634		1645	1505		1673	1551	1446
Flt Permitted	0.10	1.00		0.12	1.00		0.35	1.00		0.36	1.00	1.00
Satd. Flow (perm)	176	1602		208	1634		597	1505		627	1551	1446
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	187	493	168	91	470	137	85	261	76	199	443	173
RTOR Reduction (vph)	0	9	0	0	8	0	0	8	0	0	0	79
Lane Group Flow (vph)	187	652	0	91	599	0	85	329	0	199	443	94
Confl. Peds. (#/hr)	5		3	3		5	3		9	9		3
Heavy Vehicles (%)	5%	4%	5%	3%	2%	5%	6%	6%	2%	4%	8%	5%
Bus Blockages (#/hr)	0	12	0	0	12	0	0	25	0	0	22	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)	62.7	54.7		54.7	49.7		51.3	46.3		60.8	52.8	52.8
Effective Green, g (s)	62.7	54.7		54.7	49.7		51.3	46.3		60.8	52.8	53.8
Actuated g/C Ratio	0.46	0.41		0.41	0.37		0.38	0.34		0.45	0.39	0.40
Clearance Time (s)	3.0	5.9		3.0	5.9		3.0	5.6		3.0	5.6	5.6
Vehicle Extension (s)	2.0	0.2		2.0	0.2		2.0	0.2		2.0	0.2	0.2
Lane Grp Cap (vph)	191	649		139	601		265	516		371	606	576
v/s Ratio Prot	c0.07	c0.41		0.02	0.37		0.01	0.22		c0.05	c0.29	
v/s Ratio Perm	0.38			0.24			0.11			0.20		0.07
v/c Ratio	0.98	1.00		0.65	1.00		0.32	0.64		0.54	0.73	0.16
Uniform Delay, d1	31.7	40.1		30.6	42.6		28.3	37.3		24.6	35.0	26.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	58.1	36.5		8.2	35.7		0.3	5.9		0.7	7.6	0.6
Delay (s)	89.9	76.6		38.8	78.3		28.5	43.2		25.4	42.6	26.7
Level of Service	F	E		D	E		C	D		C	D	C
Approach Delay (s)		79.6			73.2			40.3			35.0	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	59.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Appendix F

Traffic Analysis Briefing Notes

Upper Wellington Traffic Analysis Briefing Notes

City of Hamilton

September 27th, 2021

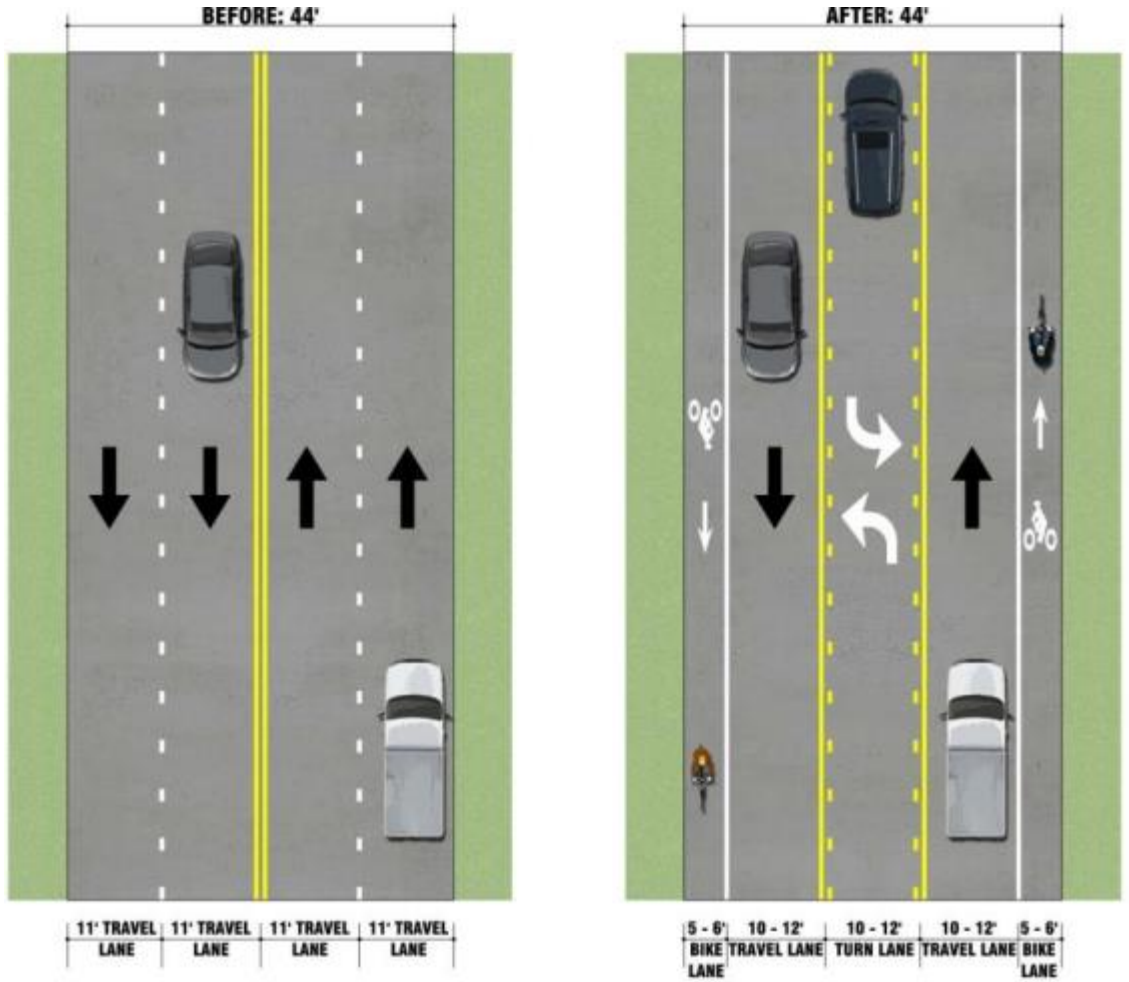
Objective

- Review road diet threshold to check the suitability of Upper Wellington Street as good candidate for a 3-lane cross section
- Assess the growth rate along Upper Wellington Street based on the available historical data along other parallel corridors
- Review growth in jobs and population on the EMME traffic zones along Upper Wellington Street
- Suggest a growth factor that can be used for the 2031 Synchro analysis
- Review the capacity of the turn lanes and expected improvements along the corridor
- Recommendation for a cross section on Upper Wellington Street

Road Diets

What are Road Diets?

- Typically a reduction in lanes from 4 to 3
- Some studies noted a reduction in overall ADT (10% decrease) after implementation
- Crash reductions between 19 – 47 percent
- Reductions in speed (3 – 5 mph or 5 – 8 km/h)



wood.

Volume Thresholds for Road Diets

- Probably feasible at or below 750 vphpd
- Consider cautiously between 750 – 875 vphpd during the peak hour
- Feasibility is less likely above 875 vphpd and expect reduced arterial LOS during the peak period
- One study conducted a sensitivity analysis to determine at what hourly volumes the arterial LOS declines, it found that a two-way peak hour volumes of **1,750 veh/hour (875 each direction)** was the threshold when a decrease in LOS was observed. It also found that this could be mitigated by signal optimization
- A 2011 Kentucky study showed road diets could work up to an ADT of 23,000 veh per day
- The FHWA advises that roadways with 20,000 veh per day or less may be a good candidate for a road diet

(*FHWA Road Diet Informational Guide*, 2014)

- Maximum volumes along Upper Wellington among all available data is 17,079 veh per day on the 2031 EMME base model, thus Upper Wellington is a good candidate for 3-lane cross section

AADT Road Diet Volume Thresholds

LESS THAN 10,000 ADT

Great candidate for Road Diets in most instances. Capacity will most likely not be affected.

10,000 – 15,000 ADT

Good candidate for Road Diets in many instances. Agencies should conduct intersection analysis and consider signal retiming to determine any effect on capacity.

15,000 – 20,000 ADT

Good candidate for Road Diets in some instances. Agencies should conduct a corridor analysis. Capacity may be affected at this volume depending on the "before" condition.

GREATER THAN 20,000 ADT

Agencies should complete a feasibility study to determine whether this is a good location for a Road Diet. There are several examples across the country where Road Diets have been successful with ADTs as high as 26,000. Capacity may be affected at this volume.

1 FHWA, Road Diet Informational Guide, FHWA-SA-14-028 (Washington, DC: FHWA, 2014. Available at: http://safety.fhwa.dot.gov/road_diets/case_studies/roaddiet_cs.pdf.

2 City of Seattle Modeling Flow Chart for Road Diet Feasibility Determination. Available at: http://safety.fhwa.dot.gov/road_diets/info_guide/ch3.cfm#f1.

3 MnDOT Office of Traffic, Safety and Technology, Minnesota's Best Practices for Pedestrian/Bicycle Safety, Report 2013-22 (Roseville, MN: MNDOT, 2013). Available at: http://www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf.

U.S. Department of Transportation
Federal Highway Administration

safety.fhwa.dot.gov/road_diets

Safe Roads for a Safer Future
Investment in roadway safety saves live

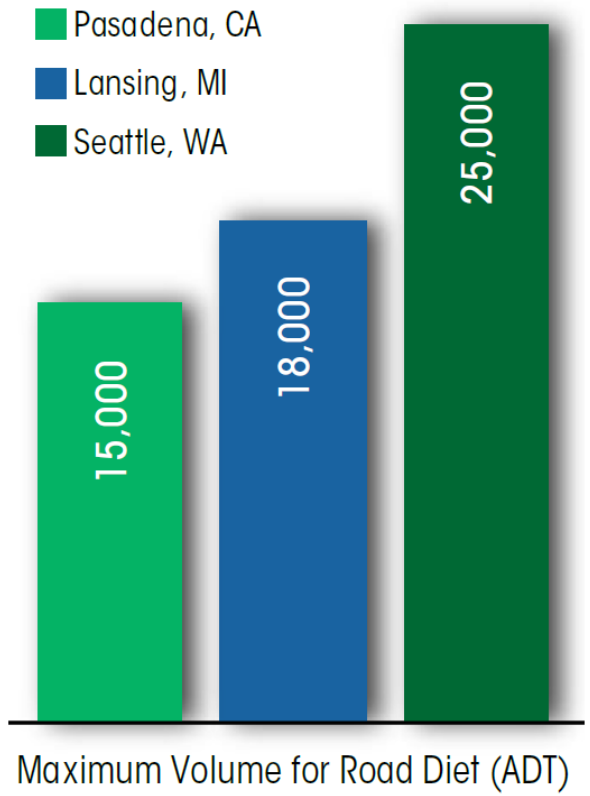


Figure 12. Road Diet Implementation Maximum Volume Thresholds by Agency

Existing Volumes 2020

- 2020 existing volumes indicate that all NB and SB volumes along the study corridor are less than 750 vph, this makes Upper Wellington Street a good candidate for a three-lane cross section

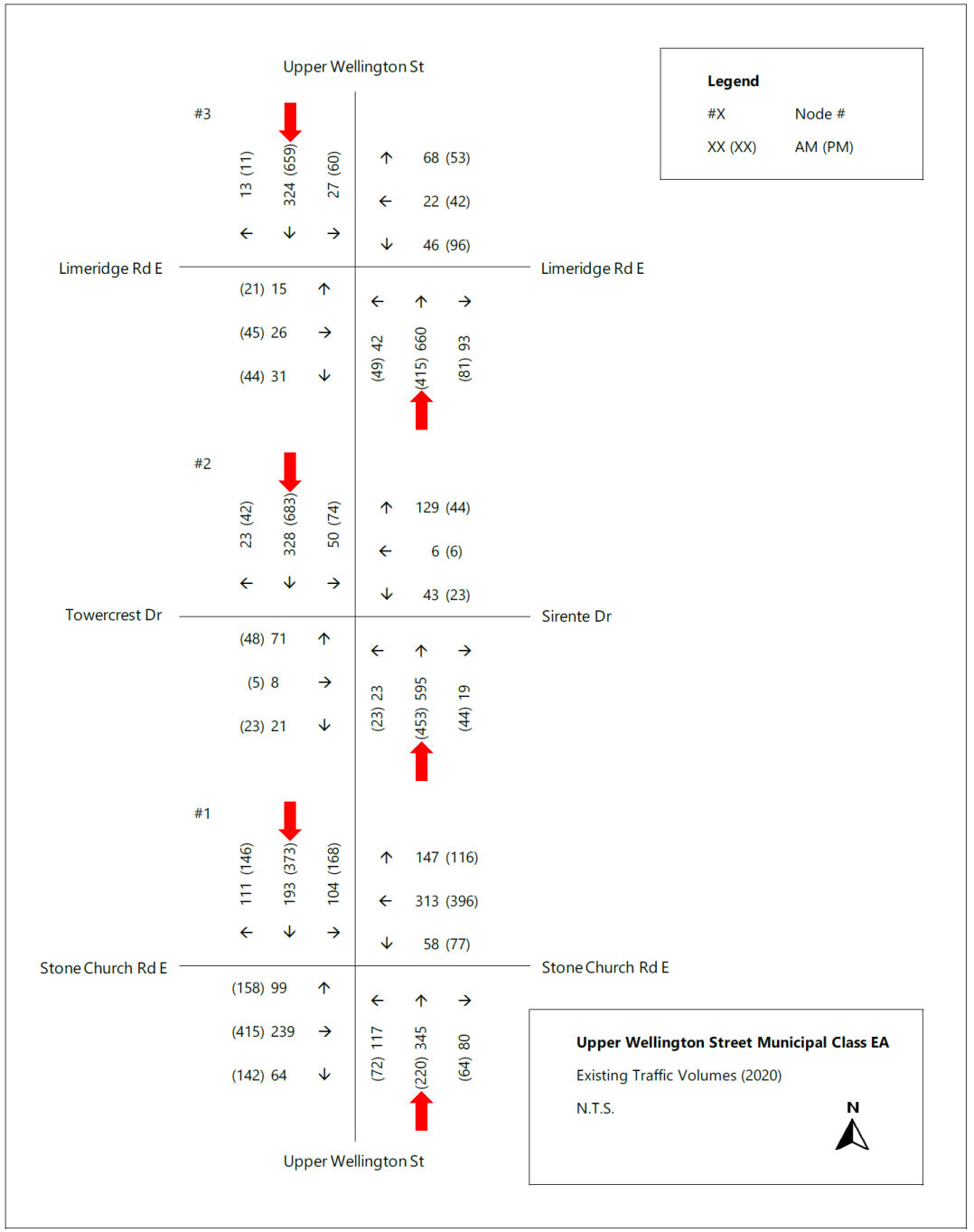


Figure 5: Existing Traffic Volumes (2020)

Modeling Flow Chart for Road Diet

- The most recent available data (2019) for Upper Wellington (south of Lincoln Alexander Parkway) suggest an ADT of approximately 12,500 vehicles, thus Upper Wellington is a good candidate for a three-lane cross section even after applying a reasonable growth factor
- Furthermore, none of the 2020 existing left turn volumes exceed 200 veh/hour

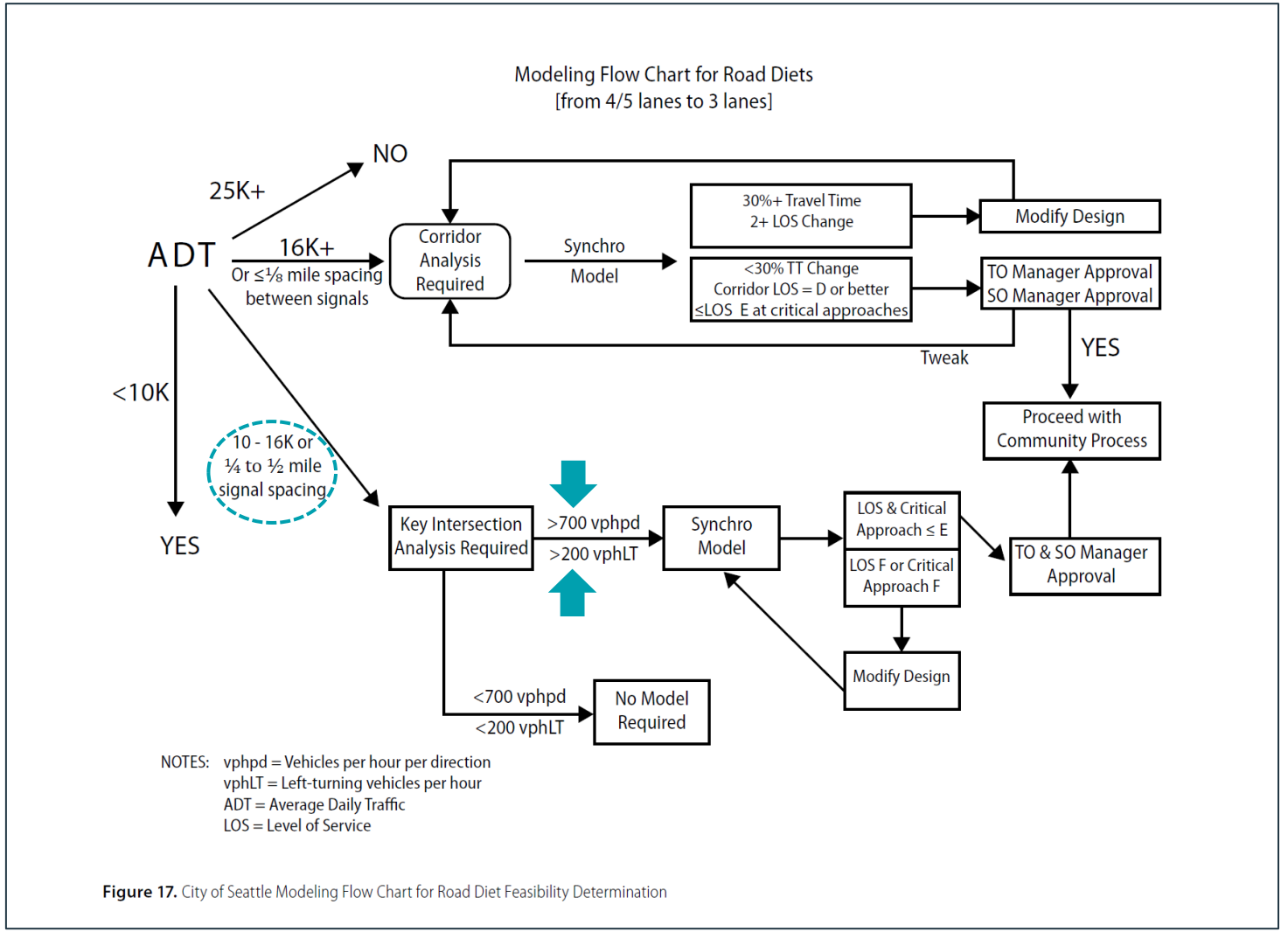


Figure 17. City of Seattle Modeling Flow Chart for Road Diet Feasibility Determination

Assessment of Growth Rates

ADT Review (Methodology)

- Historical volumes data for three corridors were summarized and compared against existing and model volumes:
  - West 5th
  - Upper Wellington
  - Upper Sherman
- Analysis was conducted for two locations north and south of Lincoln Alexander Parkway due to difference in number of lanes
- ATR volumes were utilized as they are whenever the ATR data is available
- TMC volumes for the 7 hours were factored to get the ADT for each location using the proportion of the 7 hours to the whole day from the ATR data (next slide)
- 2031 model volumes for the peak hour were factored to get the ADT for each location using the proportion of the peak hour to the whole day from the ATR data

Converting TMC 7 Hours Data to ADT (Example)

- ATR Data is available for the three corridors (West 5th, Upper Wellington and Upper Sherman)
- TMC volumes for the 7 hours were factored to get the ADT for each location using the proportion of the 7 hours to the 24-hour total volumes in ATR data (an example is shown below),
- This exercise was conducted for the 3-day ATR data for each location to determine the average ratio that will be applied to the individual TMC's

Peak	Start	End	NB	SB
AM	7:15	10:00	1170	685
MD	13:45	15:30	685	816
PM	16:15	19:00	757	1,016
Directional Total			**2,612**	**2,517**
7 Hrs Total				**5,129**
24 HR VOLUME:				**11,206**
24 hours to 7 hours Ratio				**2.18**

Period Ending	Channel 1 NB	Channel 2 SB	Hourly Summary
0:15	11	16	
0:30	16	15	
0:45	6	6	
1:00	8	9	87
1:15	11	10	81
1:30	7	2	59
1:45	8	4	59
2:00	5	5	52
2:15	4	10	45
2:30	8	5	49
2:45	4	4	45
3:00	3	2	40
3:15	5	5	36
3:30	3	4	30
3:45	7	6	35
4:00	4	3	37
4:15	0	1	28
4:30	8	3	32
4:45	12	10	41
5:00	13	9	56
5:15	17	6	78
5:30	16	14	97
5:45	20	13	108
6:00	42	15	143
6:15	33	19	172
6:30	45	19	206
6:45	81	37	291
7:00	67	47	348
7:15	61	39	396
7:30	90	35	457
7:45	114	55	508
8:00	132	65	591
8:15	102	55	648
8:30	107	53	683
8:45	105	42	661
9:00	130	53	647
9:15	81	71	642
9:30	87	68	637
9:45	79	68	637
10:00	82	81	617
10:15	82	65	612
10:30	93	85	635
10:45	89	79	656
11:00	84	71	648
11:15	78	101	680
11:30	84	91	677
11:45	69	82	660
12:00	97	76	678

AM

Period Ending	Channel 1 NB	Channel 2 SB	Hourly Summary
12:15	99	102	700
12:30	89	80	694
12:45	78	85	706
13:00	92	85	710
13:15	86	86	681
13:30	74	80	666
13:45	78	87	668
14:00	81	97	669
14:15	85	79	661
14:30	85	114	706
14:45	84	89	714
15:00	80	109	725
15:15	83	114	758
15:30	109	127	795
15:45	101	138	861
16:00	82	132	886
16:15	97	135	921
16:30	110	143	938
16:45	91	131	921
17:00	98	128	933
17:15	97	135	933
17:30	98	134	887
17:45	87	91	853
18:00	94	119	840
18:15	86	85	779
18:30	83	91	746
18:45	95	91	744
19:00	81	86	698
19:15	58	109	694
19:30	65	84	669
19:45	58	83	624
20:00	60	71	588
20:15	53	73	547
20:30	56	71	525
20:45	48	44	476
21:00	42	46	433
21:15	37	67	411
21:30	32	48	364
21:45	43	62	377
22:00	35	36	360
22:15	27	33	316
22:30	23	40	299
22:45	28	28	250
23:00	26	29	234
23:15	16	45	235
23:30	25	33	230
23:45	17	22	213
0:00	8	20	186

MD

PM

wood.

Summary of All Available Data

Street Name	Location	Location 2	2003	2007	2009	2011	2014	2017	2018	2019	2020	2021	2031
West 5th	North of LAP	Limeridge							15,810			11,419	13,647
	South of LAP	Rosehill/Chester						11,092		11,710		10,623	*13,647*
	South of LAP	Stone Church							14,097			*10,623*	10,745
Upper Wellington	North of LAP	Limeridge	11,592	15,260	15,950						14,540	11,399	17,079
	South of LAP	Towercrest / Sirente		14,982	16,375	16,355				10,107		10,151	*17,079*
	South of LAP	Stone Church	11,782		15,214					12,481		*10,151*	10,282
Upper Sherman	North of LAP	Limeridge								16,242		11,436	17,989
	South of LAP	Princip/Atherley/Rowntree					16,452			11,017		11,113	*17,989*
	South of LAP	Stone Church								12,875		*11,113*	10,830
			2003 – 2014					**2017 – 2020 (pre-COVID)**				***During COVID***	**EMME Model**

LAP – Lincoln Alexander Parkway

ATR
TMC
Model

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Review of the Available Data

- The most recent data along Upper Wellington (2019) and south of Lincoln Alexander Parkway is lower than the previous years (2003-2014) by almost 4K vehicles,
- The volumes north of Lincoln Alexander Parkway are always higher than volumes at south due to the availability of more lanes
- There are volume similarities when comparing north and south of Lincoln Alexander Parkway volumes along all corridors between 2017 and 2020, thus considering similar cross section for Upper Wellington is a reasonable approach
- Traffic volumes during COVID along all corridors show an average reduction in traffic volumes by ~10% per year
- Comparing the 2031 model volumes with the most recent data on Upper Wellington (2019 or 2020) suggests a growth of 1.4% or 1.5% per year (with 3-lane cross section), noting that the model volumes include the bypass trips that are not related to zones along Upper Wellington Street

Assess Growth in Jobs and Population

Growth in Jobs and Population

- The table (next slide) shows the comparison between 2030 and 2030 Jobs and populations based on the EMME model inputs
- The growth in population between 2021 and 2031 is expected to be only 0.4% per year
- The growth in jobs between 2021 and 2031 is expected to be only 0.74% per year
- Keeping in mind that these zones have accesses on other parallel streets (Upper James and Upper Wentworth) thus growth will be distributed among these streets and actual growth along Upper Wellington is expected to be minimal since the area on the vicinity of the corridor is already developed
- Based on the above, 1.0% traffic growth along the corridor is realistic

Growth in Jobs and Population (Table)

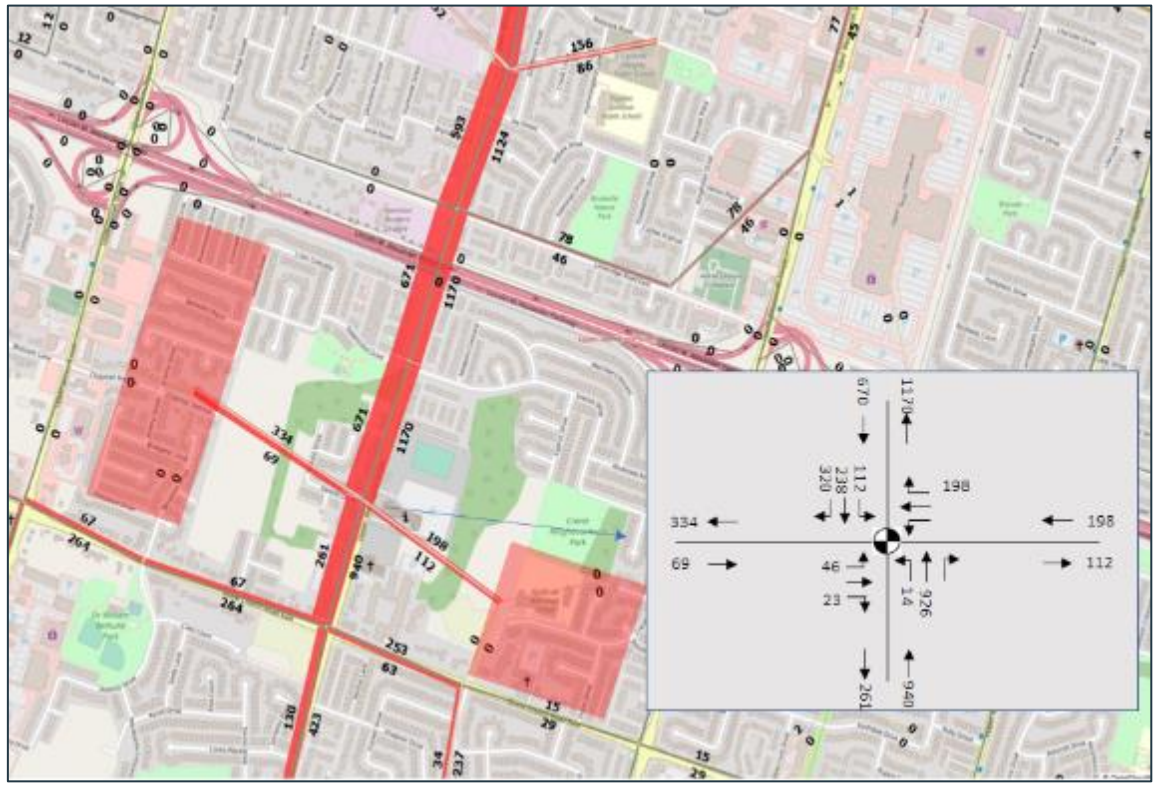
GTA06	Pop2021	Jobs2021		Pop2031	Jobs2031		Pop2041	Jobs2041		Pop2051	Jobs2051
5051	4,522	1,005		4,375	1,014		4,330	1,014		4,411	1,014
5056	2,989	1,195		3,629	1,376		4,170	1,529		5,002	1,721
5069	2,506	175		2,405	175		2,381	175		3,128	370
5075	2,078	645		2,173	685		2,141	685		2,271	707
Total	**12,095**	**3,020**		**12,582**	**3,250**		**13,022**	**3,403**		**14,812**	**3,812**

Growth	Pop	Jobs
5051	-0.33%	0.09%
5056	1.96%	1.42%
5069	-0.41%	0.00%
5075	0.45%	0.60%
2021 vs 2031	**0.40%**	**0.74%**

Left Turn Lane Volumes

Left Turn Volumes

- Based on the Select Link Analysis (SLA) for the Upper Wellington (based on EMME model):
  - 16.7% of the SB volume will use the turn lane to turn left along Upper Wellington (PM peak)
  - 1.5% of the NB volume will use the turn lane to turn left along Upper Wellington (PM peak)
  - The average usage of the turn lane in both directions is about 7.8% (PM peak)
- Based on the above, additional capacity for through lanes are expected



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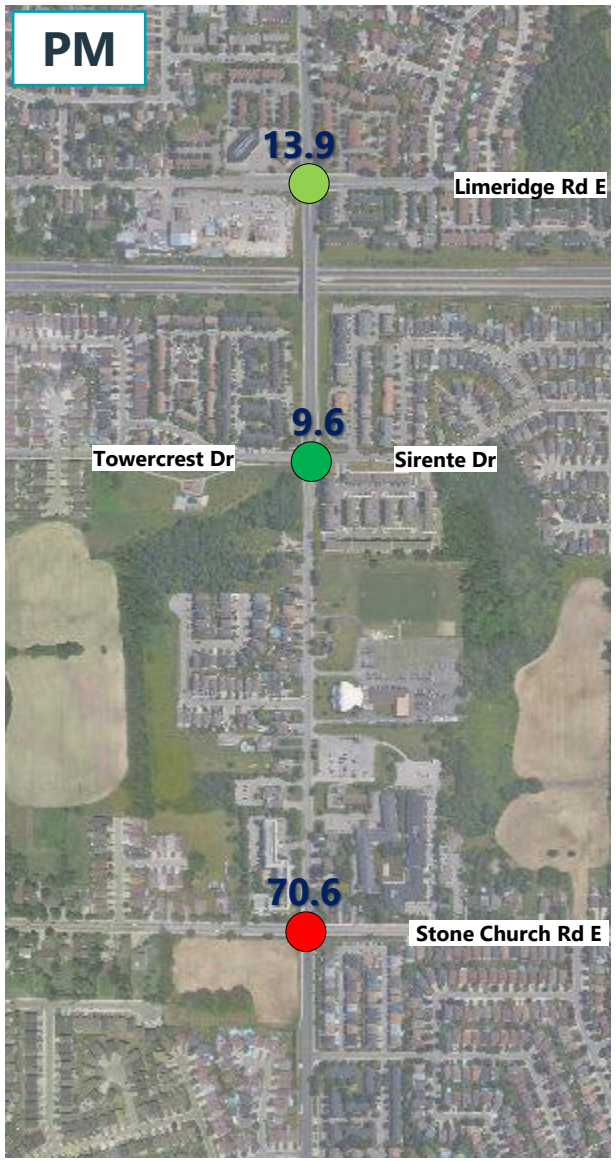
Implications of 1% versus 2% Growth

Growth Comparison (1% Results)

LOS & Overall Delay

- Level of Service
- Delay (seconds)



Legend

- Left Turn Movement
- Through Movement
- Right Turn Movement
- Critical Movement*

- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

XX.X Intersection Delay

* Movement exceeds v/c of 0.85 for through movements or shared through/turning movements, or exceeds 0.90 for exclusive turning movements, as described in the 'Traffic Impact Study Guidelines (dated July 2009) by the City of Hamilton, in the AM or PM peak hour.

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Growth Comparison (2% Results)

LOS & Overall Delay

- Level of Service
- Delay (seconds)

Legend

- Left Turn Movement
- Through Movement
- Right Turn Movement
- Critical Movement*

LOS A, LOS B, LOS C, LOS D, LOS E, LOS F

XX.X Intersection Delay

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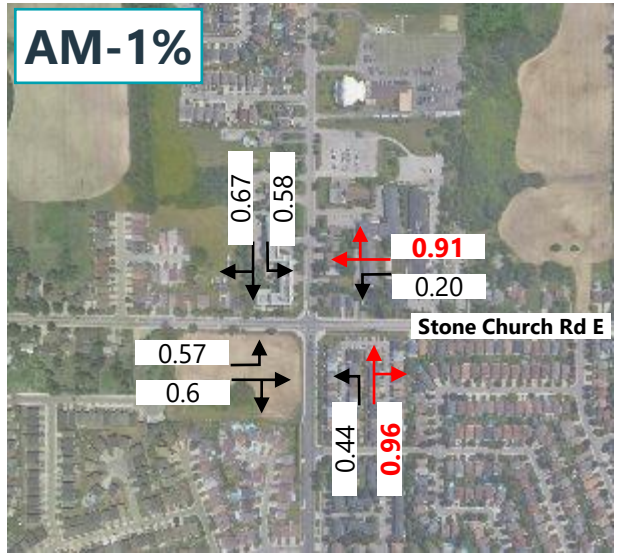
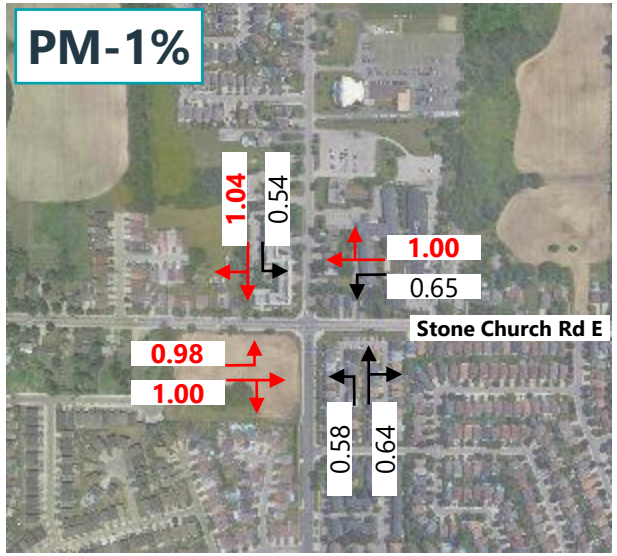
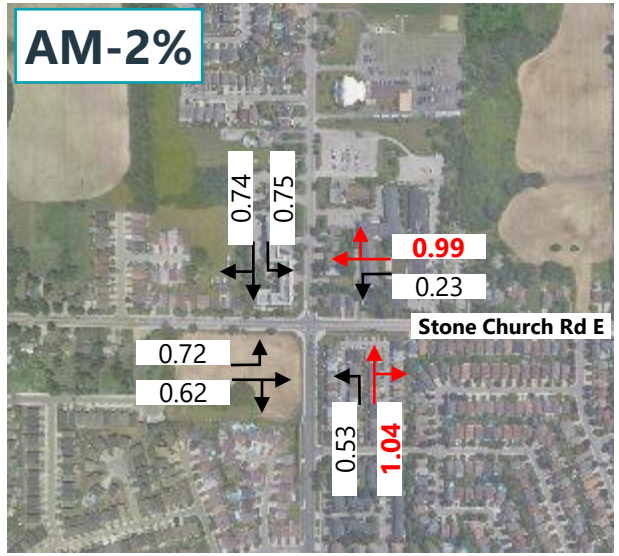
Growth Comparison (1% vs 2% Results)

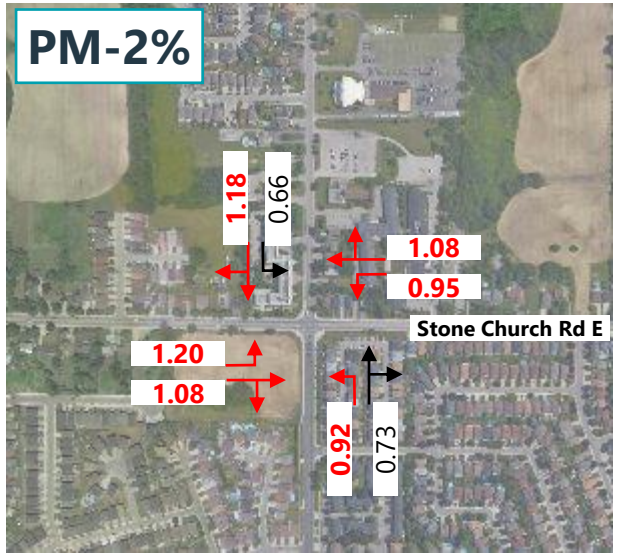
V/C Ratio

- Approach volume to capacity Ratio









Legend

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- Right Turn Movement
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- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

X.XX V/C Ratio

X.XX V/C Ratio Critical

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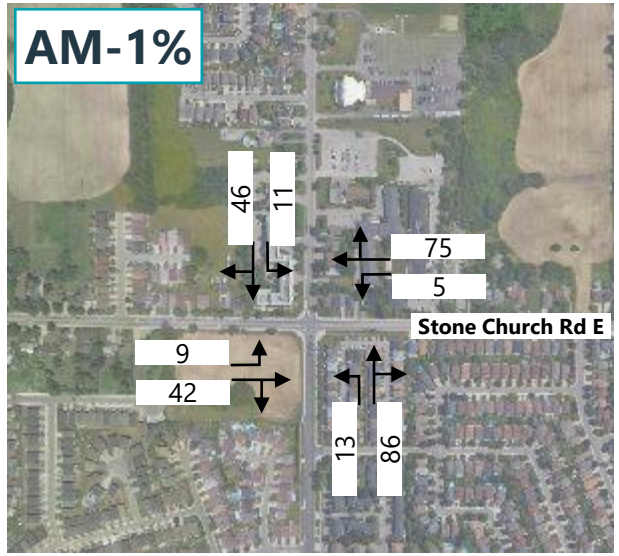
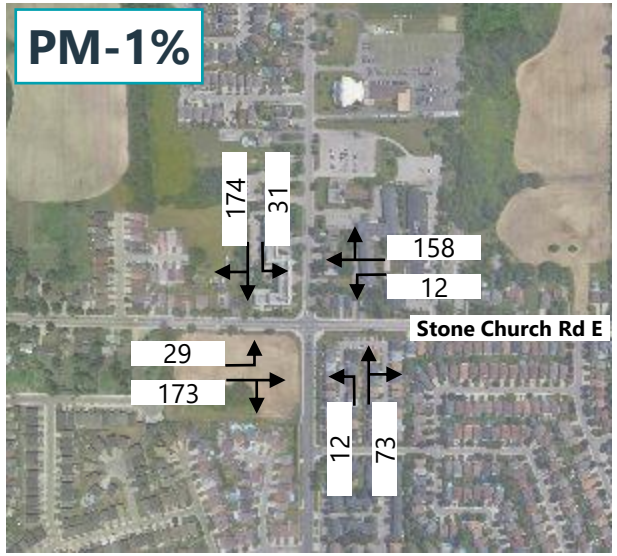
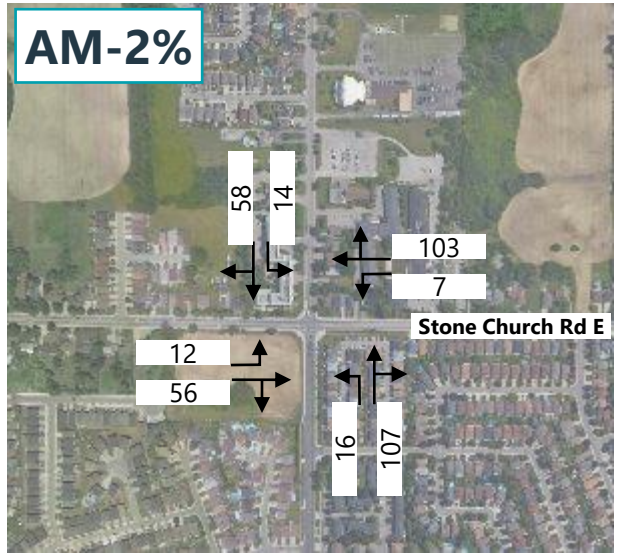
Growth Comparison (1% vs 2% Results)

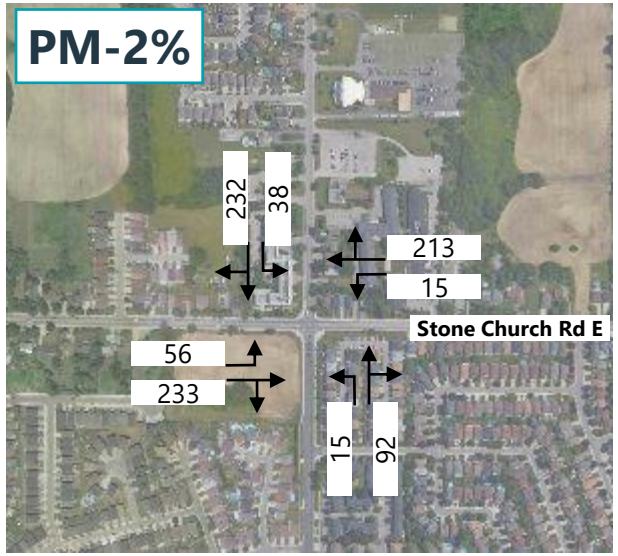
Average Queue 50%

- Approach Average Queue length in meters









Legend

- Left Turn Movement
- Through Movement
- Right Turn Movement
- Critical Movement*

LOS A, LOS B, LOS C, LOS D, LOS E, LOS F

XXX Queue Length

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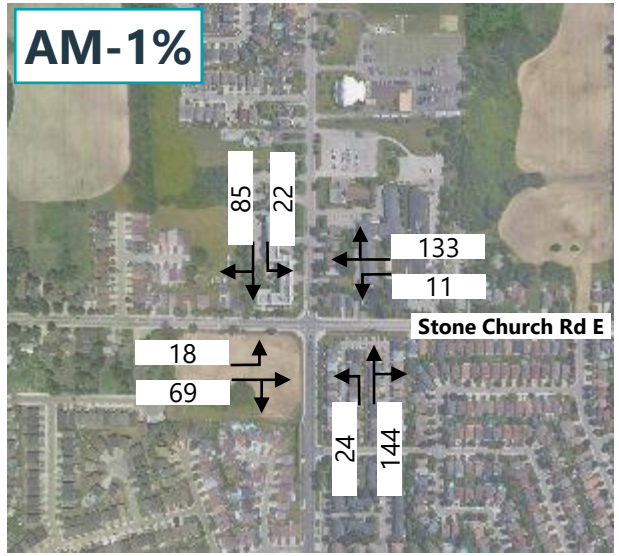
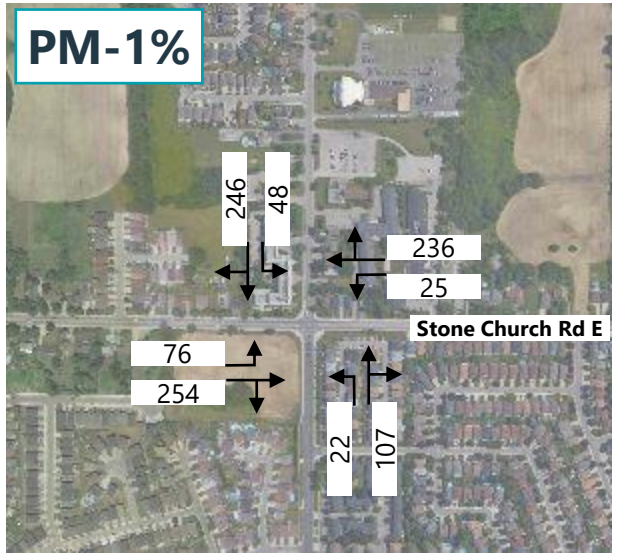
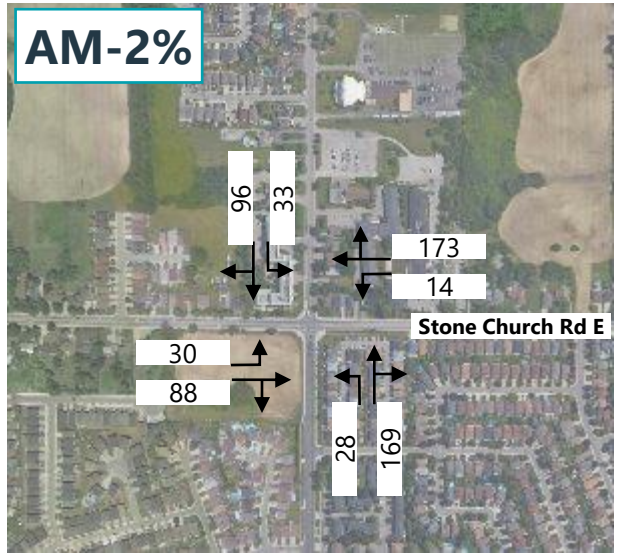
Growth Comparison (1% vs 2% Results)

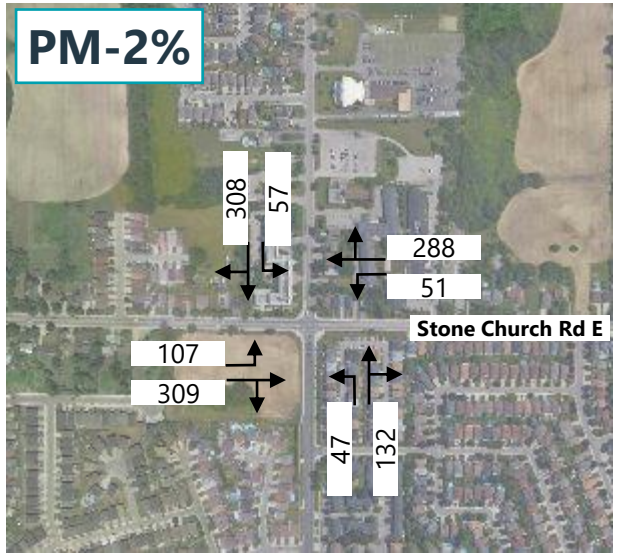
95th Percentile Queue

- Approach 95th Percentile Queue in meters









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LOS A, LOS B, LOS C, LOS D, LOS E, LOS F

XXX Queue Length

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Level of Service Summary (2% growth)

1. 2% growth will increase the delay slightly on Upper Wellington & Towercrest Drive/Sirente Drive & Limeridge Road East intersections. Good LOS will be maintained
2. Upper Wellington & Stone Church intersection delay will increase by more than ½ minute and LOS will degrade from “E” to “F” in the PM peak
3. 2% growth will increase the southbound approach average queue length at Upper Wellington & Stone Church by 58 metres (from 174m to 232 m) in the PM peak
4. 2% growth will increase the southbound approach 95th percentile queue length at Upper Wellington & Stone Church by 62 meters (from 246m to 308 m) in the PM peak
5. The southbound approach 95th percentile queue length will reach 308 meters in the PM peak. **Note:** the total distance between Stone Church Road East and Towercrest Drive/Sirente Drive is about 655 meters.
6. Accesses on the west side of Upper Wellington will be impacted and blocked during the peak hour as a result of the southbound queue (308m) in the PM peak.

Property Impacts of Four-Lane Cross Section

Property Impact Analysis (4-lane cross section)

Address	Owner	City ROW PINs	Zoning	Frontage	Value ($)
1430	Nursing Home		Institutional		No impact
1400	City – Fire Stn.				
1398	City	16943-0954			
1394	Private		Agricultural	44.23	7,076
1388	Private		Agricultural	88.38	14,140
1382	City	16943-0520			
1378	City	16943-0613			
1368	City	16943-0523			
1364	City	16943-0727			
1360	City	16943-0621			
1356	City	16943-0617			
1354	City	16943-0271			
1350	Private		Residential	68.60	10,976
1344	City	16943-0270			
1338	City	16943-0270			
1336	City	16943-0270			
1332	Private		Residential	44.23	7,076
1328	Private		Residential	44.23	7,076
1324	Private		Residential	44.23	7,076
1322	Private		Residential	44.23	7,076
1318	Private		Residential	44.23	7,076
1314	Private		Residential	66.00	10,560
1310	City	16943-0821			
1306	City	Jerome Park			
1347	Private		Institutional	58.38	8,360
1349	Private		Institutional	100.00	14,000
1355	Private		Institutional	260.66	36,492
1415	City	16942-0389			
1411	Private		Institutional	353.83	49,420
1415	City	16942-0389			
1423	Private		Residential	50.0	8,000
1427	City	16942-0548			
1431	Private		Residential	72.20	11,552
1435	City	16942-0544			
1441	Private		Agricultural	60.0	9,600
1445	City	16942-0794			
				Total	$215,556
				Add 15% Contingency	$247,889

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Implications of 3-lane cross section

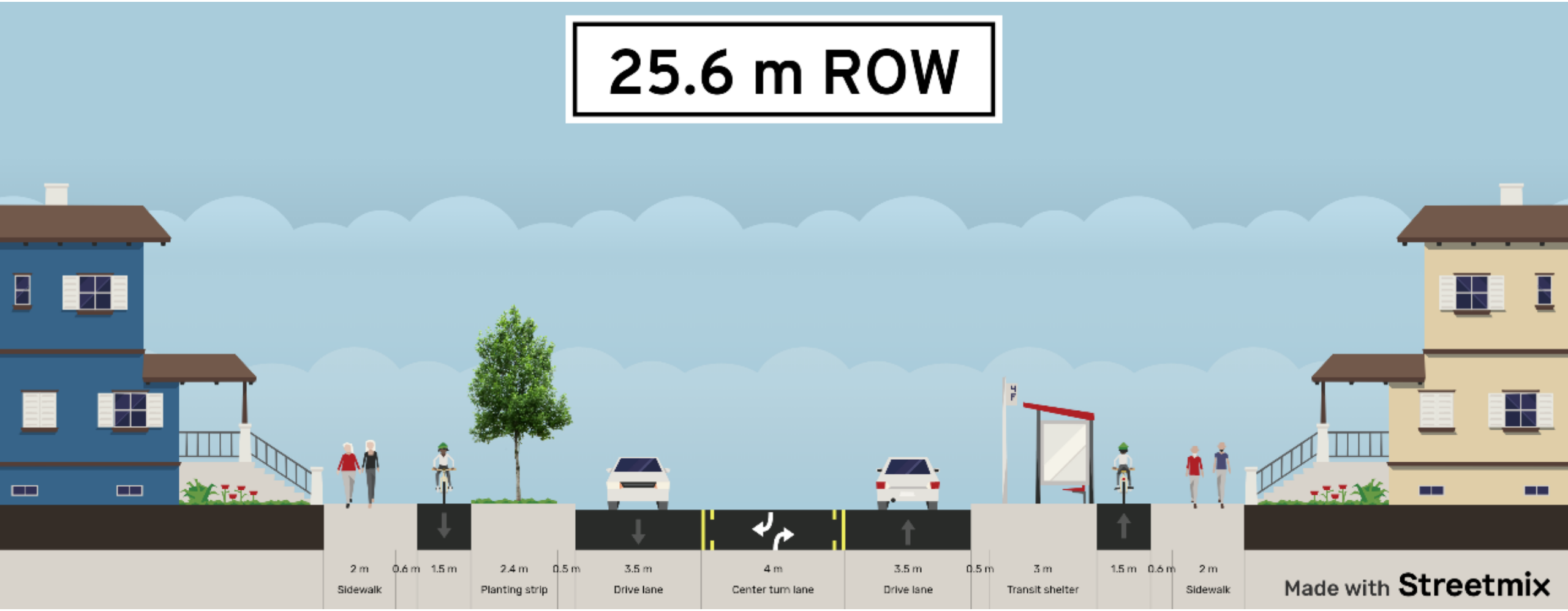
Benefits compared to 4-lane cross section

- Matches cross section to the south
- Less property taking, particularly at the intersection of Stone Church Road and Upper Wellington Street
- Less likelihood of impacts to utilities and mature trees alongside Upper Wellington
- Lower operating speeds
- Safer operating environment (for all road users)
- More attractive to cyclists
- Lower overall construction cost

Disbenefits

- Possibility of some peak hour congestion at intersection of Stone Church Road and Upper Wellington Street

Upper Wellington (Stone Church to Towercrest)



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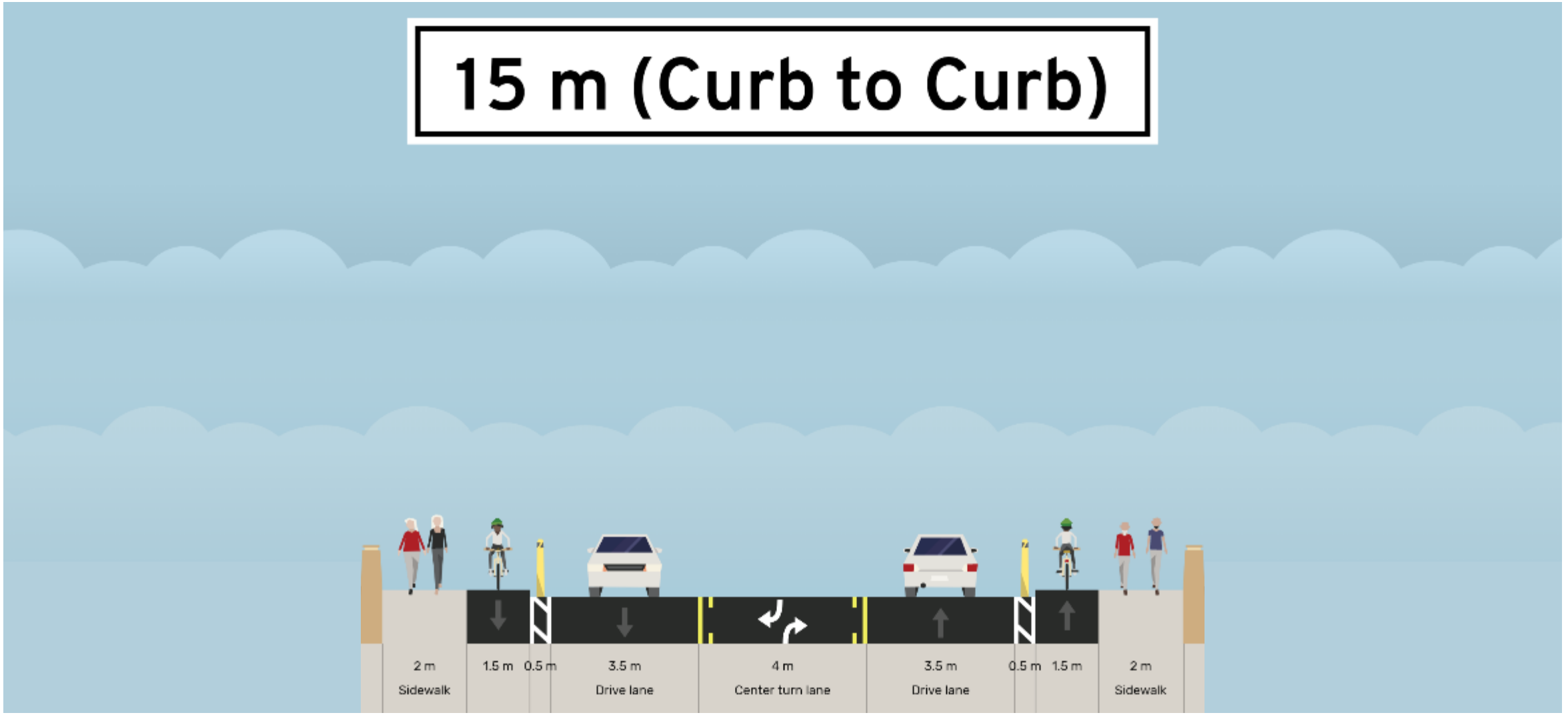
Upper Wellington (Across Lincoln Alexander)



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Conclusions (1)

- Based on the review of ADT and peak hour volumes for all years, Upper Wellington Street is a good candidate for road diets
- Road diets (3-lane cross sections) will considerably decrease vehicles, pedestrian and bicycle crashes when compared to 4-lane cross sections
- Road diets have been shown to improve connectivity for bicyclists and will increase bicycle ridership (as compared to 4-lane cross sections)
- The average traffic growth along Upper Wellington Street between the 2031 model and 2019/2020 volumes suggest a 1.4%-1.5% growth per year
- Jobs and population growth data suggest a lower growth rate (0.40 - 0.74%)

Conclusions (2)

- The growth in jobs and population between 2021 and 2031 is relatively small thus the growth should reflect that
- 2031 model volumes include the bypass trips that are not related to zones along Upper Wellington Street
- Left turn lane will capture about ~8% of the total ADT traffic along Upper Wellington Street
- Wood has suggested a **1.0%** growth between 2021 and 2031 as some road diet studies suggest a reduction in ADT by 10%
- Local mitigations on the study intersections are expected at the next stage of analysis to optimize the LOS in general

Road Diet Examples

College Avenue West – Guelph

College Avenue West

City of Guelph

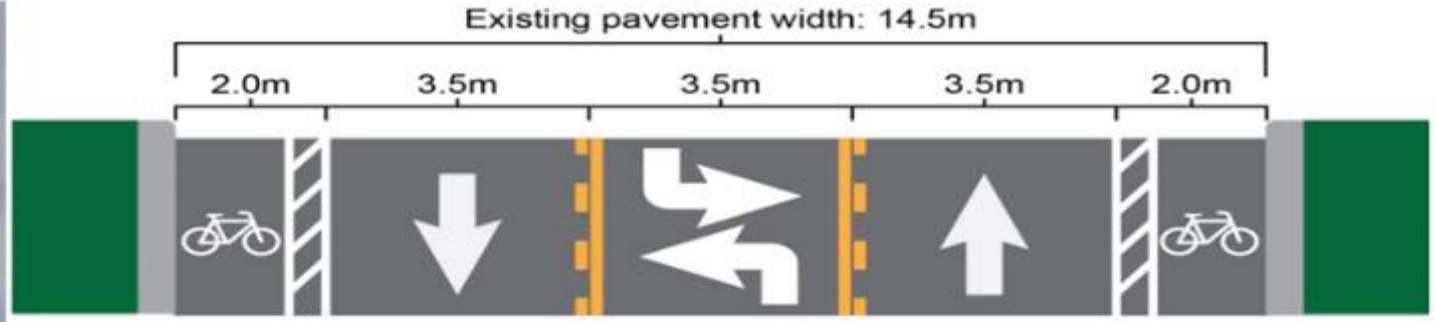
Looking west on College Avenue West, showing the added bike lanes and considerable student foot traffic.

College Avenue West was transformed by taking advantage of planned road resurfacing to include painted bike lanes and achieve an active transportation "quick win".

- Painted bike lanes added to both sides of the street.
- A road diet turned four traffic lanes into two and added one left-turn lane.
- The posted speed limit reduced to 40km/h from 50km/h.

James Street – City of Thunder Bay

Proposed Cross-section for James Street Road Diet



Location	AADT	AM Peak Hour Peak Direction Volume	PM Peak Hour Peak Direction Volume
Walsh Street	10,700	350	550
Arthur Street	12,800	400	500
Victoria Avenue	14,400	450	650
Riverview Drive	12,500	300	650
Churchill Drive	11,400	400	500
Redwood Avenue	11,400	350	550
Vale Avenue	9,900	300	550
Limbrick Street	7,900	300	400
Edward Street-Golf Links Road	12,300	400	600

Michigan – Burton Street

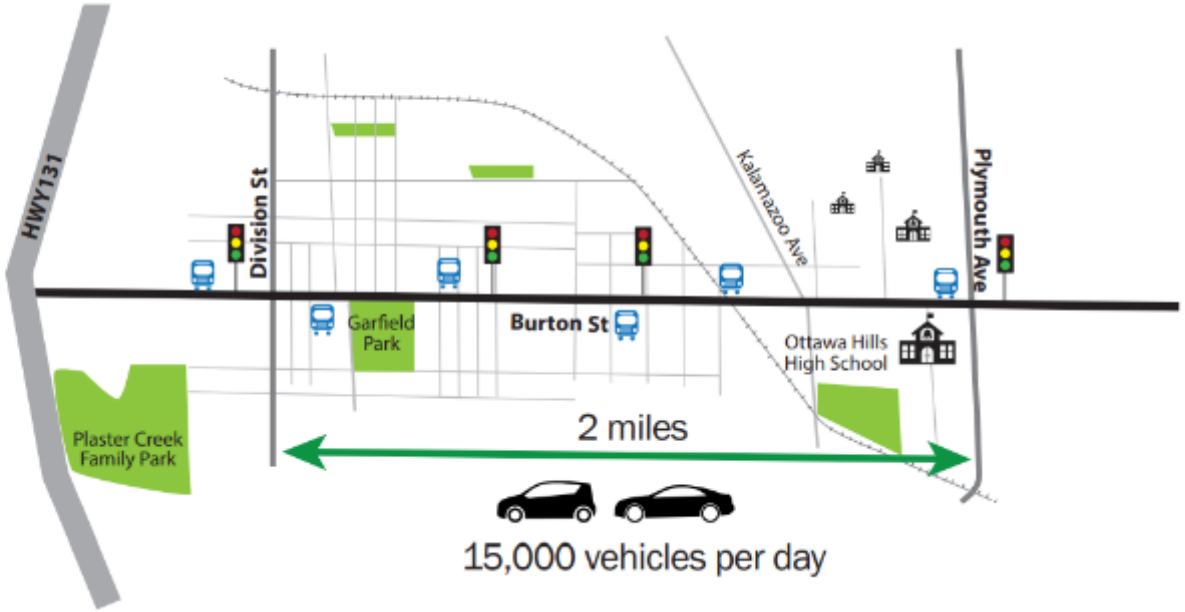
Grand Rapids, Michigan – Burton Street

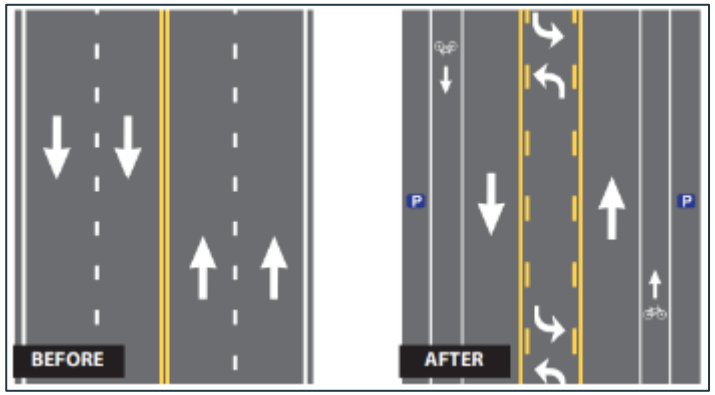
ROAD DIET AND TRANSIT WORKING TOGETHER

OBJECTIVE
- Install bicycle lanes
- Improve safety
- Accommodate needs of school bus and transit bus stops

FEATURES
- Several schools and a public park nearby
- Congestion concerns
- Frequent school buses and transit stops

RESULTS
- Improved roadway for bicyclists
- Slower speeds
- Addressed transit needs and congestion concerns





Los Angeles – Seventh Street

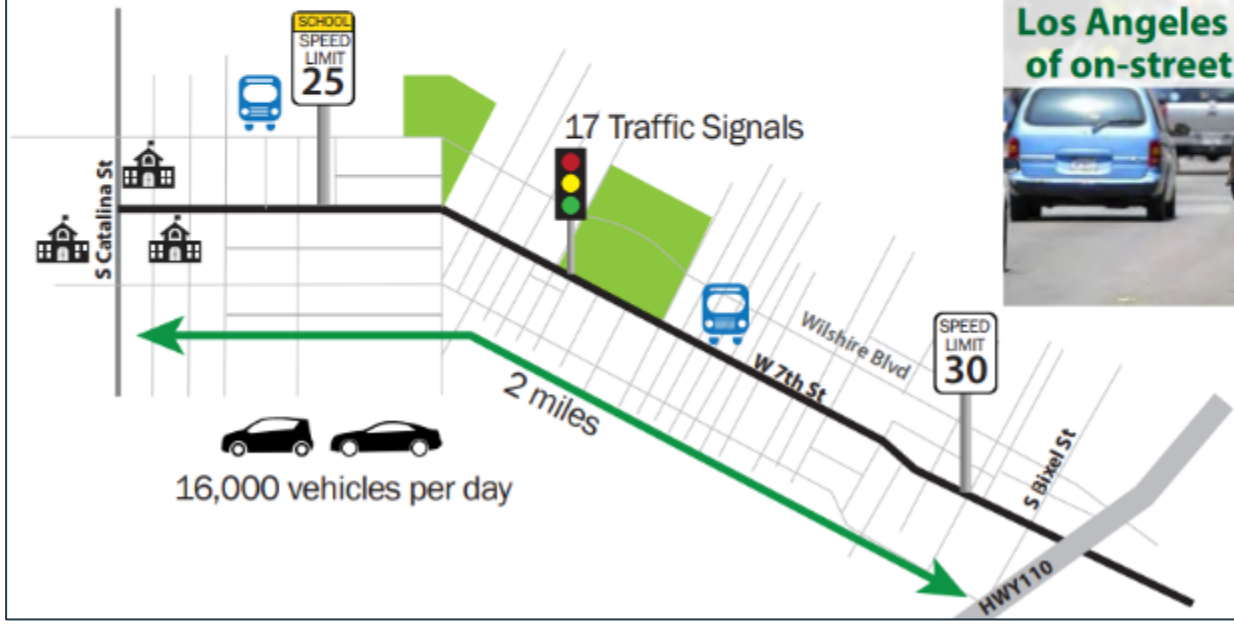
Los Angeles, California – Seventh Street

ROAD DIET: KEY INGREDIENT IN LOS ANGELES' BICYCLE MASTER PLAN

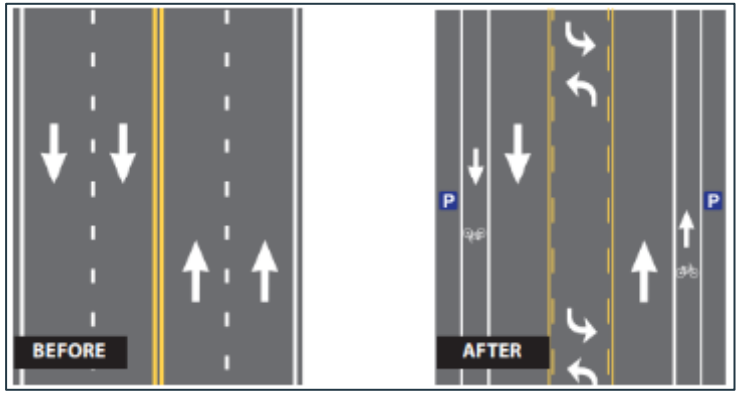
OBJECTIVE
- Install bicycle lanes
- Improve pedestrian safety
- Increased bicycle usage

FEATURES
- Urban environment
- High density pedestrians
- Several schools nearby
- Bus routes

RESULTS
- Community leader support
- Bicycle activists support
- Increased bicycle ridership



SOURCE: Alliance of Biking and Walking
PHOTO: Jobin Botsford / Los Angeles Times



- **10% drop in traffic volume (15,854 to 14,244 veh/day)**

Reno – Wells Avenue

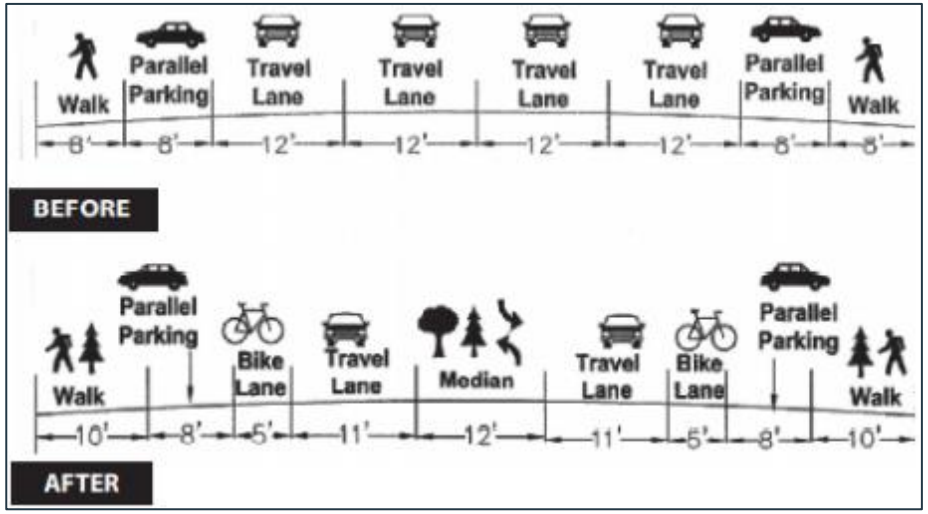
Reno, Nevada – Wells Avenue

ROAD DIET IMPROVES SAFETY FOR MOTORIZED AND NON-MOTORIZED USERS

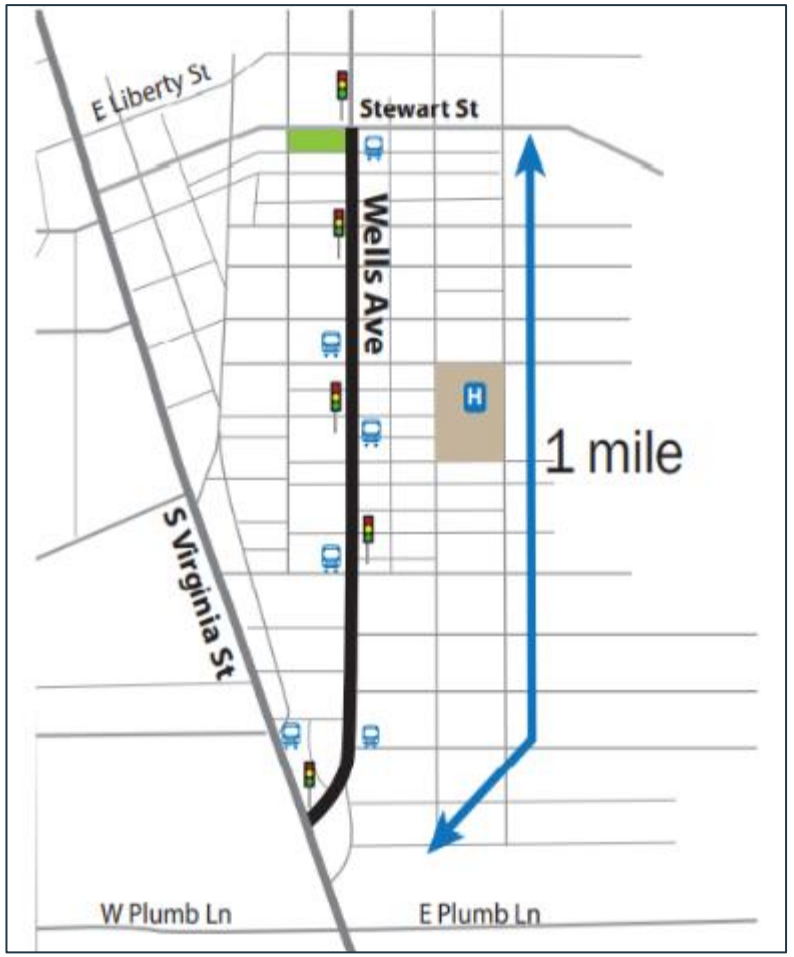
OBJECTIVE
- Reduce crashes along the corridor
- Improve pedestrian and bicyclist safety

FEATURES
- Bicycle lanes
- Curb extensions
- Medians
- Crosswalks
- Pedestrian refuge areas

RESULTS
- More than 30% decrease in overall crashes
- Reduced pedestrian crashes by 54%
- Reduced speeds 5-9 mph



Wells Avenue after the completion of the Road Diet.



wood.

Source:http://safety.fhwa.dot.gov/road_diets

Chicago – Wabash Avenue

Chicago, Illinois - Wabash Avenue

CAPACITY IMPROVED AFTER ROAD DIET

OBJECTIVE

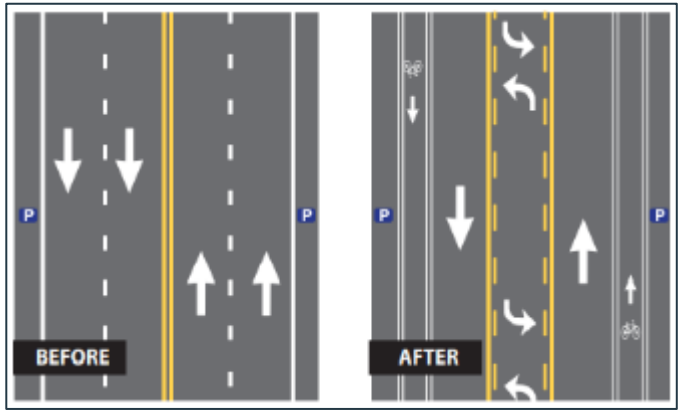
- Improve connectivity for bicyclists

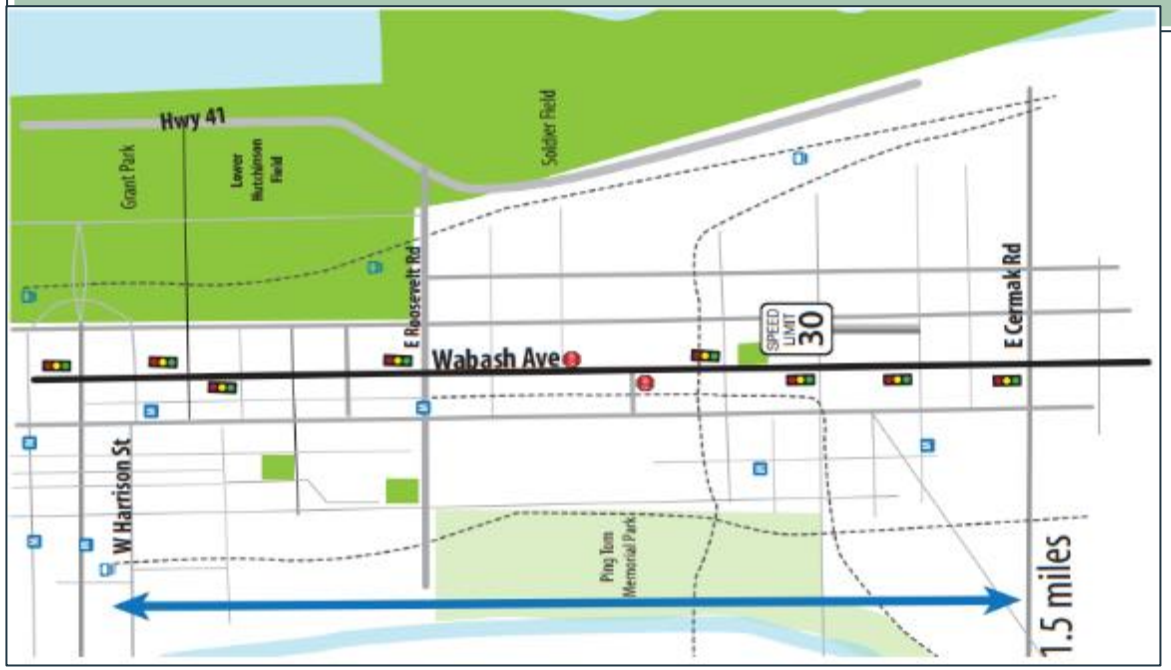
FEATURES

- Commercial and service-oriented businesses, college, connections to nearby parks
- Buffered bicycle lanes
- Signal optimization

RESULTS

- Overall capacity and level of service improved
- Improved safety and connectivity for bicyclists





Buffered Bicycle lane

wood.