



**1209 Waterloo Street
New Hamburg, Wilmot
Transportation Impact Study**

Paradigm Transportation Solutions Limited

March 2022

210005



Project Summary



Project Number

210005

March 2022

Client

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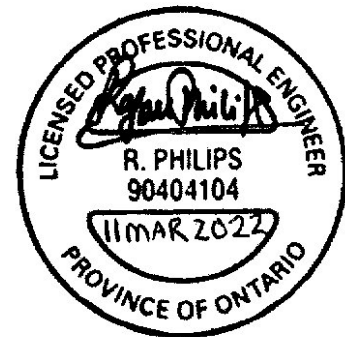
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1209 Waterloo Street
New Hamburg, Wilmot
Transportation Impact Study

A handwritten signature in black ink, appearing to read 'Rajan Philips'.



Rajan Philips, P.Eng.

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Executive Summary

Content

Capital Homes Inc. have retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study for the proposed residential subdivision on Waterloo Street in New Hamburg, Township of Wilmot, Region of Waterloo. The subject lands are to the south of Waterloo Street and east of Laschinger Boulevard.

Development Concept

The proposed subdivision will accommodate 549 single-family detached houses and 304 multi-family dwellings (townhouse and apartment units). The development is anticipated to be completed by 2026, subject to market conditions.

Vehicular access will be provided by a new municipal road connection to Waterloo Street, and connections to Charles Young Avenue and Ingold Avenue which are existing subdivision roads to the west.

Study Scope

The purpose of this study is to determine the impacts of development traffic on the surrounding road network and to identify potential improvements if necessary to accommodate this traffic. The study area intersections analysed in this study include:

- ▶ Waterloo Street and Laschinger Boulevard;
- ▶ Waterloo Street and Hostetler Road; and
- ▶ Waterloo Street and Street Two (New Road Connection).

The TIS is undertaken in accordance with the Region of Waterloo guidelines, and includes an analysis of existing traffic conditions, future background and total traffic conditions corresponding to anticipated completion of development (2026), and five years after build-out (2031).

The Township has indicated the following requirements for the study and the new subdivision and existing adjacent roads:

- ▶ Classification of subdivision roads based on AADT projections.
- ▶ Design of new subdivision roads corresponding to posted speed and traffic calming measures as appropriate.
- ▶ Assessment of the intersections of Victoria Street / Laschinger Boulevard / George Street based on development traffic routing and assignment involving the adjacent residential streets.



- ▶ Based on previous studies in the Township, either include accommodations for secondary suites by factoring the trip generation for single and semi-detached homes up by 10% or provide justification for not including the factor.

Conclusions

- ▶ **Existing Traffic Operations:** The two study area intersections as noted above are operating at acceptable levels of service during the AM and PM peak hours, with no problem movements.
- ▶ **Trip Generation:** The development is forecast to generate 533 and 680 new trips during the AM and PM peak hours, respectively at full build out (2026). It is noted that given the scale of development and the order of magnitude of trip generation estimates, it will not be necessary to include 10% additional trips for potential secondary suites in single detached dwelling units.
- ▶ **Internal Roads:** Based on internal distribution of development traffic, Street Two and Ingold Avenue extension could be classified as Collector roads, and all other subdivision roads as Local roads or Public Lanes;
- ▶ **Future (2026 & 2031) Background and Total Traffic Operations:** The study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours, with no problem movements.
- ▶ **Auxiliary Left-Turn Lanes:** Westbound Left-turn lanes are required on Waterloo Street at:
 - **Street Two** with a storage length of 30 metres; and
 - **Laschinger Boulevard** with a storage length of 25 metres.

Recommendations

Based on the findings of this study, the subject development is recommended for consideration for approval as proposed along with the provision of westbound left-turn lanes on Waterloo Street at the new Street Two access intersection, and at the existing Laschinger Boulevard intersection.



Contents

1	Introduction	1
1.1	Overview.....	1
1.2	Purpose and Scope	1
1.3	Study Area.....	2
2	Existing Conditions.....	4
2.1	Road Network.....	4
2.2	Transit Facilities	6
2.3	Pedestrian and Cycling Facilities	6
2.4	Traffic Volumes.....	6
2.5	Traffic Operations.....	10
3	Development Concept.....	12
3.1	Development Description.....	12
3.2	Development Traffic Estimates.....	14
3.3	Development Trip Distribution and Assignment	14
3.3.1	Impact on Neighbourhood Streets.....	17
3.4	Internal Road System	19
4	Evaluation of Future Traffic Conditions.....	22
4.1	2026 Horizon	22
4.1.1	2026 Background Traffic Growth.....	22
4.1.2	2026 Total Traffic Operations.....	22
4.2	2031 Horizon	27
4.2.1	2031 Background Traffic Growth.....	27
4.2.2	2031 Total Traffic Operations.....	27
5	Auxiliary Left-turn Lanes	32
5.1	MTO Methodology.....	32
5.2	Synchro and SimTraffic Analysis	32
5.3	Recommended Storage Length	33
6	Conclusions and Recommendations	37
6.1	Conclusions	37
6.2	Recommendations.....	37



Appendices

Appendix A	Pre-Study Conference with Region of Waterloo
Appendix B	Existing Turning Movement Counts
Appendix C	Base Year Traffic Operations Reports
Appendix D	2026 Background Traffic Operations Reports
Appendix E	2026 Total Traffic Operations Reports
Appendix F	2031 Background Traffic Operations Reports
Appendix G	2031 Total Traffic Operations Reports
Appendix H	2031 Total Queuing Analysis Reports

Figures

Figure 1.1:	Location of Subject Site.....	3
Figure 2.1:	Existing Lane Configuration and Traffic Control	5
Figure 2.2:	Existing Transit Network	7
Figure 2.3:	Existing and Proposed Trails Network	8
Figure 2.4:	Existing Traffic Volumes.....	9
Figure 3.1:	Proposed Draft Plan of Subdivision.....	13
Figure 3.2:	Estimated Site Generated Traffic	16
Figure 3.3:	Assumed and Alternative West In/Out Routes	18
Figure 3.4:	Estimated Site Generated Traffic – Internal Roads	21
Figure 4.1:	2026 Background Traffic.....	23
Figure 4.2:	2026 Total Traffic.....	25
Figure 4.3:	2031 Background Traffic.....	28
Figure 4.4:	2031 Total Traffic.....	30
Figure 5.1:	Westbound Left-Turn Lane Warrants Street Two & Waterloo Street – Total Traffic.....	34
Figure 5.2:	Westbound Left-Turn Lane Warrants Laschinger Boulevard & Waterloo Street – Background Traffic.....	35
Figure 5.3:	Westbound Left-Turn Lane Warrants Laschinger Boulevard & Waterloo Street – Total Traffic.....	36

Tables

Table 2.1:	Base Year Peak Hour Traffic Operations	11
Table 3.1:	Peak Hour Trip Generation	14
Table 3.2:	Estimated trip Distribution	14
Table 3.3:	Internal Road Traffic Volumes.....	20
Table 4.1:	2026 Background Traffic Operations	24
Table 4.2:	2026 Total Traffic Operations	26
Table 4.3:	2031 Background Traffic Operations	29
Table 4.4:	2031 Total Traffic Operations	31



1 Introduction

1.1 Overview

Capital Homes Inc. have retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study for the proposed residential subdivision on Waterloo Street in New Hamburg, Wilmot, Region of Waterloo. The subject lands are to the south of Waterloo Street and east of Laschinger Boulevard. The development is anticipated to be completed by 2026 subject to market conditions.

Figure 1.1 illustrates the location of the subject lands.

1.2 Purpose and Scope

The scope of this study was developed in consultation with Region of Waterloo (ROW) and Township Wilmot, and includes the following:

- ▶ document current traffic for the AM and PM peak hours, and site conditions in the vicinity of the development;
- ▶ estimate the background traffic growth in the area based on a 2% per annum road traffic growth rate;
- ▶ assign development traffic to the surrounding road network based on transportation tomorrow surveys (TTS);
- ▶ forecasts future background and total traffic volumes for two horizon years corresponding to development completion (2026), and five-years after completion (2031);
- ▶ assess the proposed intersection of Street Two at Waterloo Street; and
- ▶ identify any operational concerns and/or any mitigation measures that may be required to accommodate the development.

The Township has indicated the following requirements for the study and the new subdivision and existing adjacent roads:

- ▶ Classification of subdivision roads based on AADT projections.
- ▶ Design of new subdivision roads corresponding to posted speed and traffic calming measures as appropriate.
- ▶ Assessment of the intersections of Victoria Street / Laschinger Boulevard / George Street based on development traffic routing and assignment involving the adjacent residential streets.
- ▶ Based on previous studies in the Township, either include accommodations for secondary suites by factoring the trip generation for single and semi-detached homes up by 10% or provide justification for not including the factor.



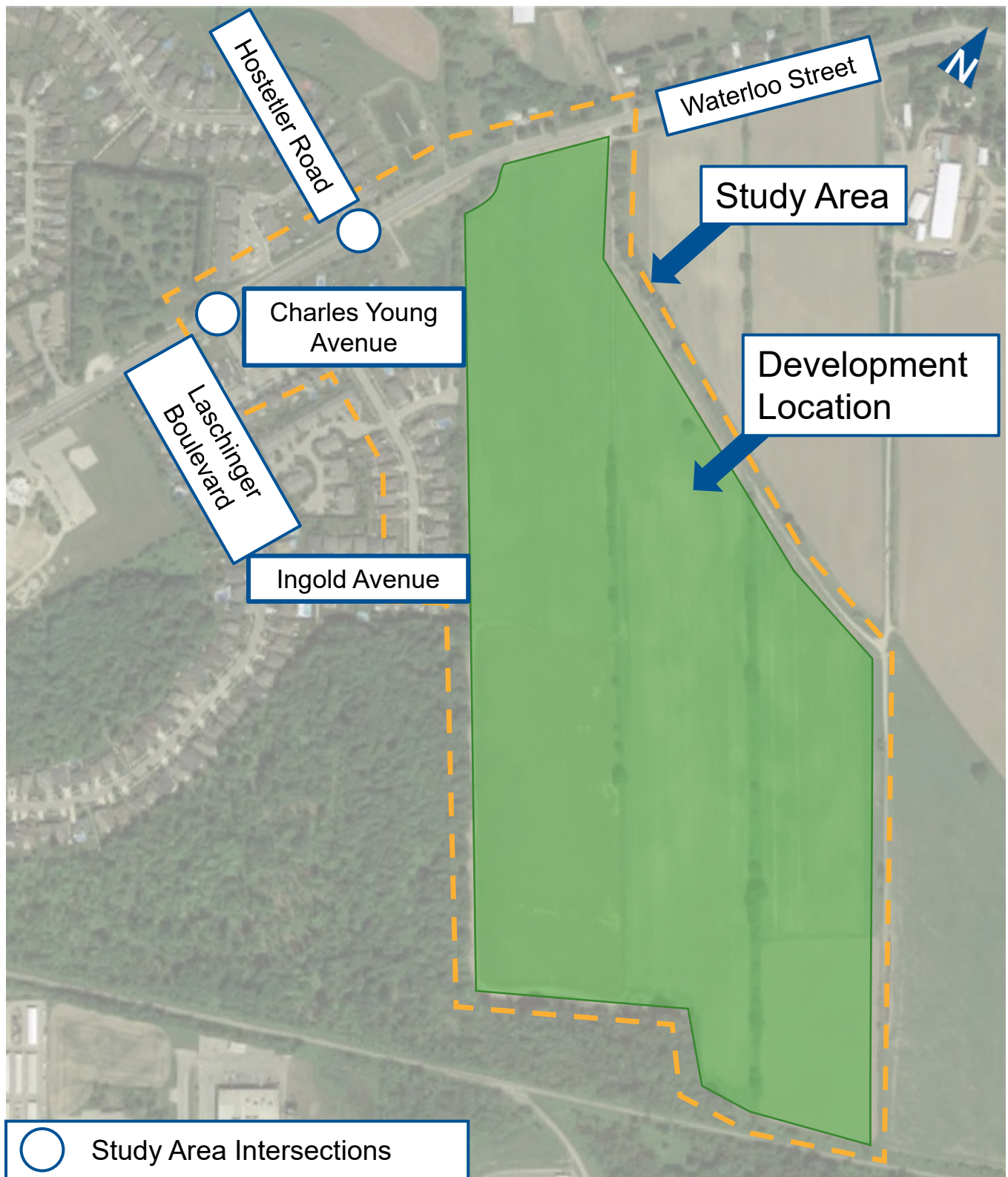
Appendix A contains the pre-study correspondence and comments received from the Region of Waterloo (Region) and Township of Wilmot (Township).

1.3 Study Area

The intersections evaluated in this study that are most likely to be impacted by the development, and which were confirmed by Region and Township staff are:

- ▶ New access intersection on Waterloo Street;
- ▶ Waterloo Street and Laschinger Boulevard; and
- ▶ Waterloo Street and Hostetler Road.





2 Existing Conditions

This section documents current traffic conditions, operational deficiencies, and constraints experienced by the public travelling at the intersections within the study area. The operational deficiencies and constraints identified at this stage will be fundamental to the process of identifying impacts and potential remedial measures.

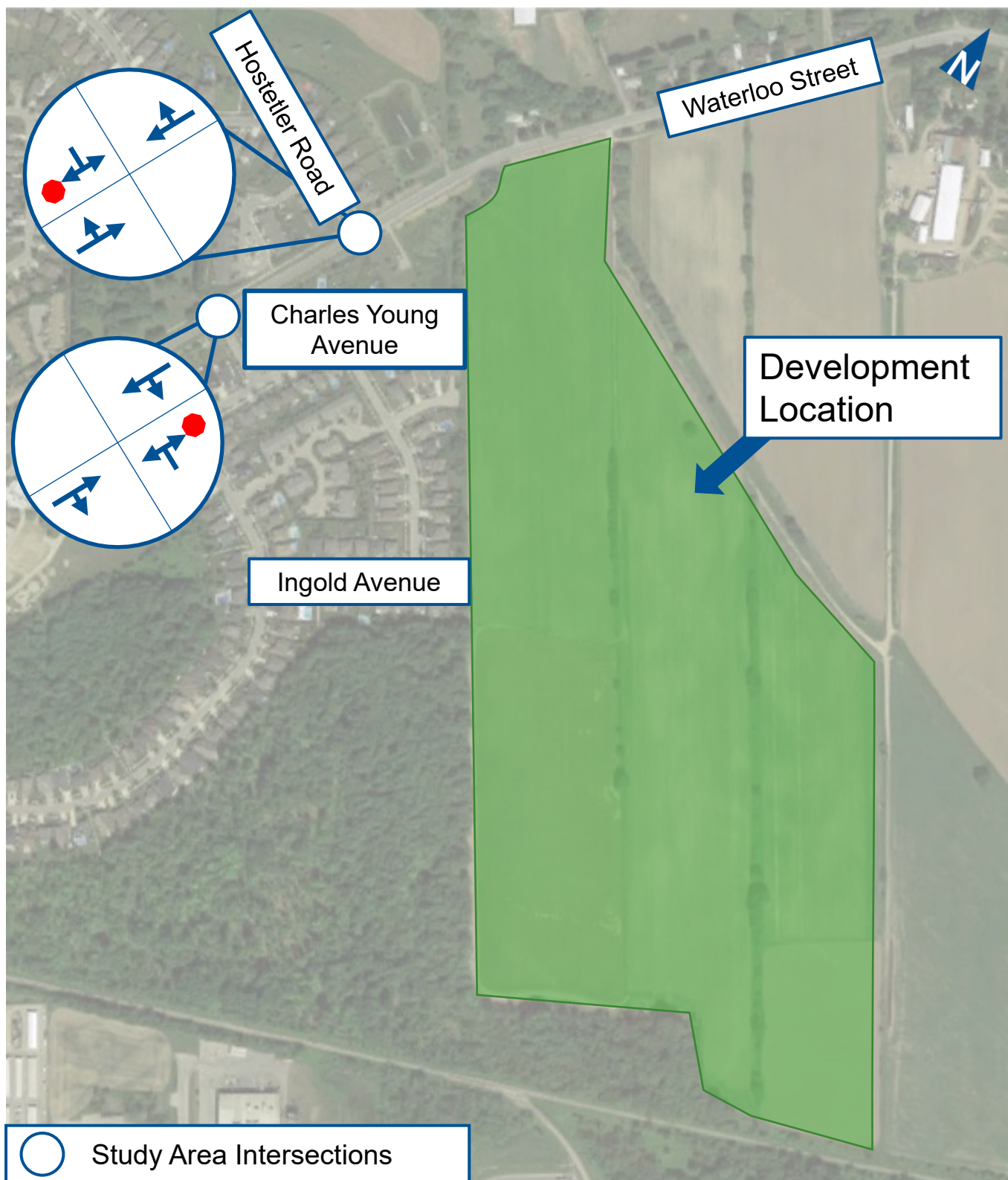
2.1 Road Network

The roads within the study area and their characteristics are:

- ▶ **Waterloo Street Two** regional road which travels east-west, has a 2-lane cross-section and a posted speed limit of 50 km/hr. It has a rural cross-section to the east of Hostetler Road and an urban cross-section west of Hostetler Road;
- ▶ **Hostetler Road** is a local road, travels north-south, has a 2-lane urban cross-section and a posted speed limit of 50 km/hr; and
- ▶ **Laschinger Boulevard** is a local road, travels north-south, has a 2-lane urban cross-section and a posted speed limit of 50 km/hr.

Figure 2.1 illustrates the existing lane configuration and traffic control.





2.2 Transit Facilities

Grand River Transit currently operates one route in the study area with the nearest stops located approximately 400 meters east from the development on Waterloo Street. **Route 77** services western Waterloo, New Hamburg, Baden and Petersburg, along Synder's Road / Waterloo Street, with a major stop at The Boardwalk. This route operates on 1-hour headways Monday-Friday and does not operate on Saturday, Sunday or Holidays.

Figure 2.2 displays the map of the existing transit network around the subject site.

2.3 Pedestrian and Cycling Facilities

Waterloo Street is classified as an On-Road Cycling Opportunity in the Township of Wilmot Trails Master Plan¹. There is also a Conceptual Trail Corridor that travels along the perimeter of the development location, overtop an existing snowmobile trail. **Figure 2.3** illustrates the existing and proposed trail network.

Sidewalks are provided on both sides of the streets west of the subject development, beginning at Hostetler Road.

2.4 Traffic Volumes

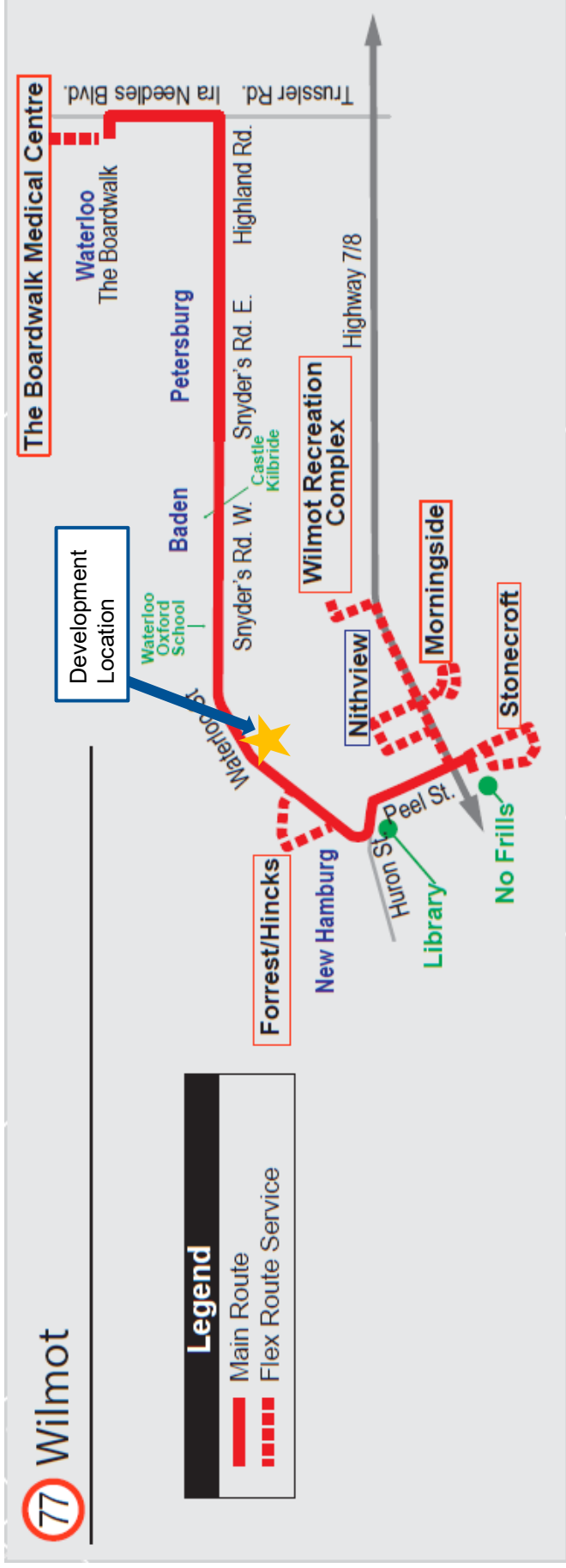
On September 18, 2018, Paradigm collected intersection turning movement data at the subject intersections.

Figure 2.4 illustrates the existing weekday AM and PM peak hour traffic volumes.

Appendix B contains the existing count data.

¹ Township of Wilmot. Township of Wilmot Trails Master Plan. November 2013







Wilmot Trails Master Plan Map 3 Existing and Proposed Resources

New Hamburg

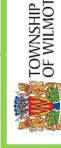
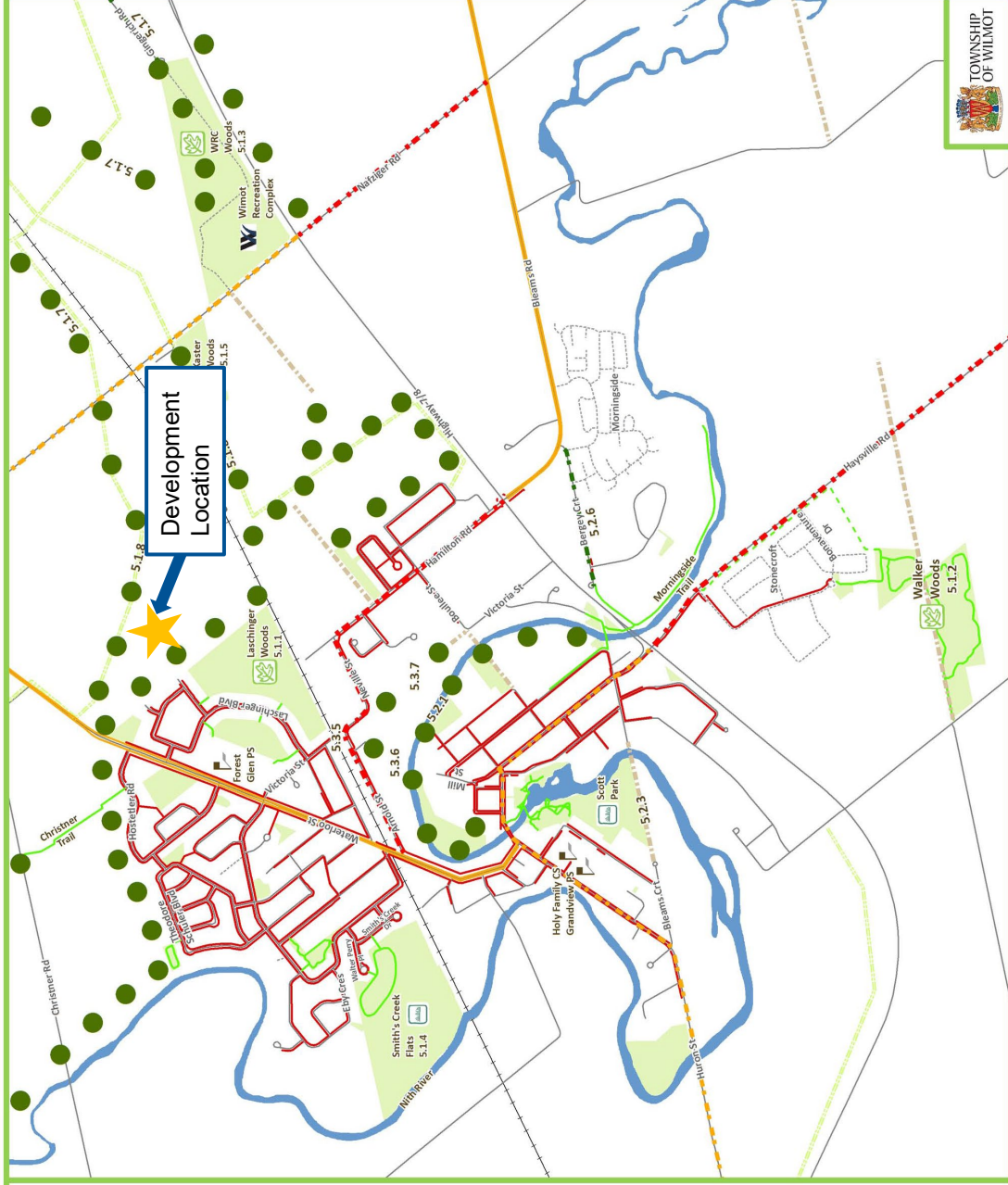
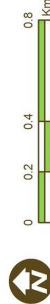
LEGEND

- On Road Cycling Opportunities (ORCO)
- Future ORCO (Wilmot)
- Future ORCO (Region)
- Trail
- Trail (private land)
- Future Boulevard Multi-Use Trail
- Conceptual Trail Corridors
- Unopened Road Allowances
- Hydro Corridor
- Existing Snowmobile Trails
- SWM, Open Space and Parkland

5.1.1 Reference to applicable report section

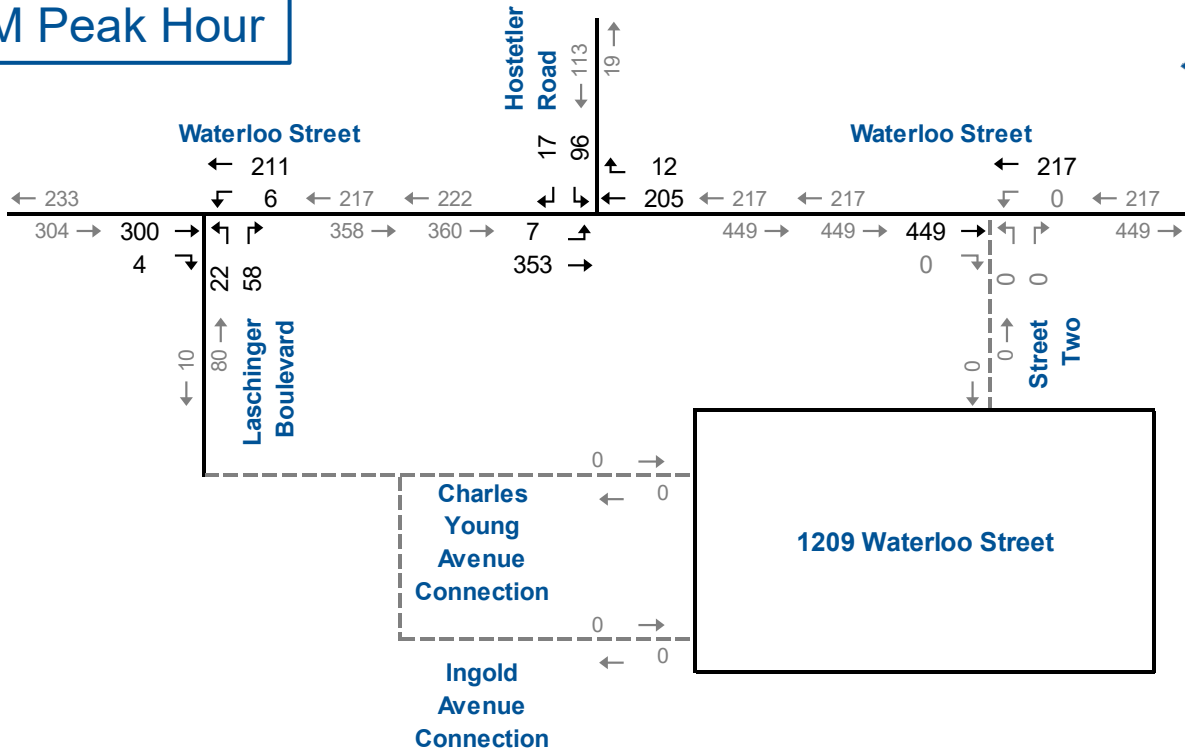
This map forms part of the Wilmot Trails Master Plan and must be read in conjunction with the entire plan.

Conceptual Trail Corridors are illustrated for reference only and shall not be interpreted as an actual established or planned route.

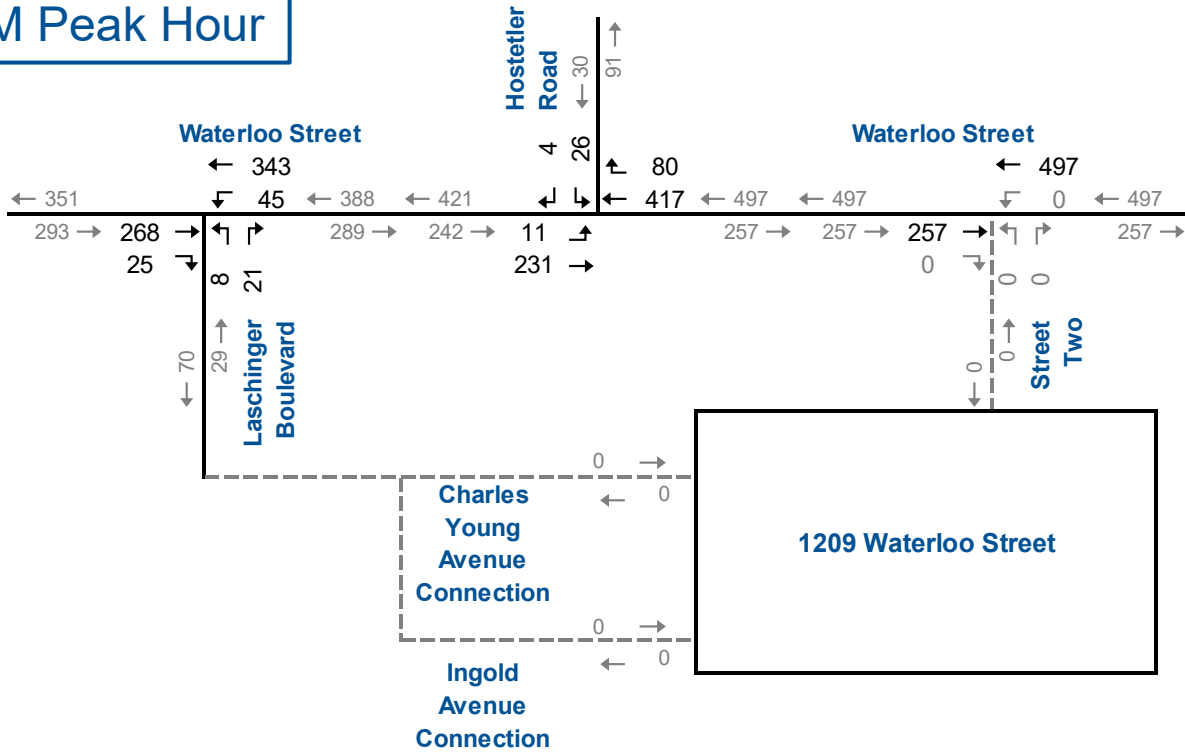


Existing and Proposed Trails Network

AM Peak Hour



PM Peak Hour



2.5 Traffic Operations

The operations of the intersections in the study area were evaluated using the existing lane configurations, traffic controls and the existing traffic peak hour volumes.

Intersection level of service (LOS) is a recognized method of quantifying the efficiency of traffic flow at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles desiring to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on a number of criteria related to the opposing traffic flows. The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds at signalized intersections (50 seconds at unsignalized intersections), the movement is considered to have a LOS F and remedial measures are usually implemented, if they are feasible.

The LOS conditions on the existing road network have been assessed using Synchro 10. The criteria, as defined by the ROW², for identifying “critical” intersections are:

- ▶ overall, LOS E or F (i.e., average control delay per vehicle greater than 55 seconds) for signalized intersections; and
- ▶ overall, LOS E or F (i.e., average control delay per vehicle greater than 35 seconds) for unsignalized intersections.

As well, the criteria for identifying individual “critical” movements are:

- ▶ the average control delay for individual movements is greater than 55 seconds;
- ▶ estimated 95th percentile queue length for an exclusive movement exceeds the available storage space;
- ▶ estimated 95th percentile queue length for an individual movement will block an existing access;
- ▶ exclusive turning lanes are inaccessible because of queue lengths in adjacent through lanes; and
- ▶ poor quality of service for non-auto modes.

Table 2.1 summarizes the LOS and other performance results. The two study area intersections are currently operating with acceptable LOS and delays.

Appendix C contains the detailed Synchro reports.

² Transportation Impact Study Guidelines, *Region of Waterloo*, July 2014



TABLE 2.1: BASE YEAR PEAK HOUR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	
				Eastbound				Westbound				Northbound				Southbound				OVERALL	
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.18 0	> > > >	A 0	< < < <	A 0 0.00 0		A 0	B 11 0.12 3		> > > >	B 11						
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 0 0.01 0		A 0		A 0 0.13 0	> > > >	A 0					B 14 0.22 7		> > > >	B 14		
PM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.17 0	> > > >	A 0	< < < <	A 1 0.04 1		A 1	B 11 0.05 1		> > > >	B 11						
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 1 0.01 0		A 1		A 0 0.29 0	> > > >	A 0					B 14 0.07 2		> > > >	B 14		

MOE - Measure of Effectiveness

LOS - Level of Service

> - Shared Right-Turn Lane

TWSC - Two-Way Stop Control

V/C - Volume to Capacity Ratio

< - Shared Left-Turn Lane

TCS - Traffic Control Signal

95th - 95th Percentile Queue Length



3 Development Concept

3.1 Development Description

The development proposes approximately 549 single-family detached houses and 304 multi-family units. Access to the development will be provided by the following:

- ▶ the Street Two connection to Waterloo Street; and
- ▶ the westerly connection to Ingold Avenue and Charles Young Avenue, both of which are existing subdivision roads to the west.

Figure 3.1 illustrates the proposed Draft Plan of Subdivision.



3.2 Development Traffic Estimates

The Institute of Transportation Engineers (ITE) Trip Generation³ rates corresponding to Land Use Code (LUC) 210 (Single-Family Detached Housing) and 220 (Multifamily Housing (Low-Rise)) were used to estimate the trip generation for the development.

Table 3.1 summarizes the site's estimated trip generation with the future expansion. The subject site is estimated to generate approximately 533 AM peak hour vehicle trips and approximately 680 PM peak hour vehicle trips. No reduction to vehicle trip generation has been assumed given the limited opportunities for non-auto usage in the area.

In addition, given the scale of development and the order of magnitude of trip generation estimates, it will not be necessary to include 10% additional trips for potential secondary suites in single detached dwelling units.

TABLE 3.1: PEAK HOUR TRIP GENERATION

Land Use Code	Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
210: Single-Family Detached Housing	549 Houses	(1)	99	296	395	(2)	328	193	521
220: Multifamily Housing (Low-Rise)	304 Dwellings	(3)	32	106	138	(4)	100	59	159
Total Net Trips			131	402	533		428	252	680

(1) $T=0.71(X)+4.80$

(3) $Ln(T)=0.95Ln(X)-0.51$

(2) $Ln(T)=0.96Ln(X)+0.20$

(4) $Ln(T)=0.89Ln(X)-0.02$

3.3 Development Trip Distribution and Assignment

TABLE 3.2: ESTIMATED TRIP DISTRIBUTION

Direction	In	Out
East via Waterloo Street	83%	83%
West via Waterloo Street	17%	17%
Total	100%	100%

Figure 3.2 illustrates the assignment of the AM/PM peak hour site-generated traffic to the study area road network based on trip distribution in **Table 3.2**.

³ Trip Generation Manual 10th Edition Institute of Transportation Engineers
Washington DC 2017

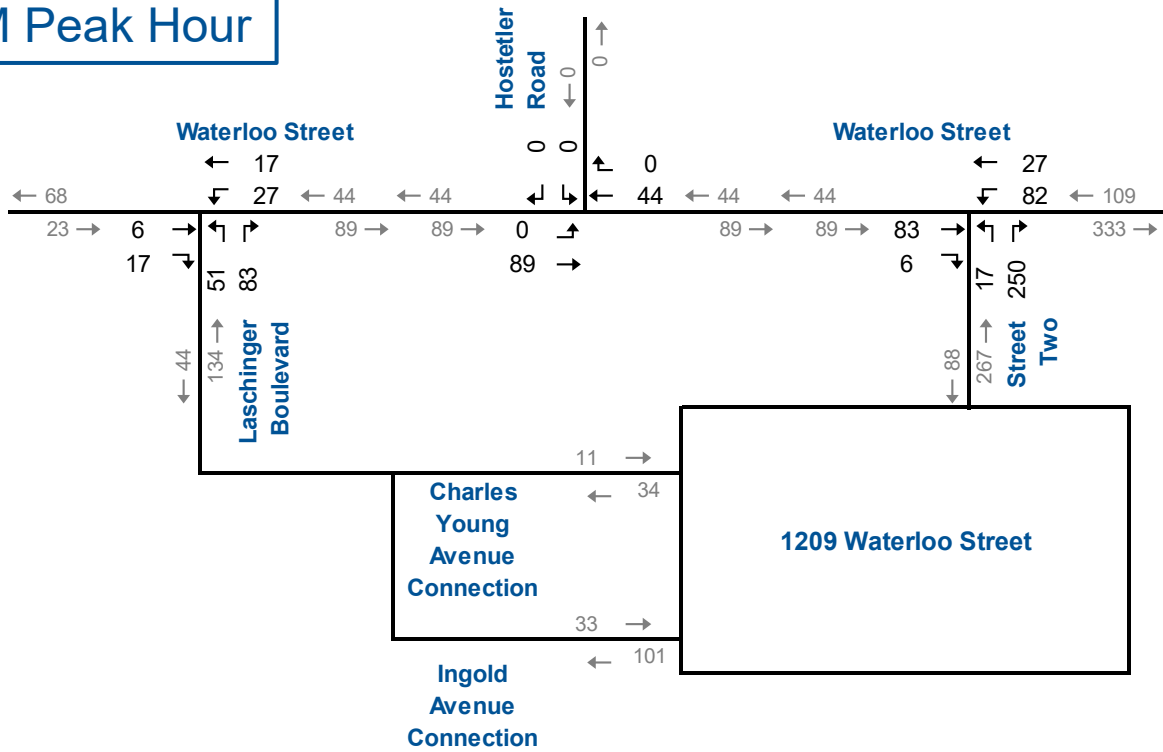


It is noted that although 83% of development traffic volumes are directed to/from east on Waterloo Street, only 66% of the peak traffic volumes are assigned to the future Street Two connection at Waterloo Street (**Figure 3.2**). The other 34% of traffic is assigned to the existing intersection of Laschinger Boulevard and Waterloo Street.

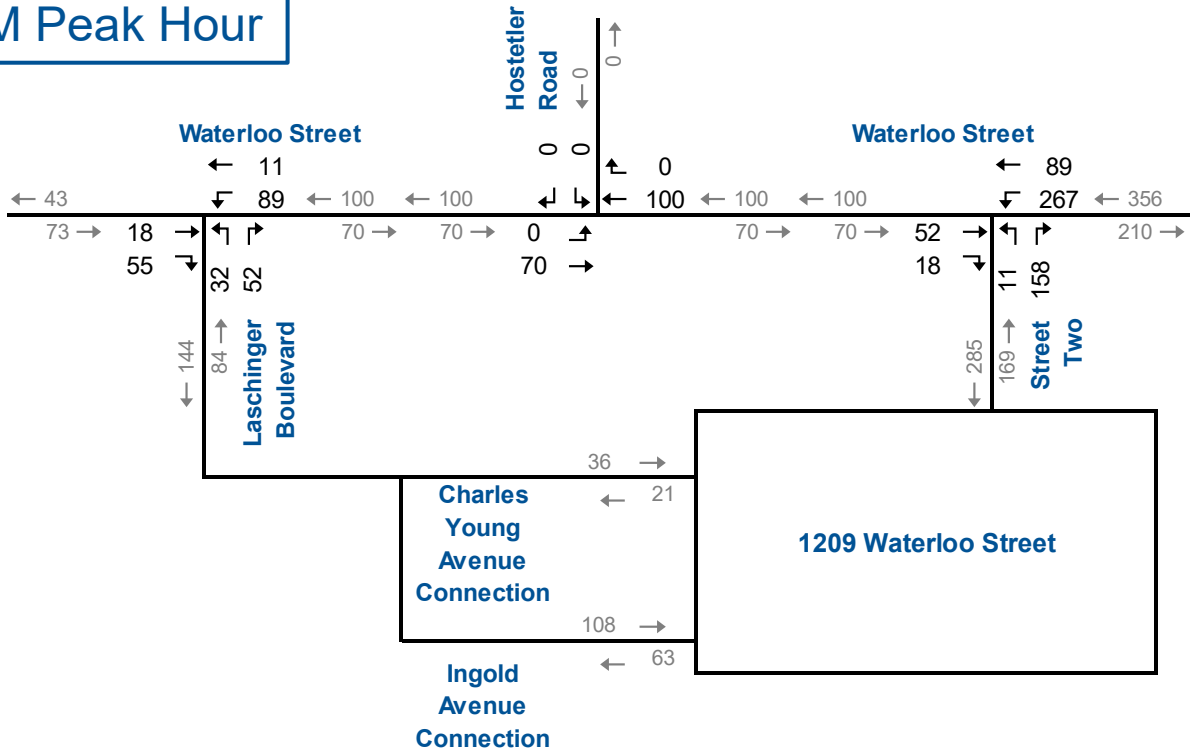
The assignment/distribution reflects likely driver behaviour to avoid high volumes of northbound right-turn movement which may occur during the AM peak hour, and westbound left-turn movements during the PM peak hour, at the Street Two and Waterloo Street intersection. At other times, including peak hour intervals, Street Two can be expected to carry all the development traffic (83%) directed to/from the east.



AM Peak Hour



PM Peak Hour



Estimated Site Generated Traffic

3.3.1 Impact on Neighbourhood Streets

The proposed connections to Ingold Avenue and Charles Young Avenue will provide additional alternative connections for the new subdivision as well as for the existing subdivision to the west. The use of the alternative connections and the distribution of traffic between the two subdivisions will be influenced by several factors, as outlined below.

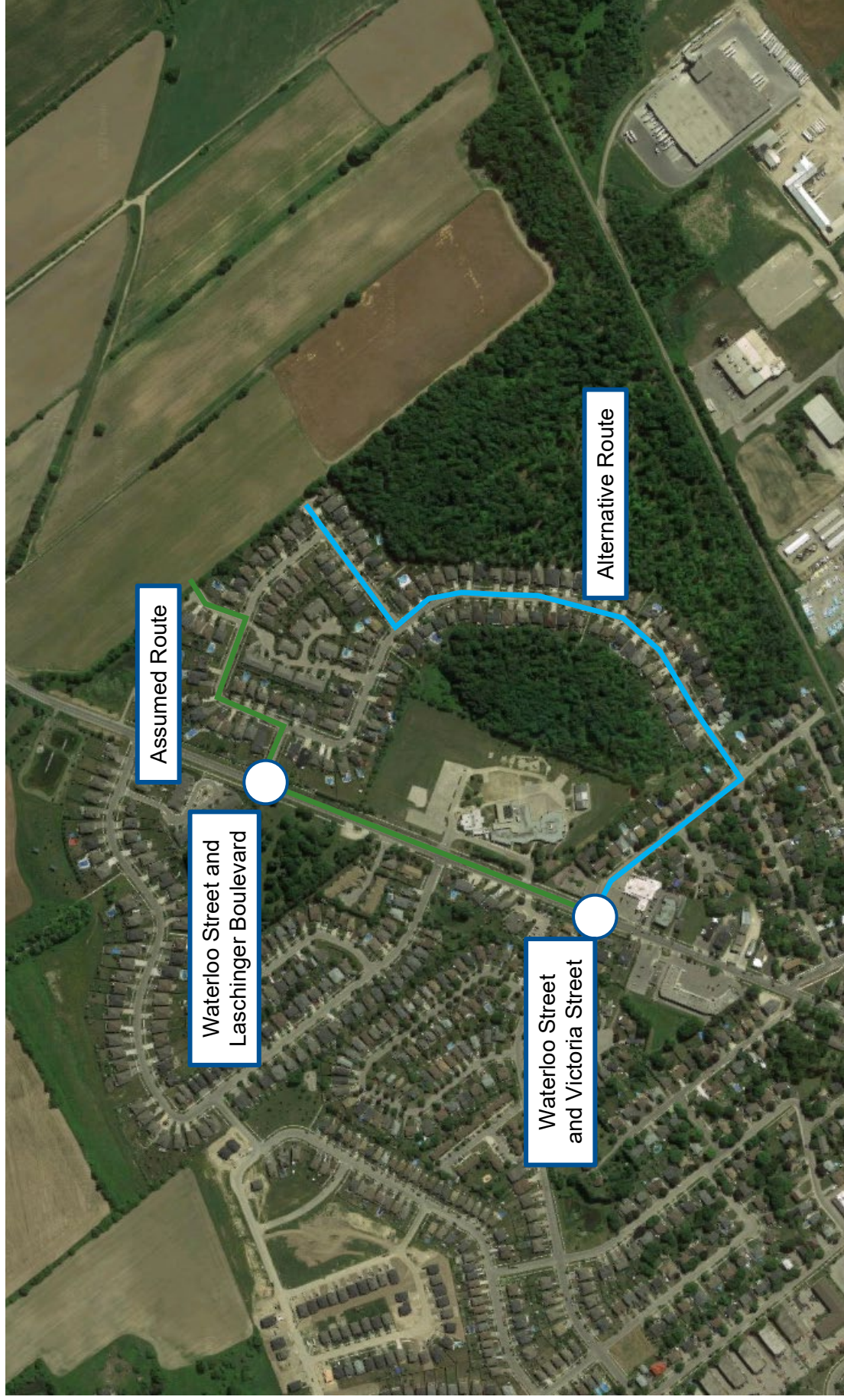
Residents of the existing subdivision are likely to continue using their current internal routes to access Waterloo Street without diverting to use the new Street Two connection. Those who may divert to use Street Two connection to Waterloo Street will be limited to those who are travelling to/from east and are likely to be from approximately 20 to 30 dwelling units located close to the intersections of Ingold Avenue and Charles Young Avenue at Laschinger Boulevard.

For the new subdivision, as noted in **Section 3.3**, Street Two will be the primary connection to Waterloo Street. The Ingold Avenue and Charles Young Avenue routes will be primarily used by new residents travelling to/from west on Waterloo Street. Residents using Ingold Avenue and Charles Young Avenue are more likely to use the intersection of Laschinger Boulevard at Waterloo Street, rather than proceed south-west on Laschinger Boulevard to Victoria Street and then travel north on Victoria Street to Waterloo Street.

The intersection of Waterloo Street and Laschinger Boulevard is much closer (270 – 400 metres) for vehicles using Ingold Avenue and Charles Young Avenue, than the intersection of Victoria Street and Waterloo Street which is located more than 800 metres away. **Figure 3.3** illustrates the likely route assumed in the analysis and the alternative route using Victoria Street.

Additionally, as shown in **Figure 3.2**, 17 inbound vehicles and 51 outbound vehicles are projected to use Ingold Avenue and Charles Young Avenue to travel to/from west on Waterloo Street, during the AM peak hour. Similarly, 55 inbound vehicles and 32 outbound vehicles are projected for the PM peak hour. These are not significantly high volumes and even if some of them use the longer Laschinger Boulevard/Victoria Street alternative route, the impact due to them will be insignificant.





3.4 Internal Road System

The internal distribution of development traffic was reviewed for the purpose of classifying the new subdivision roads, based on road classification guidelines provided by Transportation Association of Canada's Geometric Design Guide for Canadian Roads (GDG)⁴. The following three classes of roads are appropriate for residential subdivision roads:

- ▶ **Public Lanes:** primarily for access and not traffic movement, with an AADT less than 500 vehicles per day;
- ▶ **Local Roads:** access primary consideration, traffic movement secondary consideration, with an AADT between 500 and 1000 vehicles per day; and
- ▶ **Collector Roads:** traffic movement and land access are of equal importance, with an AADT between 1000 and 8000 vehicles per day.

Internal traffic distribution was prepared based on the distribution of dwelling units along internal roads, and directional distribution assumptions shown in **Table 3.2**.

Street Two is the main spine of the subdivision road system collecting development traffic from east-west side roads and distributing it primarily to Waterloo Street and to a lesser extent to Ingold Avenue and Charles Young Avenue.

Figure 3.4 illustrates the assignment of the site-generated traffic to all internal roads during the AM and PM peak hour.

Table 3.3 summarizes the inbound/outbound traffic distribution at different sections of Street Two, and for all side streets connecting to Street Two. In addition to AM/PM peak hour traffic volumes, the corresponding AADT estimates are also included.

⁴ Geometric Design Guide for Canadian Roads, *Transportation Association of Canada*, June 2017



TABLE 3.3: INTERNAL ROAD TRAFFIC VOLUMES

Section	AM Peak Hour			PM Peak Hour			AADT
	NB/EB	SB/WB	Total	NB/EB	SB/WB	Total	
Street Two							
North of Charles Young Ave	267	88	355	168	285	453	4530
Between Charles Young Ave and Ingold Ave	301	99	400	190	322	512	5120
Between Ingold Ave and Street Four/Street Six	247	81	328	156	264	420	4200
Between Street Four/Street Six and Street Five/Street Seven	123	40	163	80	135	215	2150
Between Street Five/Street Seven and Street One/Street Eight	91	30	121	59	100	159	1590
Ingold Avenue							
At Street Two	123	91	214	126	147	273	2730
Side Streets							
Street One	11	4	15	7	12	19	190
Street Four	7	2	9	5	8	13	130
Street Five	9	3	12	6	10	16	160
Street Six	46	15	61	30	51	81	810
Street Seven	23	7	30	15	25	40	400
Street Eight	19	59	78	65	38	103	1030

**Note: This table assumes the maximum value of traffic mid block as Street Two provides direct access to multiple housing blocks*

As shown in **Table 3.3**, the AADT on Street Two exceeds 1,000 vpd for every section of the roadway. The maximum AADT of 5,120 vpd is projected for the section between Ingold Avenue and Charles Young Avenue. The Street Two AADT exceeds 4,000 vpd to the north of Street Four/Street Six and is below 3,000 vpd on sections to the south.

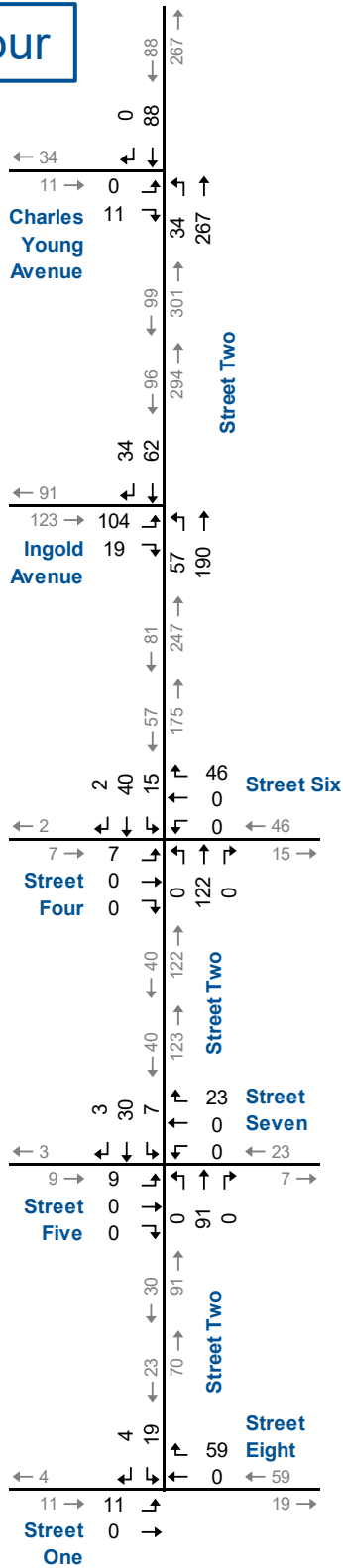
Based on the above AADT projections, Street Two and Ingold Avenue could be classified as Collector Roads.

Among the side streets, Street Eight and Street Six could be classified as Local Roads, with AADT in the 500-1000 vpd range.

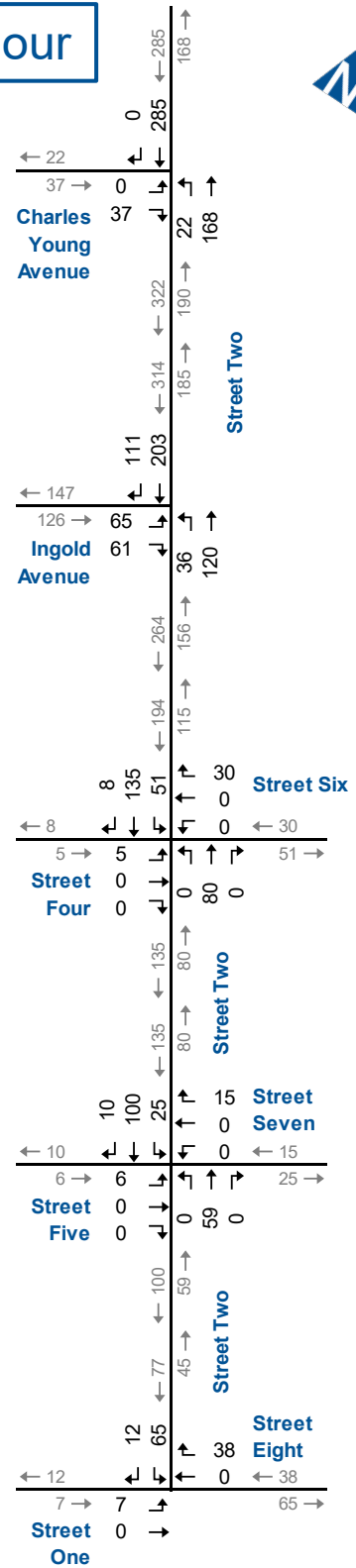
All other side streets, including the extension of Charles Young Avenue, register less than 500 vpd AADT, corresponding to the classification of Public Lanes.



AM Peak Hour



PM Peak Hour



Estimated Site Generated Traffic – Internal Roads

4 Evaluation of Future Traffic Conditions

Future traffic conditions assessed include estimates of future background and total traffic volumes and analysis for the 2026 and 2031 horizon. The future traffic volumes will consist of increased non-site traffic volumes (background traffic), and the traffic forecast to be generated by the subject lands. The growth rate for the generalized traffic near the site was conservatively assumed to be 2.0%, confirmed by the Regional Municipality of Waterloo

4.1 2026 Horizon

4.1.1 2026 Background Traffic Growth

Based on the estimated 2026 background traffic volumes, LOS analyses have been conducted using Synchro 10, for the weekday AM and PM peak hour conditions for the intersections in the study area.

Figure 4.1 displays the 2026 background traffic volumes for the weekday AM and PM peak hours, respectively.

The results of the analysis are summarized in **Table 4.1**, indicating acceptable levels of service (LOS), volume to capacity ratios (V/C) and 95th percentile queues at the two intersections.

Appendix D includes the detailed Synchro 10 reports.

4.1.2 2026 Total Traffic Operations

The 2026 total traffic volumes expected in 2026, including both background traffic and development traffic, are shown in **Figure 4.2** for the AM and PM peaks, respectively.

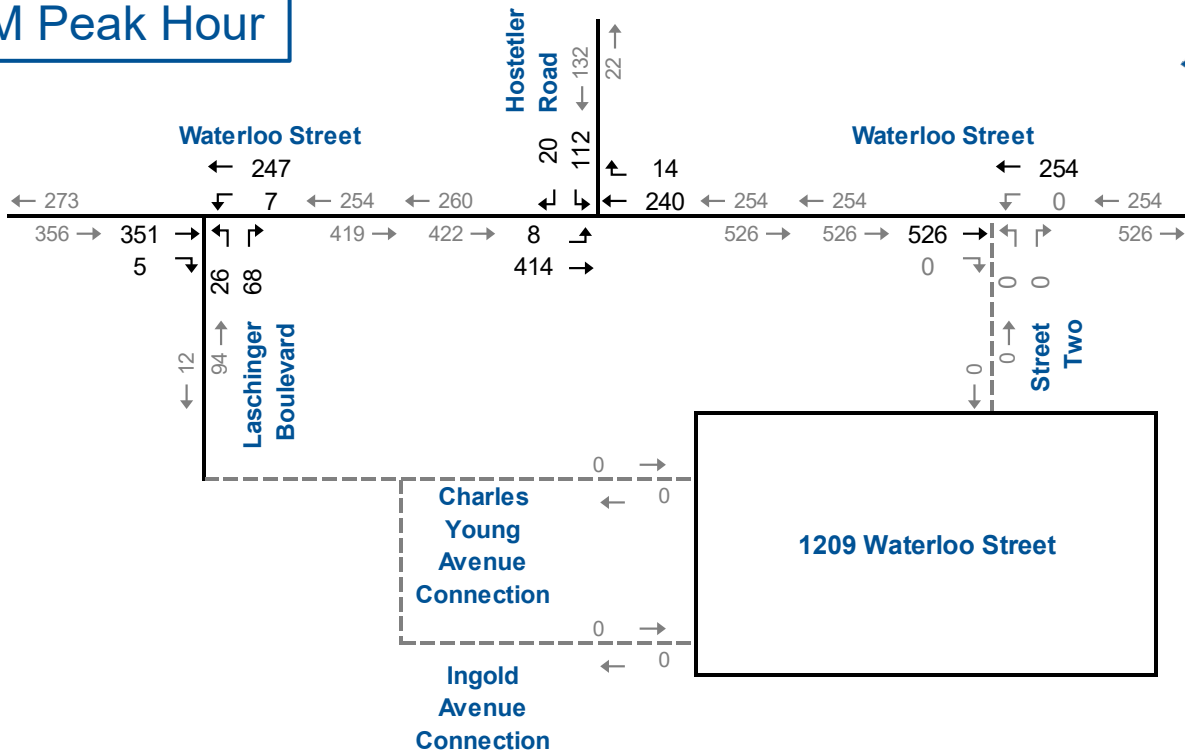
Similar to background traffic conditions, LOS analysis was undertaken, and the results are summarized in **Table 4.2**.

The results indicate acceptable levels of service (LOS), volume to capacity ratios (V/C) and 95th percentile queues, at the two study area intersections and the proposed new access intersection on Waterloo Street.

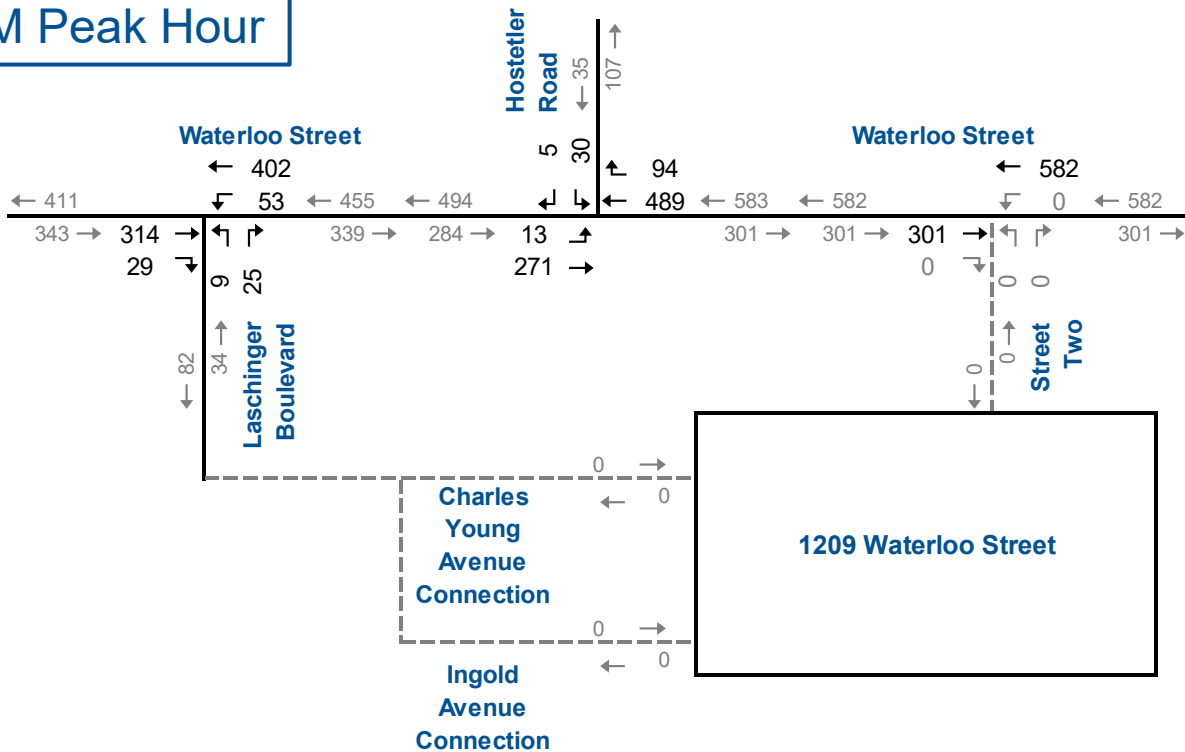
Appendix E includes the detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour



2026 Background Traffic

TABLE 4.1: 2026 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.21 0	> > >	A 0 0 0	< < <	A 0 0 0		A 0 0 0	B 12 0.16 5		> > >	B 12					
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 0 0 0.01 0		A 0 0 0.15 0	> > > >	A 0 0 0 0							C 16 0.29 10		> > > >	C 16	
PM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.20 0	> > >	A 0 1 0.04 1	< < < <	A 1 0 0.34 0		A 1 0 0 0	B 12 0.06 2		> > >	B 12					
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 1 1 0.01 0		A 1 0 0.34 0	> > > >	A 0 0 0 0							C 16 0.10 3		> > > >	C 16	

MOE - Measure of Effectiveness

LOS - Level of Service

> - Shared Right-Turn Lane

TWSC - Two-Way Stop Control

V/C - Volume to Capacity Ratio

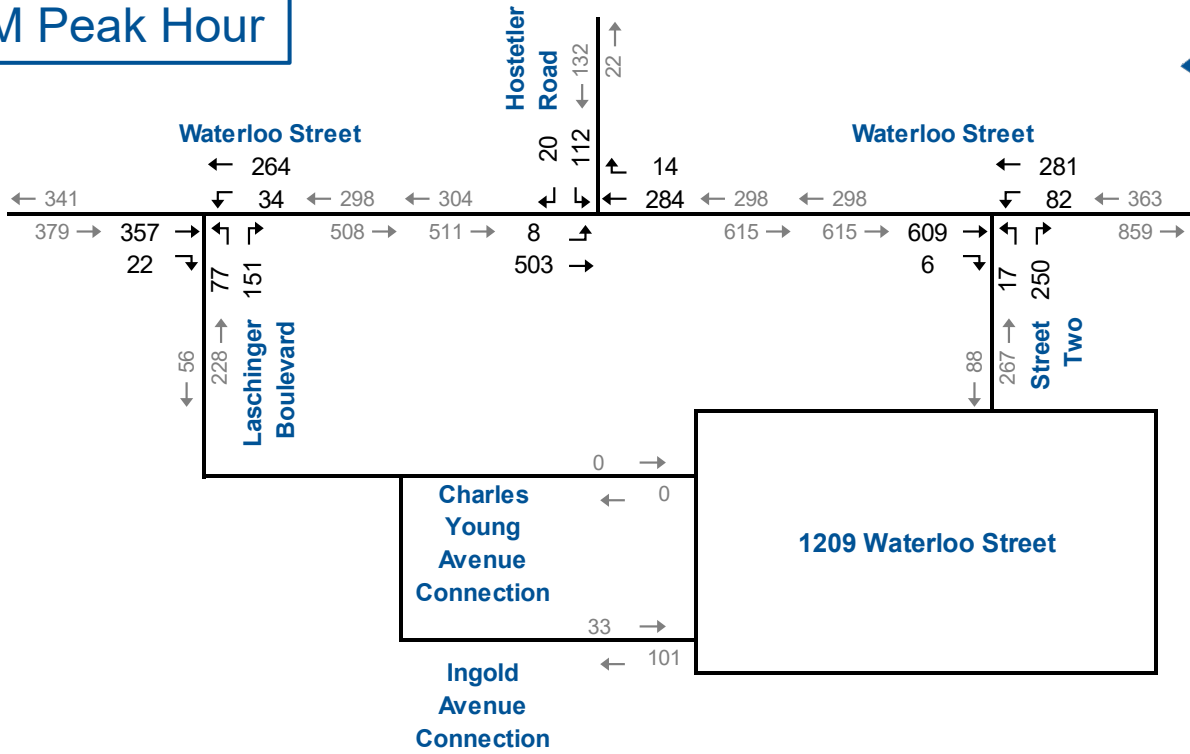
< - Shared Left-Turn Lane

TCS - Traffic Control Signal

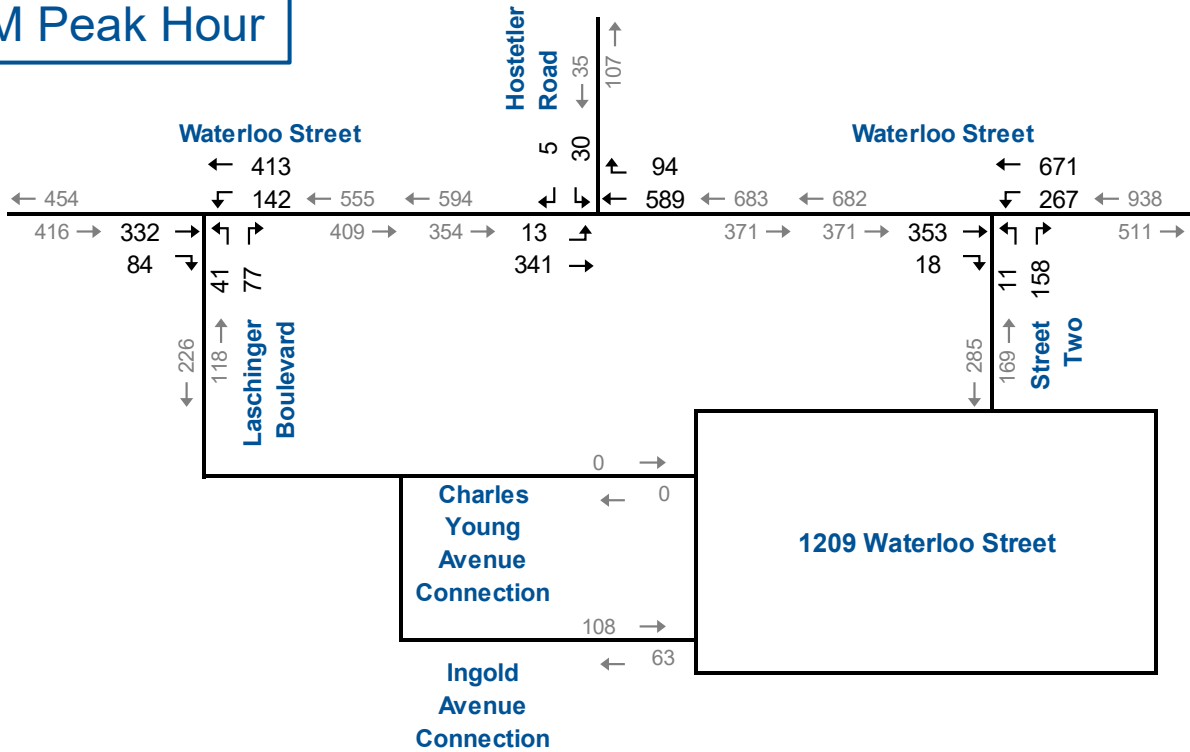
95th - 95th Percentile Queue Length



AM Peak Hour



PM Peak Hour



2026 Total Traffic

TABLE 4.2: 2026 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				OVERALL
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.22 0	> > > >	A 0 0 0	< < < <	A 1 0.03 1		A 1 0 0	C 17 0.42 17		> > > >	C 17 0 0					
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 0 0.01 0		A 0 0.18 0	> > > >	A 0 0 0					C 20 0.35 12		> > > >	C 20 0 0			
	3: Street A & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.36 0	> > > >	A 0 0 0	< < < <	A 3 0.09 2		A 3 0 0	C 23 0.58 29		> > > >	C 23 0 0					
PM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.24 0	> > > >	A 0 0 0	< < < <	A 3 0.12 3		A 3 0 0	C 19 0.31 10		> > > >	C 19 0 0					
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 1 0.01 0		A 0 0.40 0	> > > >	A 0 0 0					C 20 0.12 3		> > > >	C 20 0 0			
	3: Street A & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.22 0	> > > >	A 0 0 0	< < < <	A 5 0.22 7		A 5 0 0	C 16 0.35 12		> > > >	C 16 0 0					

MOE - Measure of Effectiveness

TWSC - Two-Way Stop Control

TCS - Traffic Control Signal

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



4.2 2031 Horizon

4.2.1 2031 Background Traffic Growth

Based on the estimated 2031 background traffic volumes, LOS analyses have been conducted using Synchro 10, for the weekday AM and PM peak hour conditions for the intersections in the study area.

Figure 4.3 displays the 2031 background traffic volumes for the weekday AM and PM peak hours, respectively.

The results of the analysis are summarized in **Table 4.3**, indicating acceptable levels of service (LOS), volume to capacity ratios (V/C) and 95th percentile queues at all intersections.

Appendix F includes the detailed Synchro 10 reports.

4.2.2 2031 Total Traffic Operations

The 2031 total traffic volumes expected in 2031, including both background traffic and development traffic, are shown in **Figure 4.4** for the AM and PM peaks, respectively.

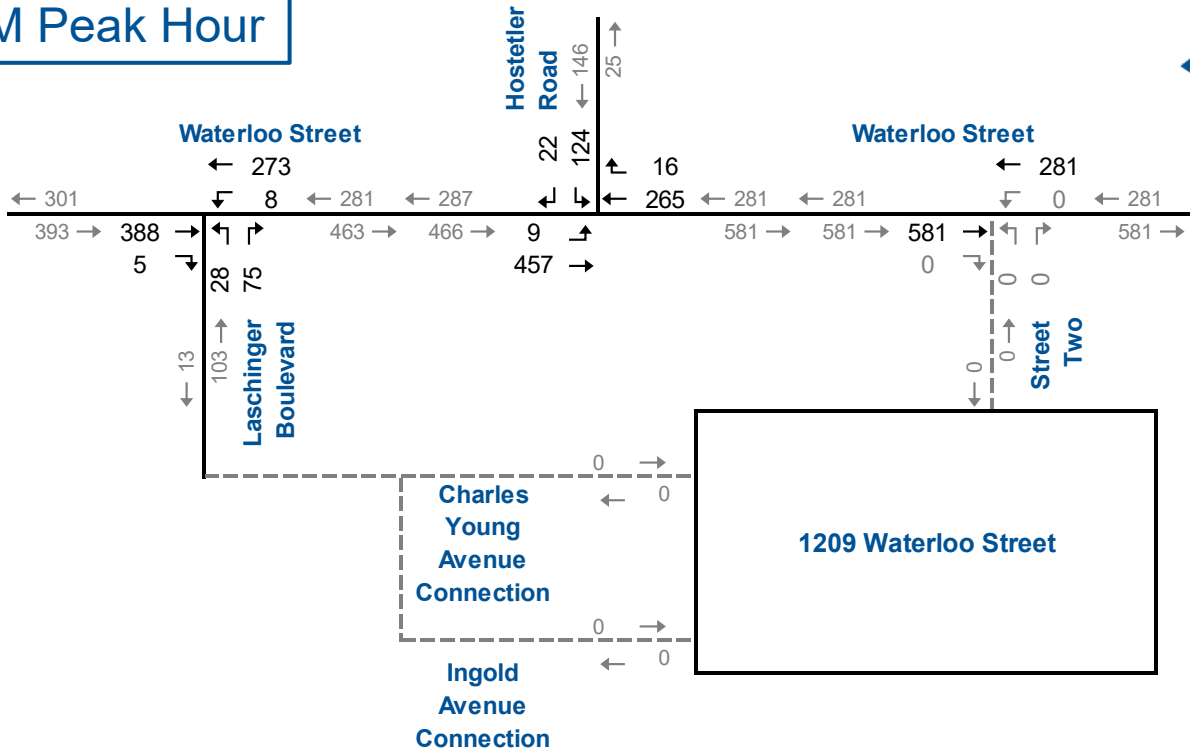
Similar to background traffic conditions, LOS analysis was undertaken, and the results are summarized in **Table 4.4**.

The results indicate acceptable levels of service (LOS), volume to capacity ratios (V/C) and 95th percentile queues, at the two study area intersections and the proposed new access intersection on Waterloo Street.

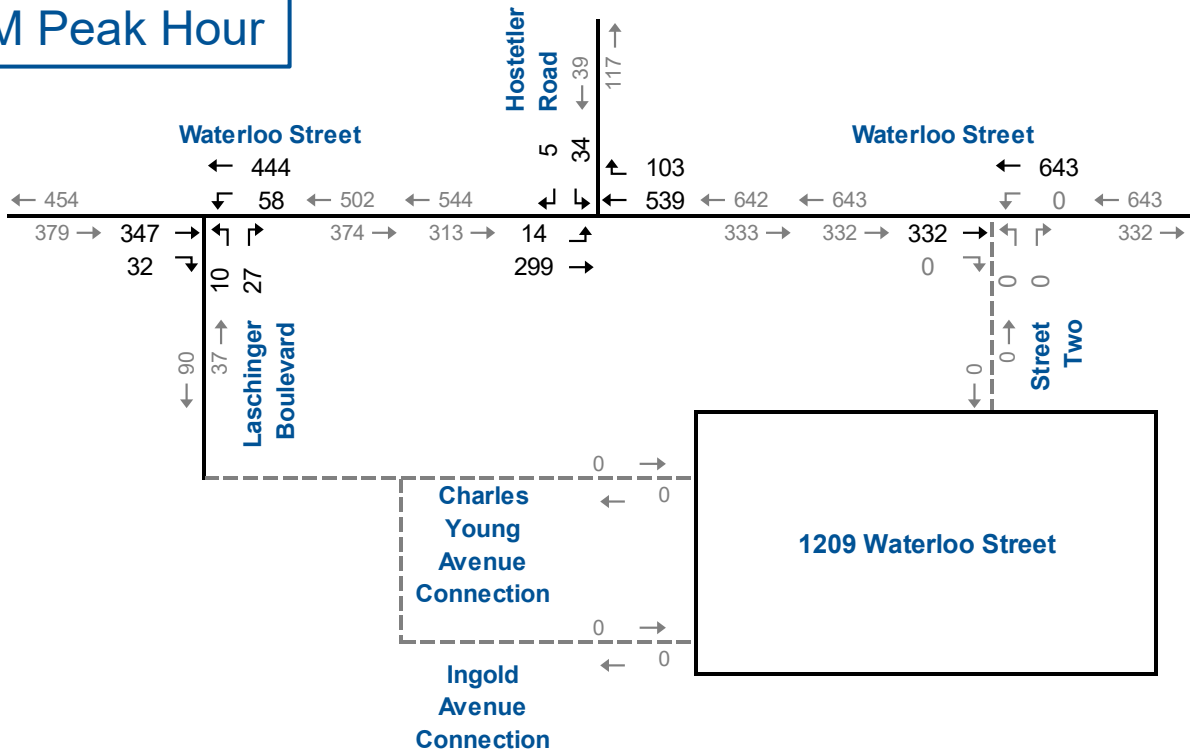
Appendix G includes the detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour



2031 Background Traffic

TABLE 4.3: 2031 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																			
				Eastbound				Westbound				Northbound				Southbound				OVERALL			
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach				
AM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.23 0	> > >	A 0 < < <	< 0 0.01 0	A		A 0	B 13 0.18 5		> > >	B 13			> > >	C 19 0.36 13		> > >	C 19	
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 0 0 0.01 0		A 0 0 0.17 0	> > > >	A 0							C 19 0.36 13		> > > >	C 19				
PM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.22 0	> > >	A 0 < < <	A 1 0.05 1	A		A 1	B 13 0.08 2		> > >	B 13			> > >			> > >	C 18 0.12 3	
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 1 1 0.01 0		A 1 0 0.38 0	> > > >	A 0							C 18 0.12 3		> > > >	C 18				

MOE - Measure of Effectiveness

LOS - Level of Service

> - Shared Right-Turn Lane

TWSC - Two-Way Stop Control

V/C - Volume to Capacity Ratio

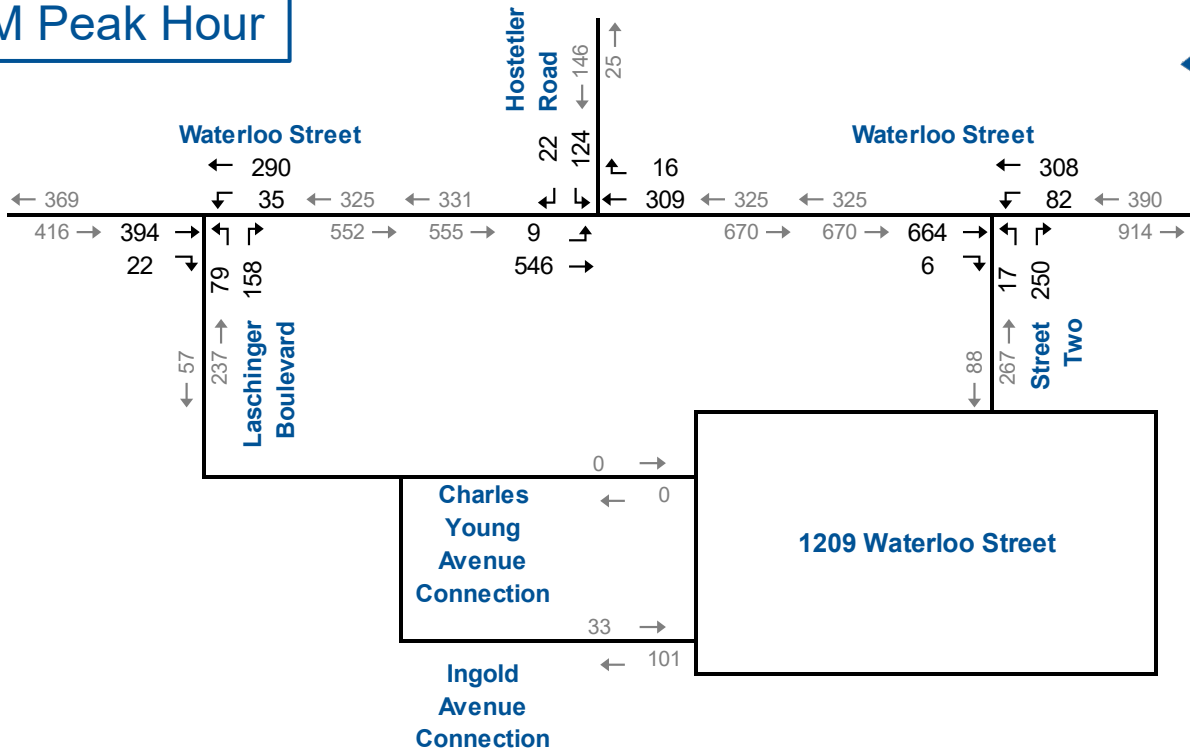
< - Shared Left-Turn Lane

TCS - Traffic Control Signal

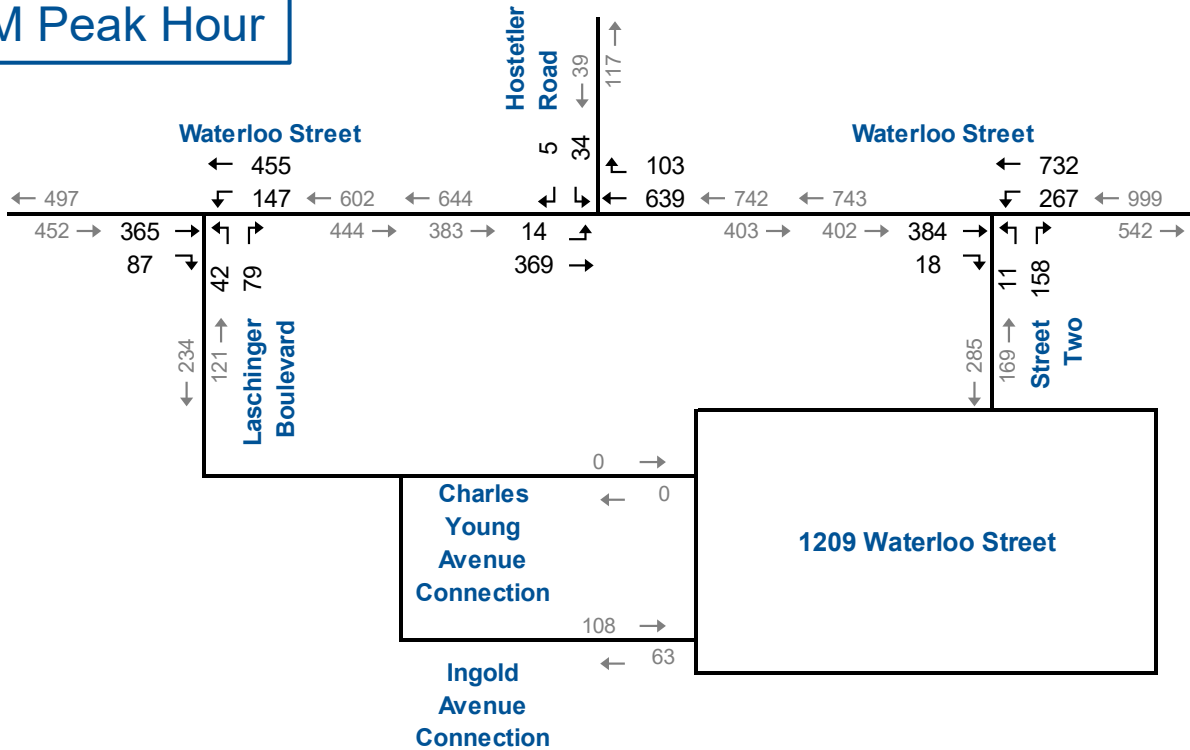
95th - 95th Percentile Queue Length



AM Peak Hour



PM Peak Hour



2031 Total Traffic

TABLE 4.4: 2031 TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	OVERALL
				Eastbound				Westbound				Northbound				Southbound					
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.24 0	> > >	A 0	< < <	A 1 0.03 1		C 18 0.47 20		> > >	C 18							
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 0 0.01 0		A 0		A 0	> > >					C 23 0.42 16		> > >	C 23			
	3: Street A & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.39 0	> > >	A 0	< < <	A 3 0.09 2		D 27 0.63 34		> > >	D 27							
PM Peak Hour	1: Laschinger Boulevard & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.27 0	> > >	A 0	< < <	A 3 0.13 4		C 21 0.35 12		> > >	C 21							
	2: Waterloo Street & Hostetler Road	TWSC	LOS Delay V/C 95th	< < < <	A 1 0.02 0		A 1		A 0	> > >					C 22 0.16 4		> > >	C 22			
	3: Street A & Waterloo Street	TWSC	LOS Delay V/C 95th		A 0 0.24 0	> > >	A 0	< < <	A 5 0.23 7		C 18 0.37 14		> > >	C 18							

MOE - Measure of Effectiveness

TWSC - Two-Way Stop Control

TCS - Traffic Control Signal

LOS - Level of Service

V/C - Volume to Capacity Ratio

95th - 95th Percentile Queue Length

> - Shared Right-Turn Lane

< - Shared Left-Turn Lane



5 Auxiliary Left-turn Lanes

The need for westbound left-turn lanes on Waterloo Street at the new intersection of Street Two, and the existing intersection of Laschinger Boulevard, was assessed using the MTO Methodology and Operational analyses using Synchro and SimTraffic Models.

5.1 MTO Methodology

MTO procedures detailed in the Geometric Design Manual⁵ provide left-turn lane warrant nomographs and storage lengths corresponding to different road speeds. A design speed that is 10 km/h higher than the posted speed is used in the assessment. For Waterloo Street, the posted speed limit in the study area is 50 km/h, so a design speed of 60 km/h was used.

The results indicate the following left-turn lane requirements corresponding to both 2026 and 2031 total traffic conditions:

- ▶ **Waterloo Street and Street A:** a 70-metre storage westbound left-turn lane is warranted under 2031 total traffic conditions.
- ▶ **Laschinger Boulevard and Waterloo Street:** a 30-metre storage westbound left-turn lane is warranted under 2031 total traffic conditions.

Figure 5.1 – 5.3 display the left-turn lane warrant nomographs and storage lengths for the two intersections.

5.2 Synchro and SimTraffic Analysis

As outlined in **Section 4.2**, operational analysis of the two intersections under 2031 traffic conditions with a shared left-through westbound lane, indicates that both intersections are projected to operate at a high level of service (LOS A), with negligible delays, and 95th percentile queue length not exceeding seven metres (one car length).

However, given the significant westbound left-turn traffic volumes (267 vph at Street Two and 147 vph at Laschinger Boulevard, during the PM peak hour), an auxiliary left-turn lane should be provided at both intersections.

Operational analyses were repeated with an auxiliary westbound left-turn included, using both Synchro and SimTraffic.

The results of the Synchro 10 analysis indicate the following storage lengths:

- ▶ **Waterloo Street and Street A:** a 7-metre storage westbound left-turn lane, approximately one vehicle.

⁵ *Geometric Design Manual for Ontario Highways*, Ministry of Transportation of Ontario, Queen's Printer for Ontario, 1986



- ▶ **Laschinger Boulevard and Waterloo Street:** a 4-metre storage westbound left-turn lane, approximately one vehicle.

The results of SimTraffic analysis, a micro simulation software used in tandem with Synchro 10, indicate the following:

- ▶ **Waterloo Street and Street A:** a 23-metre storage westbound left-turn lane, approximately three vehicles.
- ▶ **Laschinger Boulevard and Waterloo Street:** a 19-metre storage westbound left-turn lane, approximately three vehicles.

Appendix H contains the Synchro and SimTraffic reports regarding the queuing analysis.

5.3 Recommended Storage Length

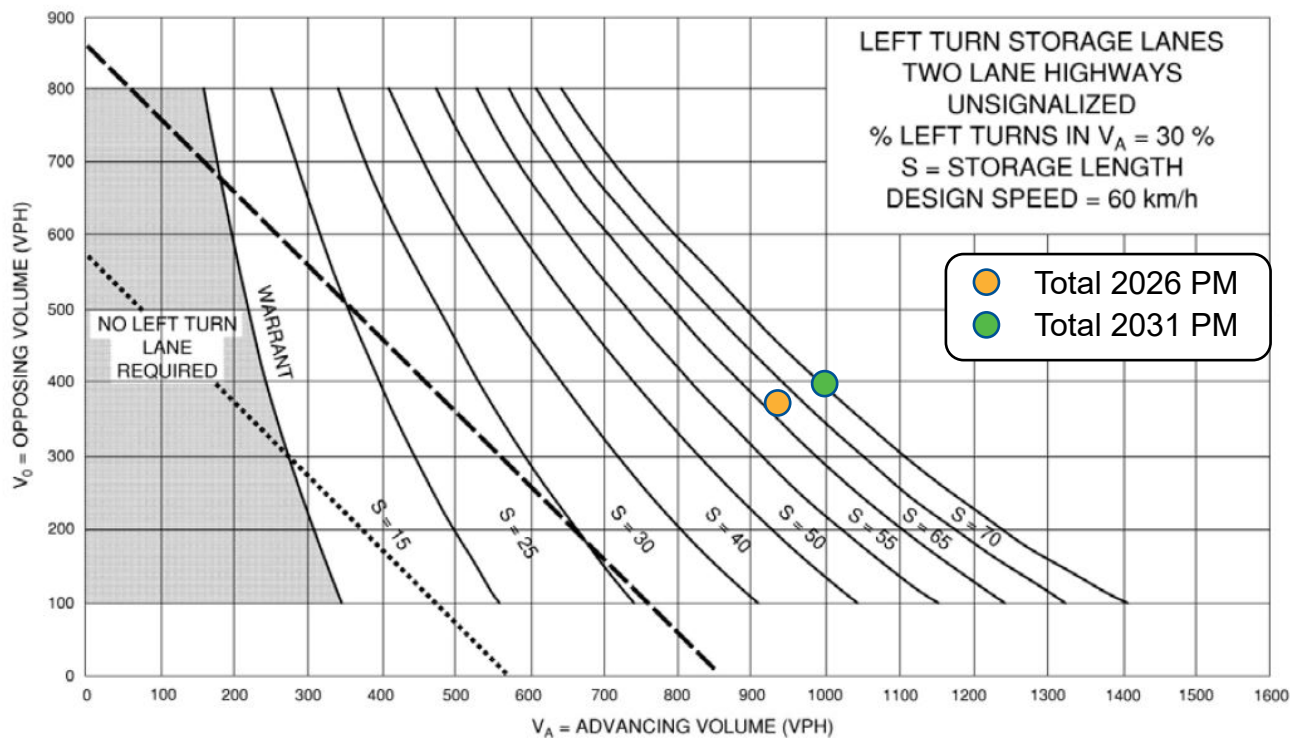
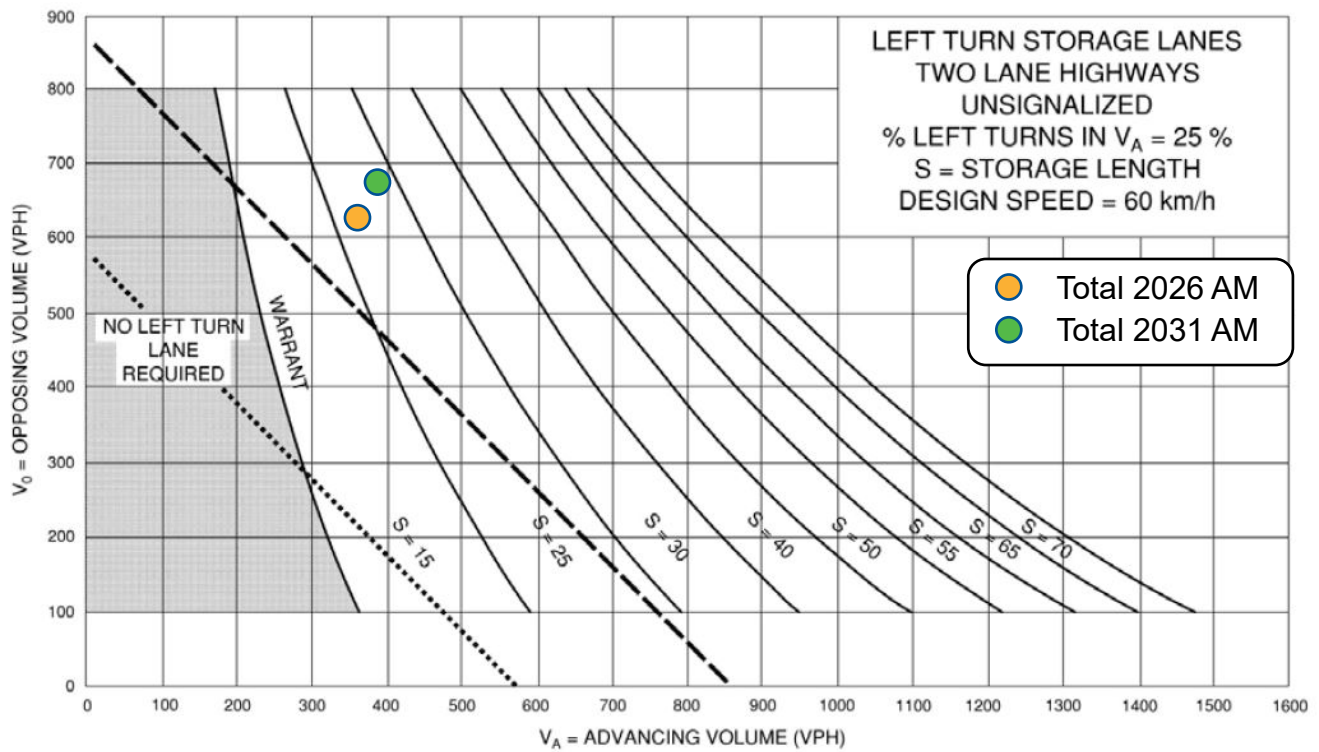
As outlined above, the operational analyses indicate that the two intersections on Waterloo Street can operate adequately without an exclusive westbound left-turn lane. However, given the significant left-turn traffic volumes, it is necessary that exclusive westbound left-turn lanes are provided at both intersections.

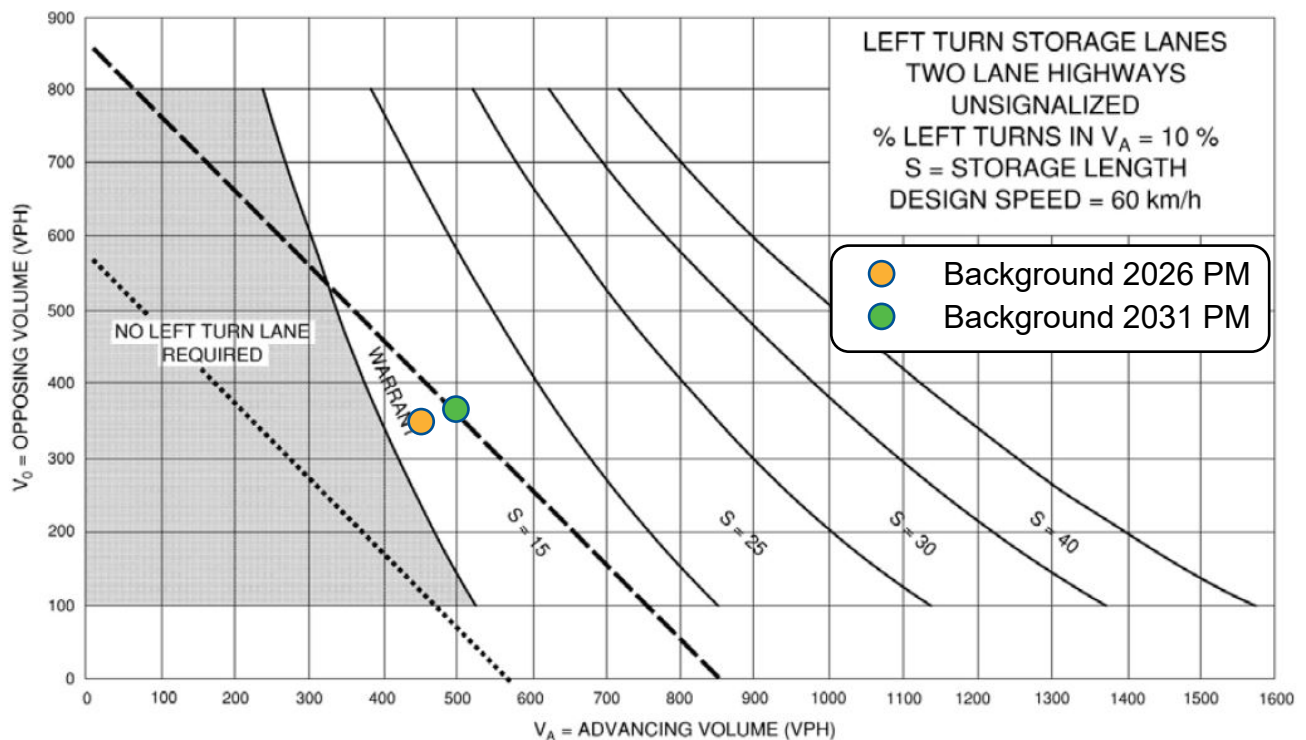
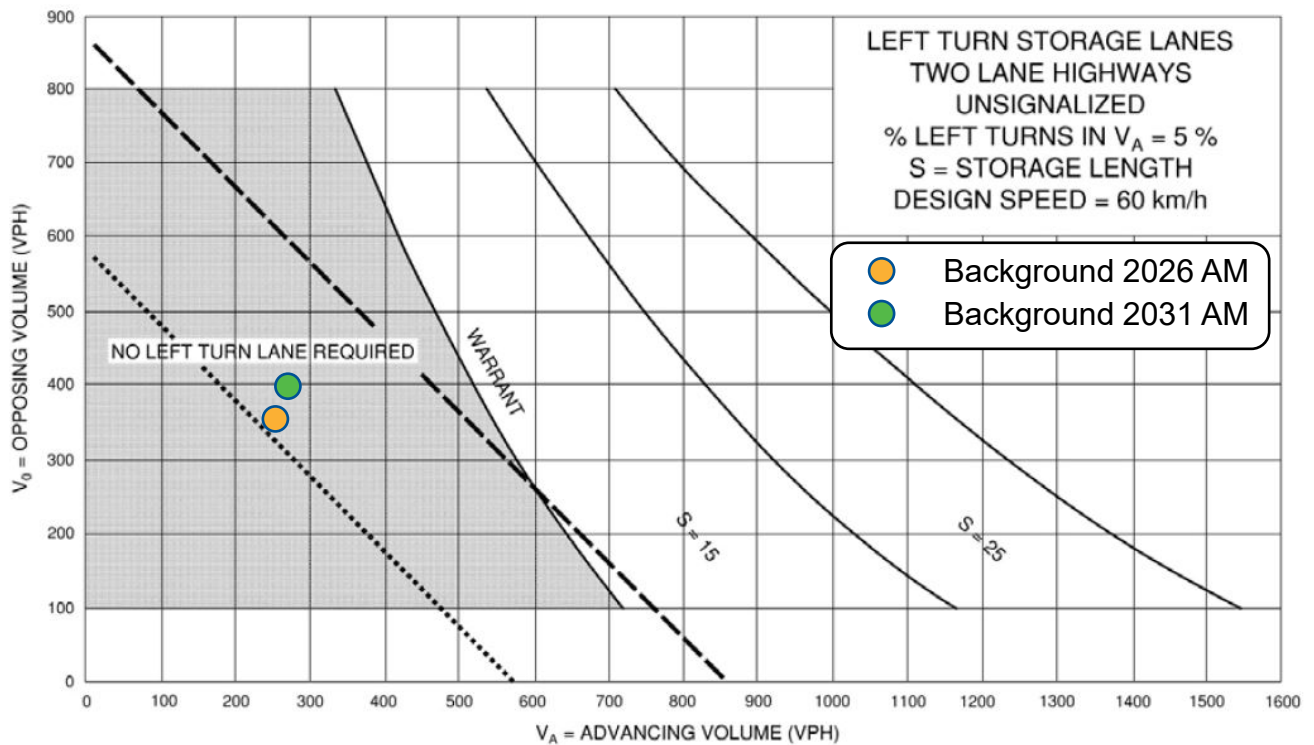
The assessment of storage lengths, based on the MTO methodology, indicates 70-metre and 30-metre storage lengths are required, respectively, at Street Two and at Laschinger Boulevard.

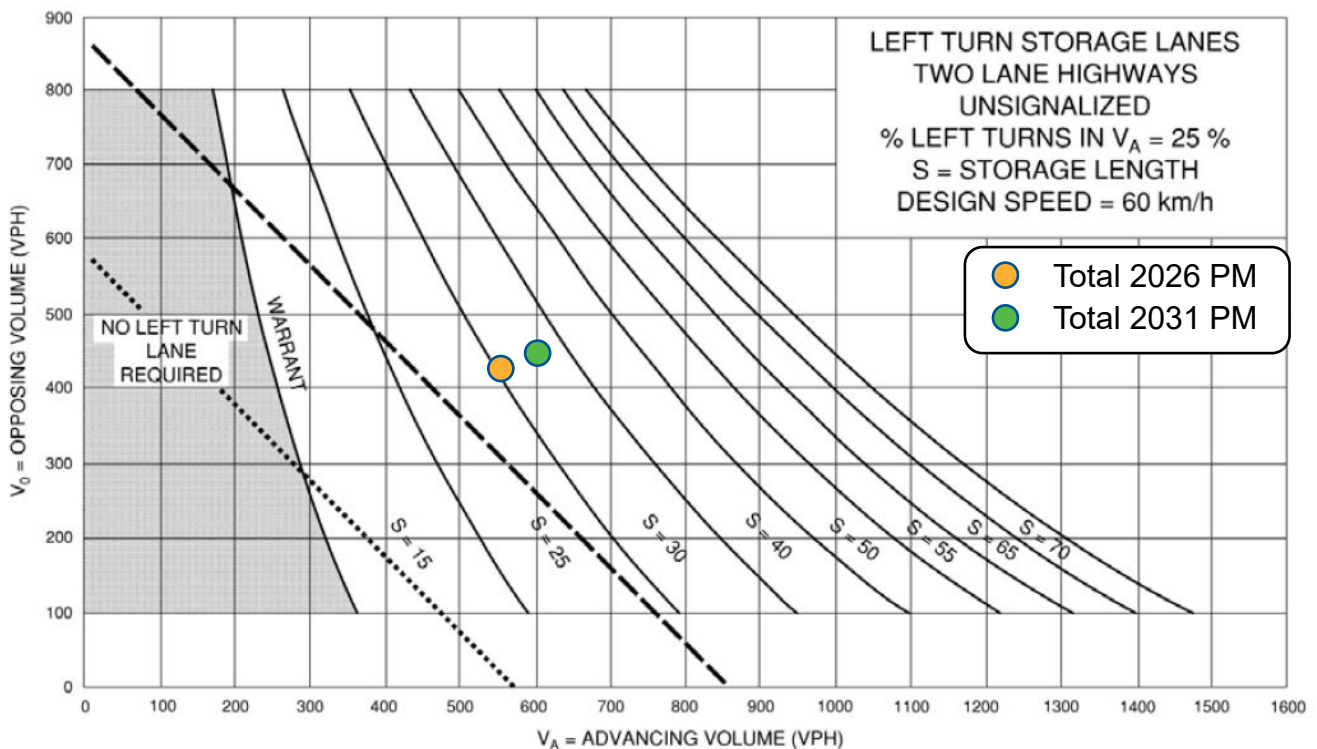
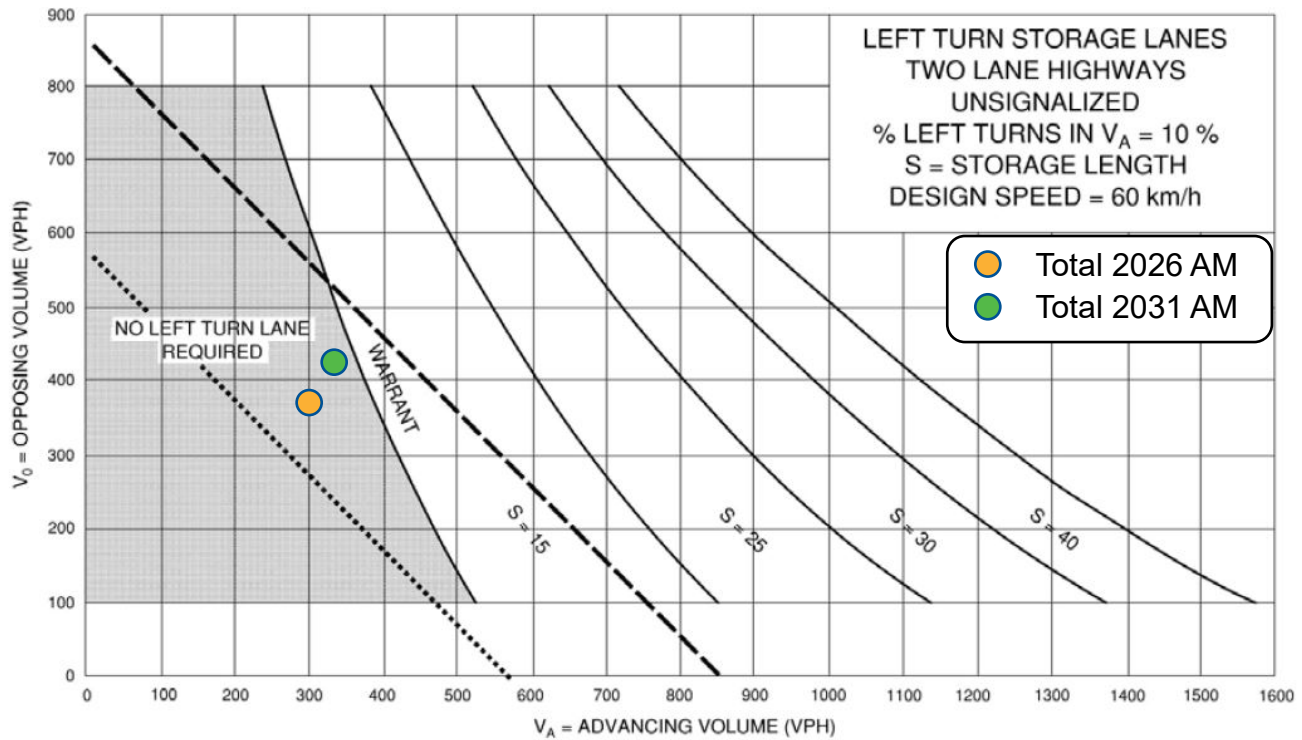
Storage lengths based on Synchro/SimTraffic models range between seven and 23 metres for the two intersections.

Considering both the operational parameters (i.e., LOS A, less than five sec delay, and 95th percentile queue lengths), and storage length assessments, it is appropriate to recommend a westbound left-turn lane storage length on Waterloo Street of 30 metres at Street Two, and 25 metres at Laschinger Boulevard.









6 Conclusions and Recommendations

6.1 Conclusions

- ▶ **Existing Traffic Operations:** The two study area intersections as noted above are operating at acceptable levels of service during the AM and PM peak hours, with no problem movements.
- ▶ **Trip Generation:** The development is forecast to generate 533 and 680 new trips during the AM and PM peak hours, respectively at full build out (2026). It is noted that given the scale of development and the order of magnitude of trip generation estimates, it will not be necessary to include 10% additional trips for potential secondary suites in single detached dwelling units.
- ▶ **Internal Roads:** Based on internal distribution of development traffic, Street Two and Ingold Avenue extension could be classified as Collector roads, and all other subdivision roads as Local roads or Public Lanes;
- ▶ **Future (2026 & 2031) Background and Total Traffic Operations:** The study area intersections are forecast to operate at acceptable levels of service during the AM and PM peak hours, with no problem movements.
- ▶ **Auxiliary Left-Turn Lanes:** Westbound Left-turn lanes are required on Waterloo Street at:
 - **Street Two** with a storage length of 30 metres; and
 - **Laschinger Boulevard** with a storage length of 25 metres.

6.2 Recommendations

Based on the findings of this study, the subject development is recommended for consideration for approval as proposed along with the provision of westbound left-turn lanes on Waterloo Street at the new Street Two access intersection, and at the existing Laschinger Boulevard intersection.



Appendix A

Pre-Study Conference with Region of Waterloo



PRE-STUDY CONFERENCE FORM

210005 – 1209 Waterloo St, Wilmot, TIS – December 2021

Item	Description	Details
ISSUES		
1	List any issues expected that may impact the content or recommendations of the subject Transportation Impact Study.	<u>Township Requirements</u> • Street Two and Street Eight collector road designation (as per TAC AADT values) • New roads included in the subdivision should be designed for the posted speed and measures put in place • Include the intersection of Victoria & Laschinger/George with commentary on trip assignment to the adjacent residential streets. • In previous studies in the Township, accommodations have been made for secondary suites by factoring the trip generation for single and semi-detached homes up by 10%. The TIS should either include a similar factor or justification for not including the factor.
INTRODUCTION		
2	Nature of application (Attach a drawing)	o Plan of Subdivision
3	TIS process, and relevant policies, procedures and approvals	o Guidelines for the preparation of Transportation Impact Studies in Support of Development Applications o Transportation Impact Studies Requirements for Capacity Analysis, Roundabouts, Turn Lanes o Safety Analysis Checklist o Policy and Procedures for Access onto Regional Roads
4	Public Meeting	o Not Required
CONTEXT		
5	Study intersections (Intersections to be analyzed) Note: the consultant is responsible to identify any further intersections impacted as the study progresses.	o Waterloo Street and Laschinger Boulevard (unsignalized);
		o Waterloo Street and Hostetter Road (east leg)
		o Waterloo Street and Street A - to check LT lane req.
6	Size and number of phases of development	o Single Phase
		o 440 single-detached
		o 280 multi-family dwellings
7	Approved and pending approval development applications	
8	Planned transportation system improvements	o New trails and sidewalks in the study area
TRAVEL DEMAND		
9	Horizon years	o full occupancy (2026) o 5 years after full occupancy (2031)

Item	Description	Details
10	Peak hour determination	- o AM weekday peak hour of adjacent roadway - o PM weekday peak hour of adjacent roadway
11	Background	- o Historical traffic/transit counts - o +2% growth per annum
12	Trip generation	- o ITE average rates - o ITE fitted equation
13	Trip reductions (TDM, internal, pass-by)	
14	Trip distribution	- o ITE trip distribution IN/OUT split - o Regional travel demand
15	Trip assignment	o Local traffic pattern
EVALUATION OF IMPACTS		
16	Traffic impact analysis (Use approved software)	- o Unsignalized intersections - o left turn warrant analysis - o signal warrant analysis - o Signalized intersections - o LOS, v/c, delay, queuing - o ROW saturation flow rates - o Existing signal timings for existing conditions - o Optimize signal timings for future conditions - o Use existing cycle length to respect coordinated corridor - o Queuing analysis - o Roundabouts - o Other...

Item	Description	Details
17	Roundabout feasibility (Use approved software)	
18	Transit assessment	- o Frequency and hours of service - o Presence of bus stops - o Reliability of service - o Passenger loads - o Travel time - o Other
19	Pedestrian assessment	- o Presence, connectivity, and width of sidewalks - o Barriers and buffers from traffic - o Crossing opportunities at intersections - o Delay at intersections - o Number of driveways and traffic volumes at the driveways - o Presence of illumination - o Future needs (desire lines / policy / accessibility / demand) - o Other
20	Cycling assessment	- o Presence of a dedicated facility - o Network connectivity - o Number and width of travel lanes adjacent to the route - o Volume and speed of traffic - o Percentage of trucks and buses encountered - o Pavement condition - o Presence of parking /showers/change rooms - o Future needs (desire lines / policy / demand) - o Other
21	Safety analysis	- o Road safety review - o Collision risk analysis - o Access conflict evaluation
22	Site access and circulation	- o Review sight distances at all new access points - o Internal traffic controls - o Loading facilities and access - o Service/maintenance vehicle access - o Emergency vehicle access
23	Submission format	- o One hard copies of main report including appendices (other than analysis results/output e.g. Synchro reports) - o Minimum one original hard copy must be sealed by a professional engineer - o Electronic copy of complete report and all appendices - o Electronic copy of operational analysis files (e.g. Synchro, Arcady) - o Electronic copy of all signal warrant calculation files - o Other

Appendix B

Existing Turning Movement Counts





Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@pts1.com

Count Name: Waterloo Street & Hostetter Road
Site Code:
Start Date: 09/18/2018
Page No: 1

Turning Movement Data

Start Time	Waterloo Street Eastbound					Waterloo Street Westbound					Hostetter Road Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:00 AM	0	70	0	0	70	20	0	0	2	20	14	1	0	0	15	105
7:15 AM	1	93	0	0	94	27	2	0	0	29	21	0	0	1	21	144
7:30 AM	0	93	0	0	93	36	2	0	1	38	22	2	0	0	24	155
7:45 AM	0	90	0	0	90	52	1	0	0	53	30	2	0	0	32	175
Hourly Total	1	346	0	0	347	135	5	0	3	140	87	5	0	1	92	579
8:00 AM	2	90	0	0	92	65	3	0	0	68	29	12	0	0	41	201
8:15 AM	5	80	0	0	85	52	6	0	0	58	15	1	0	2	16	159
8:30 AM	1	38	0	0	39	35	3	0	0	38	11	1	0	0	12	89
8:45 AM	1	53	0	0	54	50	0	0	0	50	12	0	0	0	12	116
Hourly Total	9	261	0	0	270	202	12	0	0	214	67	14	0	2	81	565
9:00 AM	0	43	0	0	43	36	2	0	0	38	7	2	0	0	9	90
9:15 AM	0	44	0	0	44	30	3	0	0	33	9	4	0	0	13	90
9:30 AM	0	37	0	0	37	44	4	0	0	48	6	0	0	0	6	91
9:45 AM	0	44	0	0	44	39	4	0	0	43	5	1	0	0	6	93
Hourly Total	0	168	0	0	168	149	13	0	0	162	27	7	0	0	34	364
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	60	0	0	60	42	1	0	0	43	3	2	0	0	5	108
11:45 AM	0	44	0	0	44	41	1	0	0	42	3	1	0	1	4	90
Hourly Total	0	104	0	0	104	83	2	0	0	85	6	3	0	1	9	198
12:00 PM	3	41	1	0	45	47	3	0	0	50	1	2	0	0	3	98
12:15 PM	0	43	1	0	44	53	4	0	0	57	4	2	0	0	6	107
12:30 PM	3	43	0	0	46	47	6	0	0	53	0	0	0	0	0	99
12:45 PM	3	40	0	0	43	43	3	0	0	46	3	3	0	0	6	95
Hourly Total	9	167	2	0	178	190	16	0	0	206	8	7	0	0	15	399
1:00 PM	1	47	0	0	48	47	11	0	0	58	1	4	0	0	5	111
1:15 PM	1	49	0	0	50	48	5	0	0	53	5	1	0	0	6	109
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	2	96	0	0	98	95	16	0	0	111	6	5	0	0	11	220
4:00 PM	1	71	0	0	72	88	12	0	0	100	3	1	0	0	4	176
4:15 PM	2	64	0	1	66	105	12	0	0	117	4	2	0	1	6	189
4:30 PM	3	81	0	1	84	100	10	0	0	110	5	2	0	0	7	201
4:45 PM	2	62	0	0	64	85	10	0	0	95	6	1	0	0	7	166
Hourly Total	8	278	0	2	286	378	44	0	0	422	18	6	0	1	24	732
5:00 PM	1	71	0	1	72	104	15	0	0	119	5	0	0	0	5	196
5:15 PM	6	54	0	0	60	97	17	0	0	114	7	0	0	1	7	181

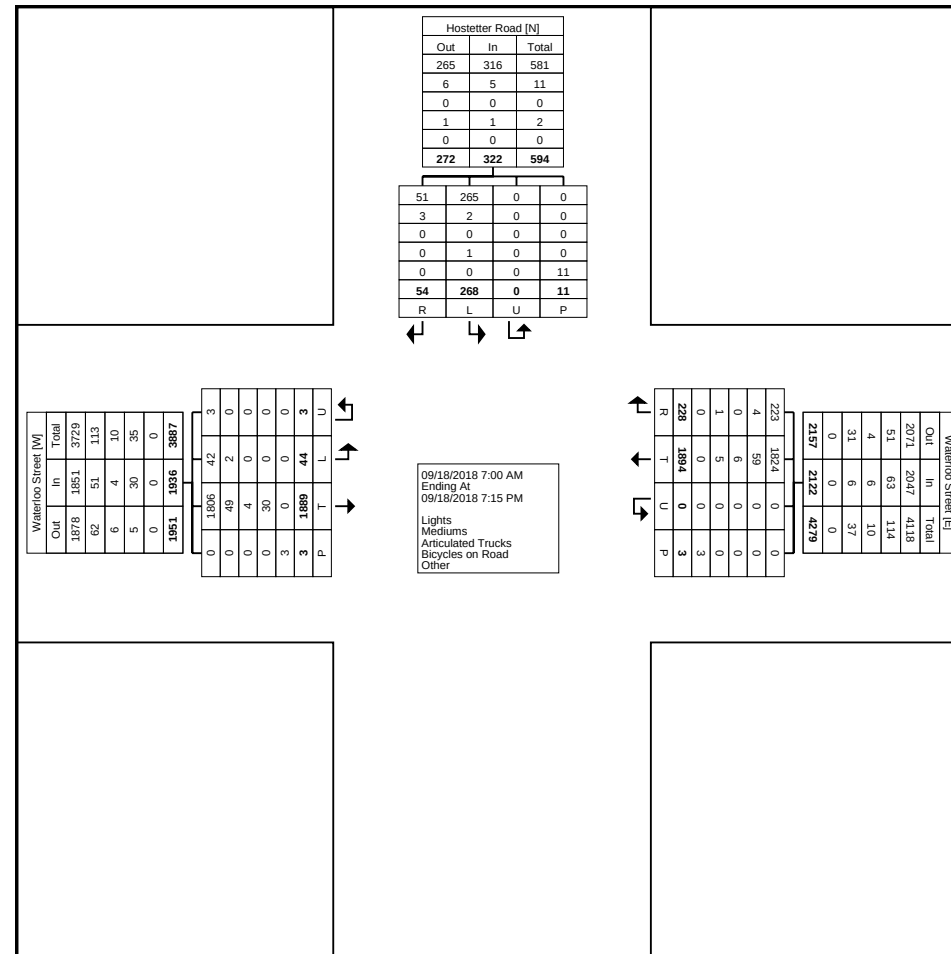
5:30 PM	1	56	0	0	57	128	29	0	0	157	8	2	0	1	10	224
5:45 PM	3	50	1	0	54	88	19	0	0	107	6	2	0	0	8	169
Hourly Total	11	231	1	1	243	417	80	0	0	497	26	4	0	2	30	770
6:00 PM	0	57	0	0	57	77	13	0	0	90	4	0	0	0	4	151
6:15 PM	1	56	0	0	57	60	6	0	0	66	7	2	0	1	9	132
6:30 PM	2	57	0	0	59	55	12	0	0	67	8	0	0	1	8	134
6:45 PM	1	68	0	0	69	53	9	0	0	62	4	1	0	2	5	136
Hourly Total	4	238	0	0	242	245	40	0	0	285	23	3	0	4	26	553
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	44	1889	3	3	1936	1894	228	0	3	2122	268	54	0	11	322	4380
Approach %	2.3	97.6	0.2	-	-	89.3	10.7	0.0	-	-	83.2	16.8	0.0	-	-	-
Total %	1.0	43.1	0.1	-	44.2	43.2	5.2	0.0	-	48.4	6.1	1.2	0.0	-	7.4	-
Lights	42	1806	3	-	1851	1824	223	0	-	2047	265	51	0	-	316	4214
% Lights	95.5	95.6	100.0	-	95.6	96.3	97.8	-	-	96.5	98.9	94.4	-	-	98.1	96.2
Mediums	2	49	0	-	51	59	4	0	-	63	2	3	0	-	5	119
% Mediums	4.5	2.6	0.0	-	2.6	3.1	1.8	-	-	3.0	0.7	5.6	-	-	1.6	2.7
Articulated Trucks	0	4	0	-	4	6	0	0	-	6	0	0	0	-	0	10
% Articulated Trucks	0.0	0.2	0.0	-	0.2	0.3	0.0	-	-	0.3	0.0	0.0	-	-	0.0	0.2
Bicycles on Road	0	30	0	-	30	5	1	0	-	6	1	0	0	-	1	37
% Bicycles on Road	0.0	1.6	0.0	-	1.5	0.3	0.4	-	-	0.3	0.4	0.0	-	-	0.3	0.8
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	9.1	-	-
Pedestrians	-	-	-	3	-	-	-	-	3	-	-	-	-	10	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	90.9	-	-



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Count Name: Waterloo Street & Hostetter Road
Site Code:
Start Date: 09/18/2018
Page No: 3



Turning Movement Data Plot



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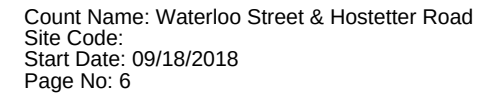
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Count Name: Waterloo Street & Hostetter Road
Site Code:
Start Date: 09/18/2018
Page No: 4

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Waterloo Street Eastbound					Waterloo Street Westbound					Hostetter Road Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:30 AM	0	93	0	0	93	36	2	0	1	38	22	2	0	0	24	155
7:45 AM	0	90	0	0	90	52	1	0	0	53	30	2	0	0	32	175
8:00 AM	2	90	0	0	92	65	3	0	0	68	29	12	0	0	41	201
8:15 AM	5	80	0	0	85	52	6	0	0	58	15	1	0	2	16	159
Total	7	353	0	0	360	205	12	0	1	217	96	17	0	2	113	690
Approach %	1.9	98.1	0.0	-	-	94.5	5.5	0.0	-	-	85.0	15.0	0.0	-	-	-
Total %	1.0	51.2	0.0	-	52.2	29.7	1.7	0.0	-	31.4	13.9	2.5	0.0	-	16.4	-
PHF	0.350	0.949	0.000	-	0.968	0.788	0.500	0.000	-	0.798	0.800	0.354	0.000	-	0.689	0.858
Lights	7	342	0	-	349	187	11	0	-	198	96	17	0	-	113	660
% Lights	100.0	96.9	-	-	96.9	91.2	91.7	-	-	91.2	100.0	100.0	-	-	100.0	95.7
Mediums	0	10	0	-	10	15	1	0	-	16	0	0	0	-	0	26
% Mediums	0.0	2.8	-	-	2.8	7.3	8.3	-	-	7.4	0.0	0.0	-	-	0.0	3.8
Articulated Trucks	0	0	0	-	0	2	0	0	-	2	0	0	0	-	0	2
% Articulated Trucks	0.0	0.0	-	-	0.0	1.0	0.0	-	-	0.9	0.0	0.0	-	-	0.0	0.3
Bicycles on Road	0	1	0	-	1	1	0	0	-	1	0	0	0	-	0	2
% Bicycles on Road	0.0	0.3	-	-	0.3	0.5	0.0	-	-	0.5	0.0	0.0	-	-	0.0	0.3
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data Plot (7:30 AM)

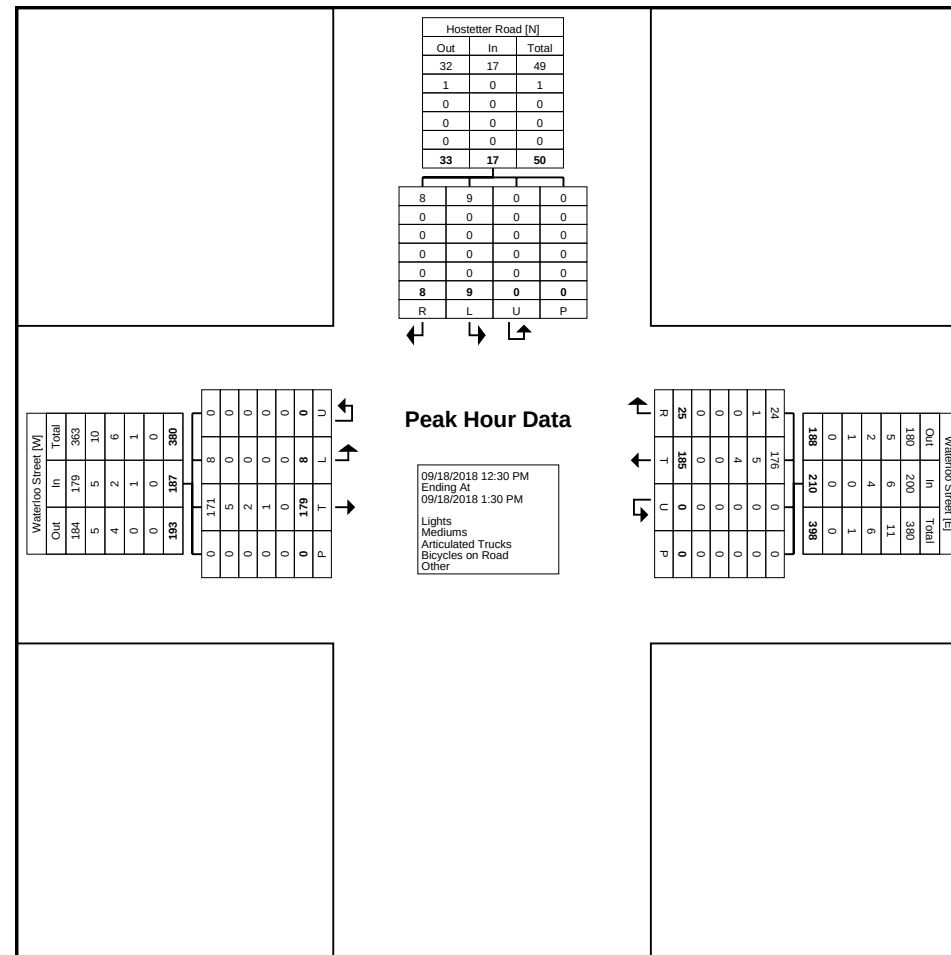




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Count Name: Waterloo Street & Hostetter Road
Site Code:
Start Date: 09/18/2018
Page No: 7



Turning Movement Peak Hour Data Plot (12:30 PM)



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Count Name: Waterloo Street & Hostetter Road
Site Code:
Start Date: 09/18/2018
Page No: 8

Turning Movement Peak Hour Data (5:00 PM)

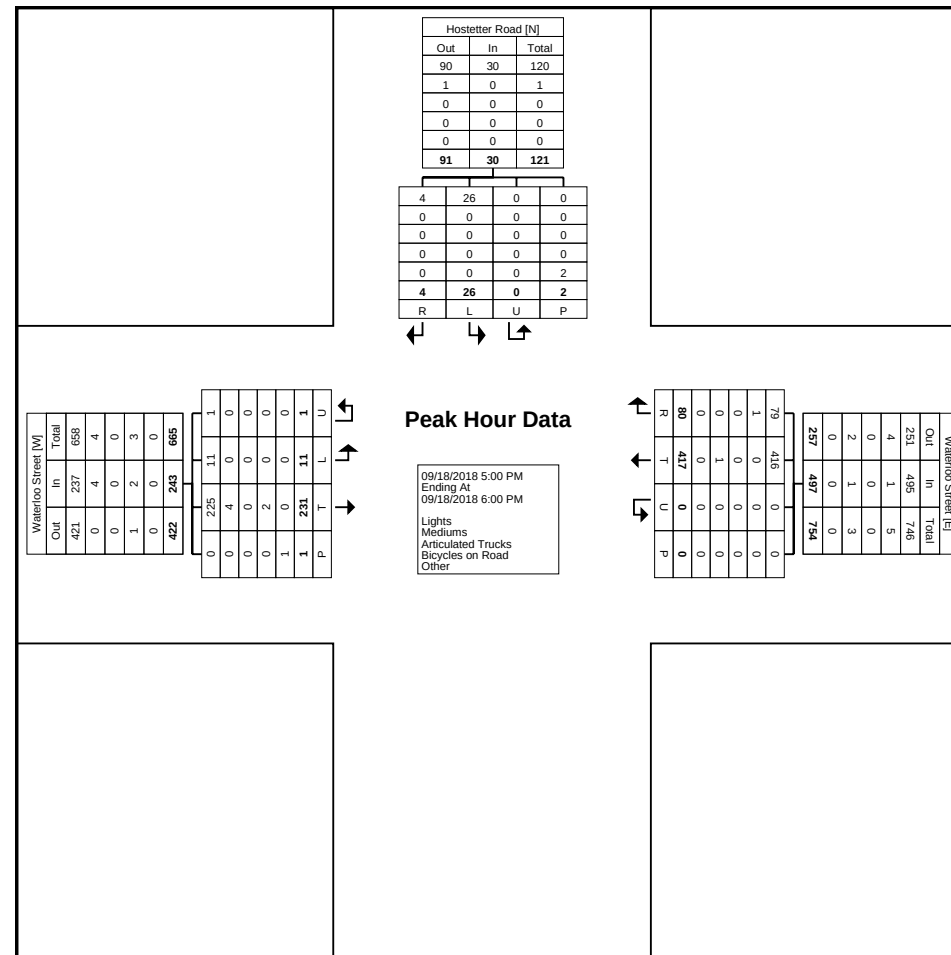
Start Time	Waterloo Street Eastbound					Waterloo Street Westbound					Hostetter Road Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
5:00 PM	1	71	0	1	72	104	15	0	0	119	5	0	0	0	5	196
5:15 PM	6	54	0	0	60	97	17	0	0	114	7	0	0	1	7	181
5:30 PM	1	56	0	0	57	128	29	0	0	157	8	2	0	1	10	224
5:45 PM	3	50	1	0	54	88	19	0	0	107	6	2	0	0	8	169
Total	11	231	1	1	243	417	80	0	0	497	26	4	0	2	30	770
Approach %	4.5	95.1	0.4	-	-	83.9	16.1	0.0	-	-	86.7	13.3	0.0	-	-	-
Total %	1.4	30.0	0.1	-	31.6	54.2	10.4	0.0	-	64.5	3.4	0.5	0.0	-	3.9	-
PHF	0.458	0.813	0.250	-	0.844	0.814	0.690	0.000	-	0.791	0.813	0.500	0.000	-	0.750	0.859
Lights	11	225	1	-	237	416	79	0	-	495	26	4	0	-	30	762
% Lights	100.0	97.4	100.0	-	97.5	99.8	98.8	-	-	99.6	100.0	100.0	-	-	100.0	99.0
Mediums	0	4	0	-	4	0	1	0	-	1	0	0	0	-	0	5
% Mediums	0.0	1.7	0.0	-	1.6	0.0	1.3	-	-	0.2	0.0	0.0	-	-	0.0	0.6
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	2	0	-	2	1	0	0	-	1	0	0	0	-	0	3
% Bicycles on Road	0.0	0.9	0.0	-	0.8	0.2	0.0	-	-	0.2	0.0	0.0	-	-	0.0	0.4
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	2	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	100.0	-	-



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Count Name: Waterloo Street & Hostetter Road
Site Code:
Start Date: 09/18/2018
Page No: 9



Turning Movement Peak Hour Data Plot (5:00 PM)



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Count Name: Waterloo Street & Hostetter Road
Site Code:
Start Date: 09/18/2018
Page No: 10



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 1

Turning Movement Data

Start Time	Huron Street Eastbound					Huron Street Westbound					Waterloo Street Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:00 AM	6	14	0	3	20	7	11	0	1	18	11	6	0	0	17	55
7:15 AM	8	14	0	0	22	6	13	0	3	19	13	11	0	2	24	65
7:30 AM	21	15	0	0	36	12	26	0	0	38	22	19	0	0	41	115
7:45 AM	32	20	0	2	52	15	25	0	0	40	28	17	0	0	45	137
Hourly Total	67	63	0	5	130	40	75	0	4	115	74	53	0	2	127	372
8:00 AM	11	13	0	0	24	14	25	0	0	39	29	25	0	0	54	117
8:15 AM	16	18	0	0	34	11	22	0	0	33	29	18	0	0	47	114
8:30 AM	14	19	0	0	33	14	26	0	0	40	32	21	0	2	53	126
8:45 AM	30	30	0	2	60	21	39	0	3	60	39	34	0	2	73	193
Hourly Total	71	80	0	2	151	60	112	0	3	172	129	98	0	4	227	550
9:00 AM	21	27	0	1	48	38	38	0	6	76	27	17	0	0	44	168
9:15 AM	26	38	0	3	64	19	25	0	7	44	38	12	0	0	50	158
9:30 AM	14	28	0	1	42	13	44	0	0	57	31	14	0	1	45	144
9:45 AM	8	21	0	5	29	22	41	0	1	63	45	10	0	4	55	147
Hourly Total	69	114	0	10	183	92	148	0	14	240	141	53	0	5	194	617
10:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
11:30 AM	16	19	0	1	35	10	66	0	1	76	39	8	0	0	47	158
11:45 AM	14	22	0	0	36	20	44	0	0	64	47	5	0	4	52	152
Hourly Total	30	41	0	1	71	30	110	0	1	140	86	13	0	4	99	310
12:00 PM	11	25	0	1	36	19	52	0	2	71	52	12	0	1	64	171
12:15 PM	9	10	0	0	19	20	64	0	0	84	52	13	0	1	65	168
12:30 PM	5	13	0	1	18	19	54	0	0	73	54	10	0	0	64	155
12:45 PM	14	15	0	2	29	8	54	0	2	62	45	11	0	3	56	147
Hourly Total	39	63	0	4	102	66	224	0	4	290	203	46	0	5	249	641
1:00 PM	16	24	0	0	40	21	54	0	0	75	56	16	0	0	72	187
1:15 PM	12	22	0	1	34	22	51	0	0	73	56	9	0	0	65	172
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	28	46	0	1	74	43	105	0	0	148	112	25	0	0	137	359
4:00 PM	36	21	0	4	57	24	85	0	0	109	53	22	0	1	75	241
4:15 PM	28	20	0	1	48	19	83	0	0	102	56	14	0	1	70	220
4:30 PM	24	18	0	2	42	33	74	0	2	107	58	25	0	0	83	232
4:45 PM	33	30	0	0	63	24	81	0	0	105	60	17	0	2	77	245
Hourly Total	121	89	0	7	210	100	323	0	2	423	227	78	0	4	305	938
5:00 PM	22	16	0	1	38	40	78	0	0	118	49	13	0	1	62	218
5:15 PM	34	25	0	0	59	33	68	0	2	101	40	12	0	2	52	212

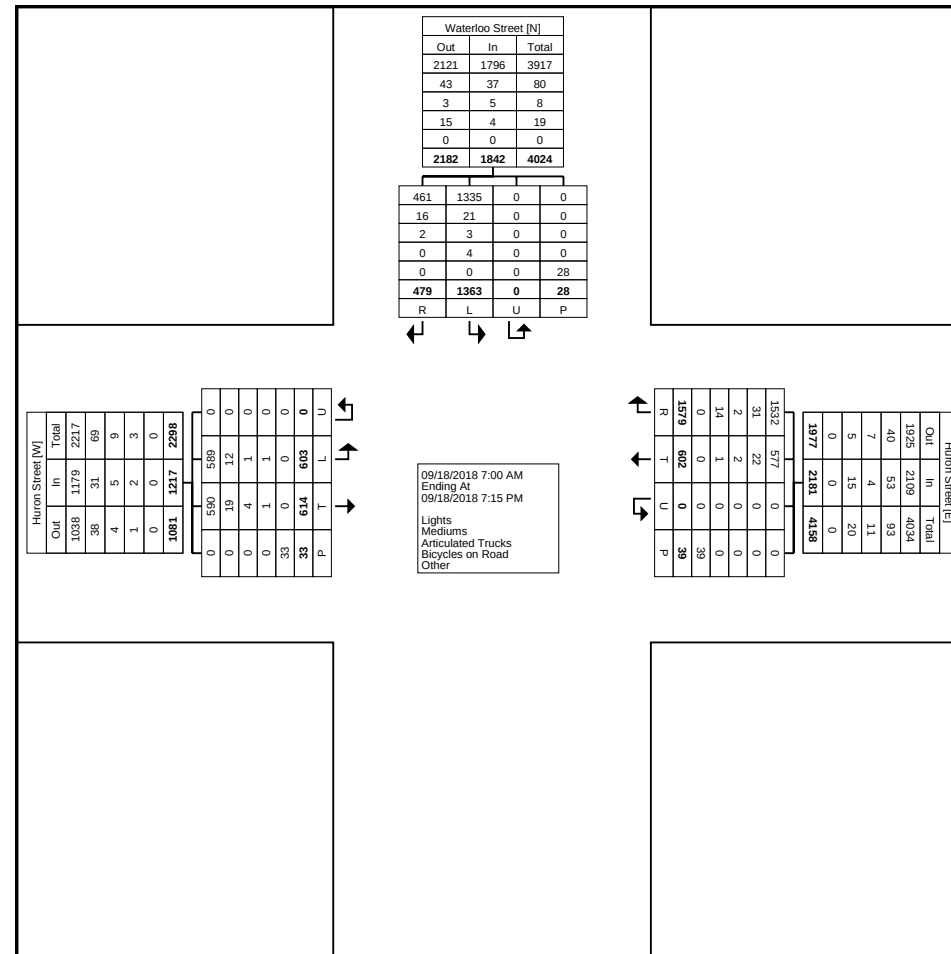
5:30 PM	40	19	0	0	59	22	59	0	3	81	62	17	0	0	79	219
5:45 PM	22	10	0	1	32	19	80	0	0	99	50	17	0	0	67	198
Hourly Total	118	70	0	2	188	114	285	0	5	399	201	59	0	3	260	847
6:00 PM	12	7	0	0	19	15	55	0	2	70	42	15	0	0	57	146
6:15 PM	11	15	0	0	26	20	55	0	0	75	53	14	0	0	67	168
6:30 PM	18	11	0	0	29	9	41	0	4	50	48	13	0	1	61	140
6:45 PM	19	14	0	1	33	13	46	0	0	59	47	12	0	0	59	151
Hourly Total	60	47	0	1	107	57	197	0	6	254	190	54	0	1	244	605
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	603	614	0	33	1217	602	1579	0	39	2181	1363	479	0	28	1842	5240
Approach %	49.5	50.5	0.0	-	-	27.6	72.4	0.0	-	-	74.0	26.0	0.0	-	-	-
Total %	11.5	11.7	0.0	-	23.2	11.5	30.1	0.0	-	41.6	26.0	9.1	0.0	-	35.2	-
Lights	589	590	0	-	1179	577	1532	0	-	2109	1335	461	0	-	1796	5084
% Lights	97.7	96.1	-	-	96.9	95.8	97.0	-	-	96.7	97.9	96.2	-	-	97.5	97.0
Mediums	12	19	0	-	31	22	31	0	-	53	21	16	0	-	37	121
% Mediums	2.0	3.1	-	-	2.5	3.7	2.0	-	-	2.4	1.5	3.3	-	-	2.0	2.3
Articulated Trucks	1	4	0	-	5	2	2	0	-	4	3	2	0	-	5	14
% Articulated Trucks	0.2	0.7	-	-	0.4	0.3	0.1	-	-	0.2	0.2	0.4	-	-	0.3	0.3
Bicycles on Road	1	1	0	-	2	1	14	0	-	15	4	0	0	-	4	21
% Bicycles on Road	0.2	0.2	-	-	0.2	0.2	0.9	-	-	0.7	0.3	0.0	-	-	0.2	0.4
Bicycles on Crosswalk	-	-	-	5	-	-	-	-	4	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	15.2	-	-	-	-	10.3	-	-	-	-	3.6	-	-
Pedestrians	-	-	-	28	-	-	-	-	35	-	-	-	-	27	-	-
% Pedestrians	-	-	-	84.8	-	-	-	-	89.7	-	-	-	-	96.4	-	-



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 3



Turning Movement Data Plot



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 4

Turning Movement Peak Hour Data (8:45 AM)

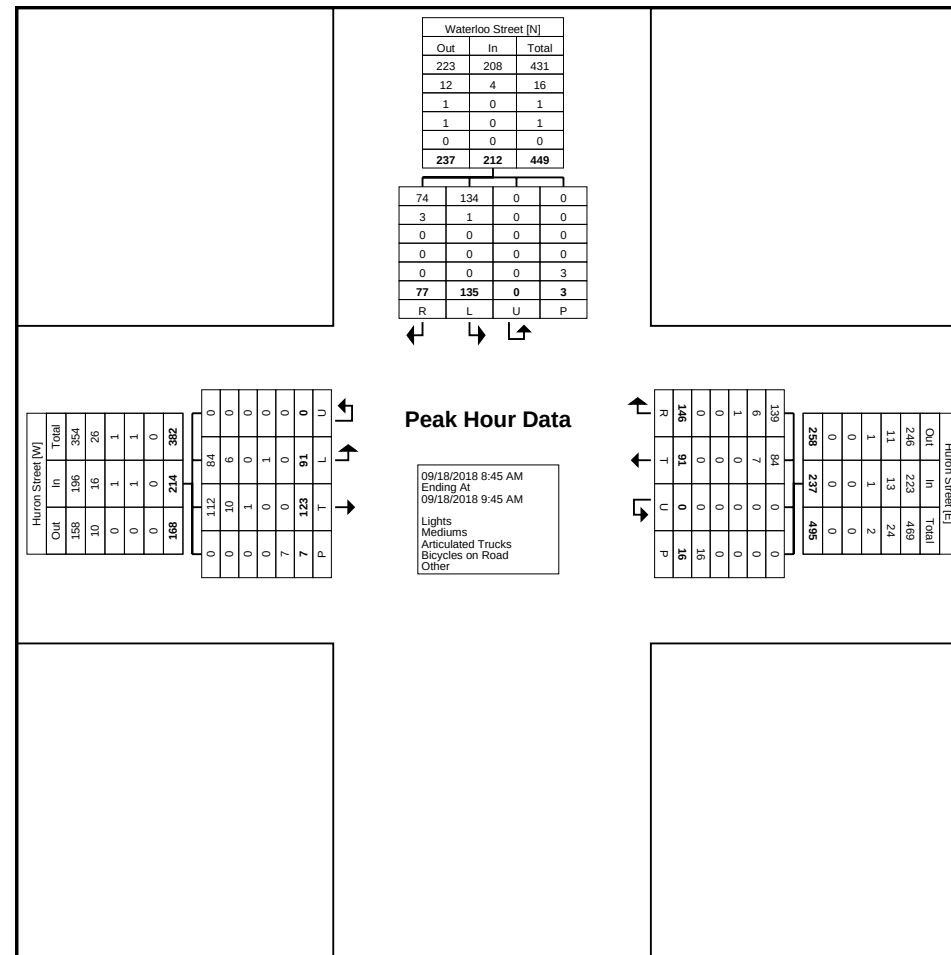
Start Time	Huron Street Eastbound					Huron Street Westbound					Waterloo Street Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
8:45 AM	30	30	0	2	60	21	39	0	3	60	39	34	0	2	73	193
9:00 AM	21	27	0	1	48	38	38	0	6	76	27	17	0	0	44	168
9:15 AM	26	38	0	3	64	19	25	0	7	44	38	12	0	0	50	158
9:30 AM	14	28	0	1	42	13	44	0	0	57	31	14	0	1	45	144
Total	91	123	0	7	214	91	146	0	16	237	135	77	0	3	212	663
Approach %	42.5	57.5	0.0	-	-	38.4	61.6	0.0	-	-	63.7	36.3	0.0	-	-	-
Total %	13.7	18.6	0.0	-	32.3	13.7	22.0	0.0	-	35.7	20.4	11.6	0.0	-	32.0	-
PHF	0.758	0.809	0.000	-	0.836	0.599	0.830	0.000	-	0.780	0.865	0.566	0.000	-	0.726	0.859
Lights	84	112	0	-	196	84	139	0	-	223	134	74	0	-	208	627
% Lights	92.3	91.1	-	-	91.6	92.3	95.2	-	-	94.1	99.3	96.1	-	-	98.1	94.6
Mediums	6	10	0	-	16	7	6	0	-	13	1	3	0	-	4	33
% Mediums	6.6	8.1	-	-	7.5	7.7	4.1	-	-	5.5	0.7	3.9	-	-	1.9	5.0
Articulated Trucks	0	1	0	-	1	0	1	0	-	1	0	0	0	-	0	2
% Articulated Trucks	0.0	0.8	-	-	0.5	0.0	0.7	-	-	0.4	0.0	0.0	-	-	0.0	0.3
Bicycles on Road	1	0	0	-	1	0	0	0	-	0	0	0	0	-	0	1
% Bicycles on Road	1.1	0.0	-	-	0.5	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	2	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	12.5	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	7	-	-	-	-	14	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	87.5	-	-	-	-	100.0	-	-



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 5



Turning Movement Peak Hour Data Plot (8:45 AM)



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 6

Turning Movement Peak Hour Data (12:30 PM)

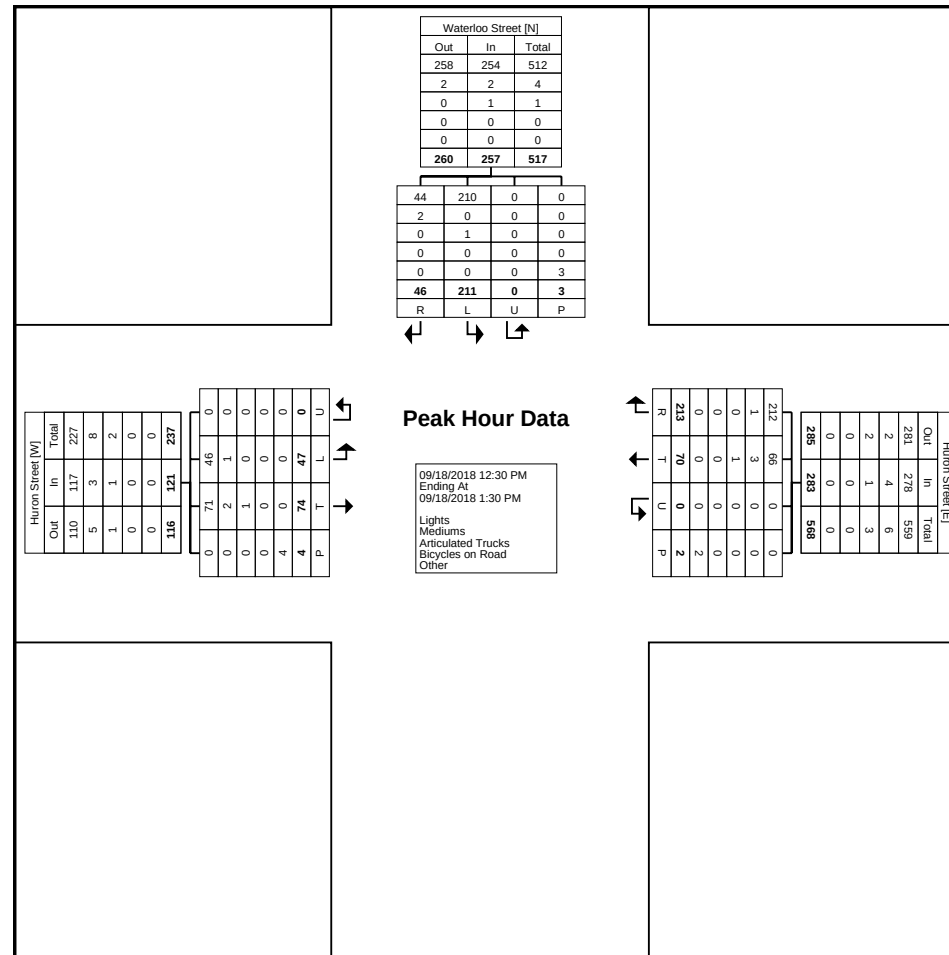
Start Time	Huron Street Eastbound					Huron Street Westbound					Waterloo Street Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
12:30 PM	5	13	0	1	18	19	54	0	0	73	54	10	0	0	64	155
12:45 PM	14	15	0	2	29	8	54	0	2	62	45	11	0	3	56	147
1:00 PM	16	24	0	0	40	21	54	0	0	75	56	16	0	0	72	187
1:15 PM	12	22	0	1	34	22	51	0	0	73	56	9	0	0	65	172
Total	47	74	0	4	121	70	213	0	2	283	211	46	0	3	257	661
Approach %	38.8	61.2	0.0	-	-	24.7	75.3	0.0	-	-	82.1	17.9	0.0	-	-	-
Total %	7.1	11.2	0.0	-	18.3	10.6	32.2	0.0	-	42.8	31.9	7.0	0.0	-	38.9	-
PHF	0.734	0.771	0.000	-	0.756	0.795	0.986	0.000	-	0.943	0.942	0.719	0.000	-	0.892	0.884
Lights	46	71	0	-	117	66	212	0	-	278	210	44	0	-	254	649
% Lights	97.9	95.9	-	-	96.7	94.3	99.5	-	-	98.2	99.5	95.7	-	-	98.8	98.2
Mediums	1	2	0	-	3	3	1	0	-	4	0	2	0	-	2	9
% Mediums	2.1	2.7	-	-	2.5	4.3	0.5	-	-	1.4	0.0	4.3	-	-	0.8	1.4
Articulated Trucks	0	1	0	-	1	1	0	0	-	1	1	0	0	-	1	3
% Articulated Trucks	0.0	1.4	-	-	0.8	1.4	0.0	-	-	0.4	0.5	0.0	-	-	0.4	0.5
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	4	-	-	-	-	2	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 7



Turning Movement Peak Hour Data Plot (12:30 PM)



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 8

Turning Movement Peak Hour Data (4:00 PM)

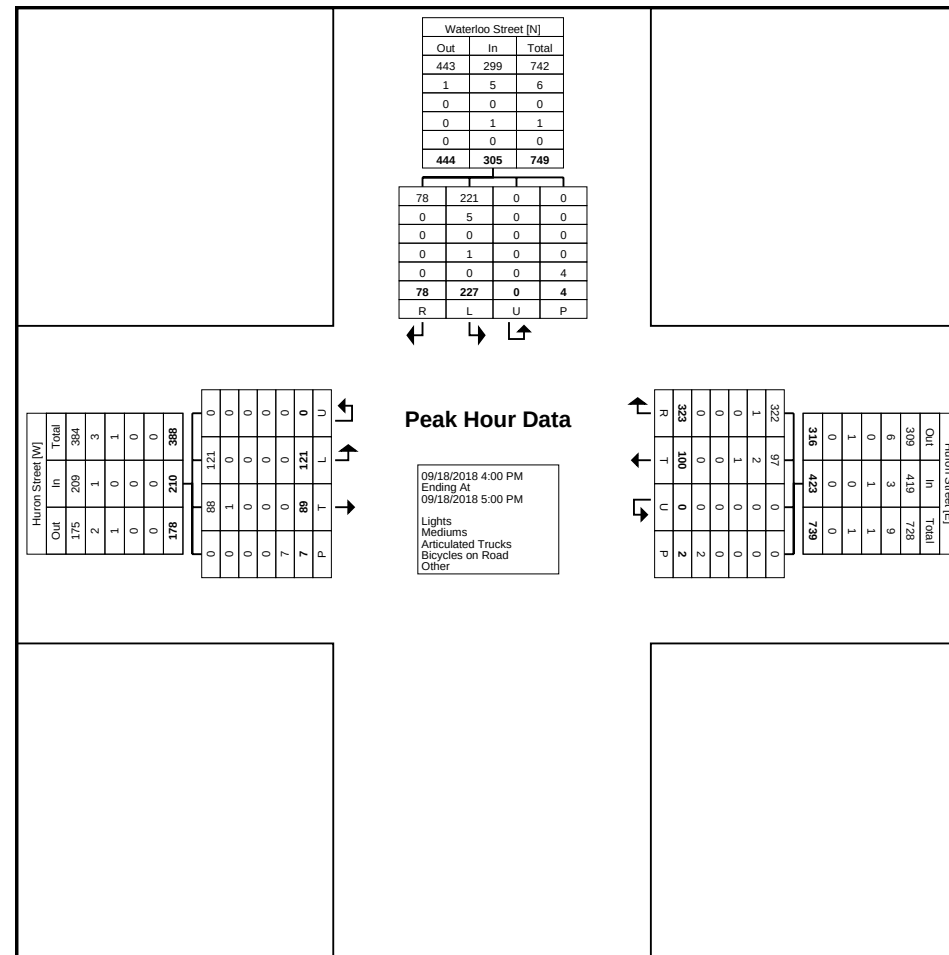
Start Time	Huron Street Eastbound					Huron Street Westbound					Waterloo Street Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
4:00 PM	36	21	0	4	57	24	85	0	0	109	53	22	0	1	75	241
4:15 PM	28	20	0	1	48	19	83	0	0	102	56	14	0	1	70	220
4:30 PM	24	18	0	2	42	33	74	0	2	107	58	25	0	0	83	232
4:45 PM	33	30	0	0	63	24	81	0	0	105	60	17	0	2	77	245
Total	121	89	0	7	210	100	323	0	2	423	227	78	0	4	305	938
Approach %	57.6	42.4	0.0	-	-	23.6	76.4	0.0	-	-	74.4	25.6	0.0	-	-	-
Total %	12.9	9.5	0.0	-	22.4	10.7	34.4	0.0	-	45.1	24.2	8.3	0.0	-	32.5	-
PHF	0.840	0.742	0.000	-	0.833	0.758	0.950	0.000	-	0.970	0.946	0.780	0.000	-	0.919	0.957
Lights	121	88	0	-	209	97	322	0	-	419	221	78	0	-	299	927
% Lights	100.0	98.9	-	-	99.5	97.0	99.7	-	-	99.1	97.4	100.0	-	-	98.0	98.8
Mediums	0	1	0	-	1	2	1	0	-	3	5	0	0	-	5	9
% Mediums	0.0	1.1	-	-	0.5	2.0	0.3	-	-	0.7	2.2	0.0	-	-	1.6	1.0
Articulated Trucks	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	-	-	0.0	1.0	0.0	-	-	0.2	0.0	0.0	-	-	0.0	0.1
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	1	0	0	-	1	1
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.4	0.0	-	-	0.3	0.1
Bicycles on Crosswalk	-	-	-	4	-	-	-	-	0	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	57.1	-	-	-	-	0.0	-	-	-	-	25.0	-	-
Pedestrians	-	-	-	3	-	-	-	-	2	-	-	-	-	3	-	-
% Pedestrians	-	-	-	42.9	-	-	-	-	100.0	-	-	-	-	75.0	-	-



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 9



Turning Movement Peak Hour Data Plot (4:00 PM)



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Count Name: Waterloo Street & Huron Street
Site Code:
Start Date: 09/18/2018
Page No: 10



Paradigm Transportation Solutions Limited
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Count Name: Waterloo Street & Laschinger Blvd
Site Code:
Start Date: 09/18/2018
Page No: 1

Turning Movement Data

Start Time	Waterloo Street Eastbound					Waterloo Street Westbound					Laschinger Blvd Northbound					Int. Total
	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:00 AM	58	1	0	0	59	3	19	0	0	22	0	13	0	0	13	94
7:15 AM	74	1	0	0	75	0	27	0	0	27	5	17	0	1	22	124
7:30 AM	77	2	0	0	79	0	37	0	0	37	3	16	0	2	19	135
7:45 AM	71	0	0	0	71	3	51	0	0	54	6	17	0	1	23	148
Hourly Total	280	4	0	0	284	6	134	0	0	140	14	63	0	4	77	501
8:00 AM	78	0	0	0	78	2	75	0	0	77	7	14	0	2	21	176
8:15 AM	74	2	0	0	76	1	48	0	1	49	6	11	0	1	17	142
8:30 AM	30	0	0	0	30	3	36	0	0	39	1	9	0	0	10	79
8:45 AM	47	1	0	0	48	2	47	0	1	49	1	8	0	0	9	106
Hourly Total	229	3	0	0	232	8	206	0	2	214	15	42	0	3	57	503
9:00 AM	37	0	0	0	37	1	40	0	0	41	3	6	0	0	9	87
9:15 AM	41	3	0	0	44	1	33	0	0	34	1	6	0	0	7	85
9:30 AM	30	1	0	0	31	4	39	0	0	43	3	8	0	1	11	85
9:45 AM	42	1	0	0	43	1	39	0	0	40	4	2	0	1	6	89
Hourly Total	150	5	0	0	155	7	151	0	0	158	11	22	0	2	33	346
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	60	2	0	0	62	6	38	0	0	44	3	2	0	0	5	111
11:45 AM	40	0	0	1	40	4	40	0	0	44	3	4	0	0	7	91
Hourly Total	100	2	0	1	102	10	78	0	0	88	6	6	0	0	12	202
12:00 PM	41	2	0	0	43	3	43	0	0	46	2	4	0	0	6	95
12:15 PM	40	2	0	0	42	3	57	0	0	60	3	3	0	0	6	108
12:30 PM	40	2	0	0	42	2	45	0	0	47	1	6	0	2	7	96
12:45 PM	40	4	0	0	44	1	43	0	0	44	0	5	0	1	5	93
Hourly Total	161	10	0	0	171	9	188	0	0	197	6	18	0	3	24	392
1:00 PM	43	1	0	0	44	3	49	0	0	52	3	4	0	1	7	103
1:15 PM	50	3	0	0	53	5	44	0	0	49	1	1	0	0	2	104
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	93	4	0	0	97	8	93	0	0	101	4	5	0	1	9	207
4:00 PM	68	2	0	0	70	6	82	0	0	88	4	3	0	0	7	165
4:15 PM	59	5	0	0	64	12	97	0	0	109	2	6	0	1	8	181
4:30 PM	78	9	0	0	87	10	87	0	0	97	2	7	0	0	9	193
4:45 PM	62	3	0	2	65	9	69	0	1	78	2	4	0	3	6	149
Hourly Total	267	19	0	2	286	37	335	0	1	372	10	20	0	4	30	688
5:00 PM	69	8	0	0	77	14	90	0	0	104	2	4	0	0	6	187
5:15 PM	57	10	0	0	67	3	92	0	0	95	4	3	0	1	7	169
5:30 PM	54	5	0	0	59	18	117	0	0	135	1	3	0	0	4	198

5:45 PM	49	3	0	0	52	11	83	0	0	94	4	3	0	0	7	153
Hourly Total	229	26	0	0	255	46	382	0	0	428	11	13	0	1	24	707
6:00 PM	51	6	0	0	57	11	63	0	0	74	5	6	0	1	11	142
6:15 PM	50	2	0	0	52	5	56	0	0	61	9	7	0	0	16	129
6:30 PM	48	4	0	0	52	7	48	0	0	55	1	8	0	2	9	116
6:45 PM	68	1	0	0	69	3	51	0	0	54	2	4	0	2	6	129
Hourly Total	217	13	0	0	230	26	218	0	0	244	17	25	0	5	42	516
Grand Total	1726	86	0	3	1812	157	1785	0	3	1942	94	214	0	23	308	4062
Approach %	95.3	4.7	0.0	-	-	8.1	91.9	0.0	-	-	30.5	69.5	0.0	-	-	-
Total %	42.5	2.1	0.0	-	44.6	3.9	43.9	0.0	-	47.8	2.3	5.3	0.0	-	7.6	-
Lights	1644	85	0	-	1729	155	1718	0	-	1873	93	209	0	-	302	3904
% Lights	95.2	98.8	-	-	95.4	98.7	96.2	-	-	96.4	98.9	97.7	-	-	98.1	96.1
Mediums	49	1	0	-	50	2	61	0	-	63	1	4	0	-	5	118
% Mediums	2.8	1.2	-	-	2.8	1.3	3.4	-	-	3.2	1.1	1.9	-	-	1.6	2.9
Articulated Trucks	5	0	0	-	5	0	4	0	-	4	0	0	0	-	0	9
% Articulated Trucks	0.3	0.0	-	-	0.3	0.0	0.2	-	-	0.2	0.0	0.0	-	-	0.0	0.2
Bicycles on Road	28	0	0	-	28	0	2	0	-	2	0	1	0	-	1	31
% Bicycles on Road	1.6	0.0	-	-	1.5	0.0	0.1	-	-	0.1	0.0	0.5	-	-	0.3	0.8
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	2	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	8.7	-	-
Pedestrians	-	-	-	3	-	-	-	-	3	-	-	-	-	21	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	91.3	-	-

Turning Movement Data Plot



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@pts1.com

Count Name: Waterloo Street & Laschinger Blvd
Site Code:
Start Date: 09/18/2018
Page No: 4

Turning Movement Peak Hour Data (7:30 AM)

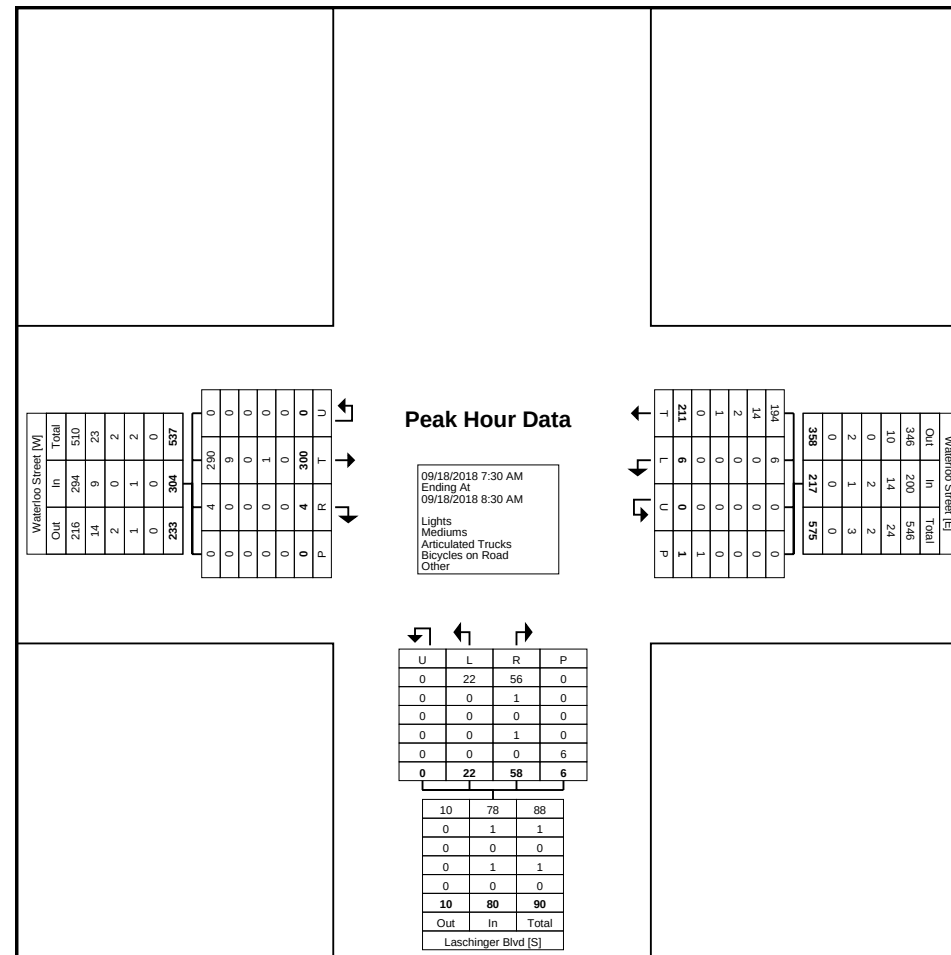
Start Time	Waterloo Street Eastbound					Waterloo Street Westbound					Laschinger Blvd Northbound					Int. Total
	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:30 AM	77	2	0	0	79	0	37	0	0	37	3	16	0	2	19	135
7:45 AM	71	0	0	0	71	3	51	0	0	54	6	17	0	1	23	148
8:00 AM	78	0	0	0	78	2	75	0	0	77	7	14	0	2	21	176
8:15 AM	74	2	0	0	76	1	48	0	1	49	6	11	0	1	17	142
Total	300	4	0	0	304	6	211	0	1	217	22	58	0	6	80	601
Approach %	98.7	1.3	0.0	-	-	2.8	97.2	0.0	-	-	27.5	72.5	0.0	-	-	-
Total %	49.9	0.7	0.0	-	50.6	1.0	35.1	0.0	-	36.1	3.7	9.7	0.0	-	13.3	-
PHF	0.962	0.500	0.000	-	0.962	0.500	0.703	0.000	-	0.705	0.786	0.853	0.000	-	0.870	0.854
Lights	290	4	0	-	294	6	194	0	-	200	22	56	0	-	78	572
% Lights	96.7	100.0	-	-	96.7	100.0	91.9	-	-	92.2	100.0	96.6	-	-	97.5	95.2
Mediums	9	0	0	-	9	0	14	0	-	14	0	1	0	-	1	24
% Mediums	3.0	0.0	-	-	3.0	0.0	6.6	-	-	6.5	0.0	1.7	-	-	1.3	4.0
Articulated Trucks	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	2
% Articulated Trucks	0.0	0.0	-	-	0.0	0.0	0.9	-	-	0.9	0.0	0.0	-	-	0.0	0.3
Bicycles on Road	1	0	0	-	1	0	1	0	-	1	0	1	0	-	1	3
% Bicycles on Road	0.3	0.0	-	-	0.3	0.0	0.5	-	-	0.5	0.0	1.7	-	-	1.3	0.5
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-



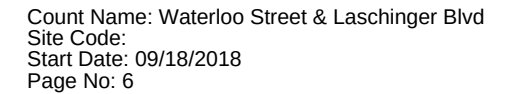
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22 King Street South, Suite 300

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Count Name: Waterloo Street & Laschinger Blvd
Site Code:
Start Date: 09/18/2018
Page No: 5



Turning Movement Peak Hour Data Plot (7:30 AM)

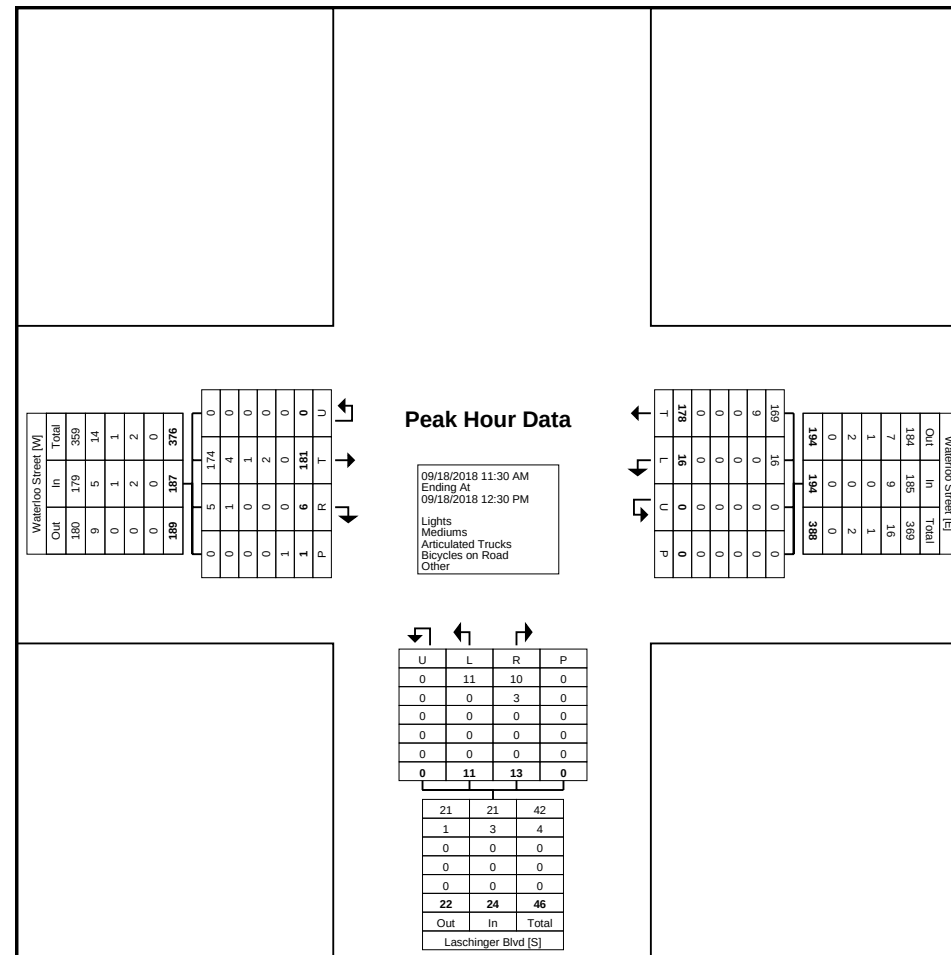




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Count Name: Waterloo Street & Laschinger Blvd
Site Code:
Start Date: 09/18/2018
Page No: 7



Turning Movement Peak Hour Data Plot (11:30 AM)



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
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Count Name: Waterloo Street & Laschinger Blvd
Site Code:
Start Date: 09/18/2018
Page No: 8

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Waterloo Street Eastbound					Waterloo Street Westbound					Laschinger Blvd Northbound					Int. Total
	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
4:15 PM	59	5	0	0	64	12	97	0	0	109	2	6	0	1	8	181
4:30 PM	78	9	0	0	87	10	87	0	0	97	2	7	0	0	9	193
4:45 PM	62	3	0	2	65	9	69	0	1	78	2	4	0	3	6	149
5:00 PM	69	8	0	0	77	14	90	0	0	104	2	4	0	0	6	187
Total	268	25	0	2	293	45	343	0	1	388	8	21	0	4	29	710
Approach %	91.5	8.5	0.0	-	-	11.6	88.4	0.0	-	-	27.6	72.4	0.0	-	-	-
Total %	37.7	3.5	0.0	-	41.3	6.3	48.3	0.0	-	54.6	1.1	3.0	0.0	-	4.1	-
PHF	0.859	0.694	0.000	-	0.842	0.804	0.884	0.000	-	0.890	1.000	0.750	0.000	-	0.806	0.920
Lights	261	25	0	-	286	45	330	0	-	375	8	21	0	-	29	690
% Lights	97.4	100.0	-	-	97.6	100.0	96.2	-	-	96.6	100.0	100.0	-	-	100.0	97.2
Mediums	7	0	0	-	7	0	12	0	-	12	0	0	0	-	0	19
% Mediums	2.6	0.0	-	-	2.4	0.0	3.5	-	-	3.1	0.0	0.0	-	-	0.0	2.7
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	1
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.3	-	-	0.3	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	2	-	-	-	-	1	-	-	-	-	4	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data Plot (4:15 PM)



Paradigm Transportation Solutions Limited
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Count Name: Waterloo Street & Laschinger Blvd
Site Code:
Start Date: 09/18/2018
Page No: 10



Paradigm Transportation Solutions Limited
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Count Name: Waterloo Street & Nafziger Road
Site Code:
Start Date: 09/18/2018
Page No: 1

Turning Movement Data

Start Time	Waterloo Street Eastbound						Snyder's Road Westbound						Nafziger Road Northbound						Nafziger Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	19	27	29	0	0	75	4	13	9	0	0	26	4	16	2	0	0	22	12	28	3	0	0	43	166
7:15 AM	24	43	49	0	0	116	8	13	6	0	0	27	10	23	9	0	1	42	8	16	8	0	0	32	217
7:30 AM	20	32	56	0	0	108	13	17	11	0	0	41	8	17	16	0	1	41	13	22	14	0	2	49	239
7:45 AM	27	57	35	0	0	119	12	32	17	0	0	61	11	30	30	0	0	71	35	33	17	0	0	85	336
Hourly Total	90	159	169	0	0	418	37	75	43	0	0	155	33	86	57	0	2	176	68	99	42	0	2	209	958
8:00 AM	28	50	40	0	0	118	17	33	13	0	0	63	21	20	17	0	0	58	44	28	13	0	0	85	324
8:15 AM	37	31	36	0	0	104	14	30	15	0	0	59	12	29	6	0	0	47	9	21	8	0	0	38	248
8:30 AM	18	19	20	0	0	57	7	27	7	0	0	41	8	12	8	0	0	28	8	21	9	0	0	38	164
8:45 AM	10	28	29	0	0	67	4	25	3	0	0	32	15	22	3	0	0	40	7	23	9	0	0	39	178
Hourly Total	93	128	125	0	0	346	42	115	38	0	0	195	56	83	34	0	0	173	68	93	39	0	0	200	914
9:00 AM	10	25	11	0	0	46	3	15	6	0	0	24	9	21	5	0	0	35	5	29	17	0	0	51	156
9:15 AM	18	31	14	0	0	63	9	21	6	0	0	36	3	20	12	0	0	35	12	18	11	0	0	41	175
9:30 AM	11	27	12	0	0	50	4	31	12	0	0	47	7	25	8	0	0	40	10	21	9	0	0	40	177
9:45 AM	14	26	8	0	0	48	5	14	2	0	0	21	11	19	6	0	0	36	5	13	16	0	1	34	139
Hourly Total	53	109	45	0	0	207	21	81	26	0	0	128	30	85	31	0	0	146	32	81	53	0	1	166	647
10:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:30 AM	10	44	12	0	0	66	7	26	4	0	0	37	10	14	16	0	0	40	2	22	6	0	0	30	173
11:45 AM	5	32	11	0	0	48	9	19	8	0	0	36	9	17	8	0	0	34	2	13	15	0	0	30	148
Hourly Total	15	76	23	0	0	114	16	45	12	0	0	73	19	31	24	0	0	74	4	35	21	0	0	60	321
12:00 PM	14	27	9	0	0	50	4	18	6	0	0	28	11	22	6	0	0	39	3	14	15	0	0	32	149
12:15 PM	16	16	10	0	0	42	5	33	7	0	0	45	13	12	3	0	0	28	7	18	11	0	0	36	151
12:30 PM	7	22	10	0	0	39	6	24	7	0	0	37	10	13	5	0	0	28	6	24	17	0	0	47	151
12:45 PM	12	19	7	0	0	38	2	17	5	0	0	24	14	20	9	0	0	43	3	19	10	0	0	32	137
Hourly Total	49	84	36	0	0	169	17	92	25	0	0	134	48	67	23	0	0	138	19	75	53	0	0	147	588
1:00 PM	12	27	9	0	0	48	4	31	7	0	0	42	16	18	8	0	0	42	7	16	14	0	0	37	169
1:15 PM	13	24	12	0	0	49	7	29	9	0	0	45	12	21	9	0	2	42	5	16	15	0	3	36	172
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	25	51	21	0	0	97	11	60	16	0	0	87	28	39	17	0	2	84	12	32	29	0	3	73	341
4:00 PM	18	32	16	0	0	66	16	46	13	0	0	75	37	32	20	0	0	89	9	13	19	0	3	41	271
4:15 PM	13	42	11	0	0	66	8	43	12	0	0	63	32	23	12	0	0	67	5	29	35	0	0	69	265
4:30 PM	19	43	13	0	0	75	7	45	8	0	0	60	38	31	13	0	0	82	9	22	32	0	0	63	280
4:45 PM	20	35	17	0	0	72	7	27	6	0	0	40	37	34	10	0	0	81	9	23	25	0	0	57	250
Hourly Total	70	152	57	0	0	279	38	161	39	0	0	238	144	120	55	0	0	319	32	87	111	0	3	230	1066
5:00 PM	27	41	19	0	0	87	12	51	16	0	0	79	40	33	14	0	0	87	8	20	25	0	0	53	306

5:15 PM	14	30	18	0	0	62	16	47	9	0	0	72	33	20	6	0	0	59	7	29	36	0	0	72	265
5:30 PM	12	40	20	0	0	72	9	45	14	0	0	68	67	24	20	0	0	111	8	32	46	0	0	86	337
5:45 PM	13	35	11	0	0	59	14	43	11	0	0	68	29	27	12	0	0	68	8	20	42	0	0	70	265
Hourly Total	66	146	68	0	0	280	51	186	50	0	0	287	169	104	52	0	0	325	31	101	149	0	0	281	1173
6:00 PM	12	33	14	0	0	59	6	40	7	0	0	53	26	24	11	0	1	61	1	17	25	0	0	43	216
6:15 PM	21	28	13	0	0	62	10	27	4	0	0	41	25	34	11	0	0	70	7	31	18	0	0	56	229
6:30 PM	18	24	19	0	0	61	4	23	2	0	0	29	25	21	16	0	0	62	8	21	18	0	0	47	199
6:45 PM	16	38	9	0	0	63	5	20	9	0	0	34	29	18	26	0	0	73	6	33	12	0	0	51	221
Hourly Total	67	123	55	0	0	245	25	110	22	0	0	157	105	97	64	0	1	266	22	102	73	0	0	197	865
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	528	1029	599	0	0	2156	258	925	271	0	0	1454	632	712	357	0	5	1701	288	705	570	0	9	1563	6874
Approach %	24.5	47.7	27.8	0.0	-	-	17.7	63.6	18.6	0.0	-	-	37.2	41.9	21.0	0.0	-	-	18.4	45.1	36.5	0.0	-	-	-
Total %	7.7	15.0	8.7	0.0	-	31.4	3.8	13.5	3.9	0.0	-	21.2	9.2	10.4	5.2	0.0	-	24.7	4.2	10.3	8.3	0.0	-	22.7	-
Lights	515	981	579	0	-	2075	238	871	247	0	-	1356	610	634	345	0	-	1589	272	635	555	0	-	1462	6482
% Lights	97.5	95.3	96.7	-	-	96.2	92.2	94.2	91.1	-	-	93.3	96.5	89.0	96.6	-	-	93.4	94.4	90.1	97.4	-	-	93.5	94.3
Mediums	10	35	15	0	-	60	19	42	20	0	-	81	18	37	11	0	-	66	14	29	12	0	-	55	262
% Mediums	1.9	3.4	2.5	-	-	2.8	7.4	4.5	7.4	-	-	5.6	2.8	5.2	3.1	-	-	3.9	4.9	4.1	2.1	-	-	3.5	3.8
Articulated Trucks	2	2	3	0	-	7	0	9	4	0	-	13	4	39	0	0	-	43	2	41	2	0	-	45	108
% Articulated Trucks	0.4	0.2	0.5	-	-	0.3	0.0	1.0	1.5	-	-	0.9	0.6	5.5	0.0	-	-	2.5	0.7	5.8	0.4	-	-	2.9	1.6
Bicycles on Road	1	11	2	0	-	14	1	3	0	0	-	4	0	2	1	0	-	3	0	0	1	0	-	1	22
% Bicycles on Road	0.2	1.1	0.3	-	-	0.6	0.4	0.3	0.0	-	-	0.3	0.0	0.3	0.3	-	-	0.2	0.0	0.0	0.2	-	-	0.1	0.3
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	4	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80.0	-	-	-	-	-	11.1	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	8	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.0	-	-	-	-	-	88.9	-	-

Turning Movement Data Plot



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Waterloo Street & Nafziger Road
Site Code:
Start Date: 09/18/2018
Page No: 4

Turning Movement Peak Hour Data (7:30 AM)

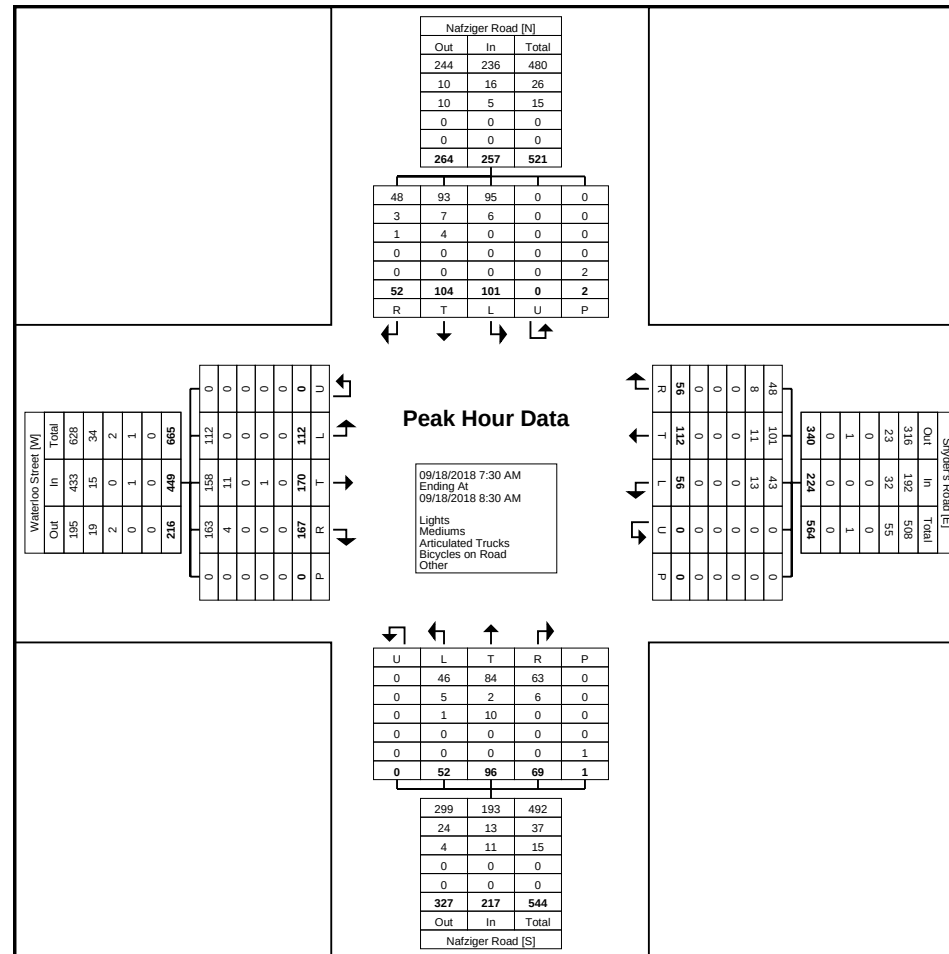
Start Time	Waterloo Street Eastbound						Snyder's Road Westbound						Nafziger Road Northbound						Nafziger Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:30 AM	20	32	56	0	0	108	13	17	11	0	0	41	8	17	16	0	1	41	13	22	14	0	2	49	239
7:45 AM	27	57	35	0	0	119	12	32	17	0	0	61	11	30	30	0	0	71	35	33	17	0	0	85	336
8:00 AM	28	50	40	0	0	118	17	33	13	0	0	63	21	20	17	0	0	58	44	28	13	0	0	85	324
8:15 AM	37	31	36	0	0	104	14	30	15	0	0	59	12	29	6	0	0	47	9	21	8	0	0	38	248
Total	112	170	167	0	0	449	56	112	56	0	0	224	52	96	69	0	1	217	101	104	52	0	2	257	1147
Approach %	24.9	37.9	37.2	0.0	-	-	25.0	50.0	25.0	0.0	-	-	24.0	44.2	31.8	0.0	-	-	39.3	40.5	20.2	0.0	-	-	-
Total %	9.8	14.8	14.6	0.0	-	39.1	4.9	9.8	4.9	0.0	-	19.5	4.5	8.4	6.0	0.0	-	18.9	8.8	9.1	4.5	0.0	-	22.4	-
PHF	0.757	0.746	0.746	0.000	-	0.943	0.824	0.848	0.824	0.000	-	0.889	0.619	0.800	0.575	0.000	-	0.764	0.574	0.788	0.765	0.000	-	0.756	0.853
Lights	112	158	163	0	-	433	43	101	48	0	-	192	46	84	63	0	-	193	95	93	48	0	-	236	1054
% Lights	100.0	92.9	97.6	-	-	96.4	76.8	90.2	85.7	-	-	85.7	88.5	87.5	91.3	-	-	88.9	94.1	89.4	92.3	-	-	91.8	91.9
Mediums	0	11	4	0	-	15	13	11	8	0	-	32	5	2	6	0	-	13	6	7	3	0	-	16	76
% Mediums	0.0	6.5	2.4	-	-	3.3	23.2	9.8	14.3	-	-	14.3	9.6	2.1	8.7	-	-	6.0	5.9	6.7	5.8	-	-	6.2	6.6
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	1	10	0	0	-	11	0	4	1	0	-	5	16
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	1.9	10.4	0.0	-	-	5.1	0.0	3.8	1.9	-	-	1.9	1.4
Bicycles on Road	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1
% Bicycles on Road	0.0	0.6	0.0	-	-	0.2	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	50.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	50.0	-	-



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
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Count Name: Waterloo Street & Nafziger Road
Site Code:
Start Date: 09/18/2018
Page No: 5



Turning Movement Peak Hour Data Plot (7:30 AM)



Paradigm Transportation Solutions Limited
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Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Waterloo Street & Nafziger Road
Site Code:
Start Date: 09/18/2018
Page No: 6

Turning Movement Peak Hour Data (12:30 PM)

Start Time	Waterloo Street Eastbound						Snyder's Road Westbound						Nafziger Road Northbound						Nafziger Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:30 PM	7	22	10	0	0	39	6	24	7	0	0	37	10	13	5	0	0	28	6	24	17	0	0	47	151
12:45 PM	12	19	7	0	0	38	2	17	5	0	0	24	14	20	9	0	0	43	3	19	10	0	0	32	137
1:00 PM	12	27	9	0	0	48	4	31	7	0	0	42	16	18	8	0	0	42	7	16	14	0	0	37	169
1:15 PM	13	24	12	0	0	49	7	29	9	0	0	45	12	21	9	0	2	42	5	16	15	0	3	36	172
Total	44	92	38	0	0	174	19	101	28	0	0	148	52	72	31	0	2	155	21	75	56	0	3	152	629
Approach %	25.3	52.9	21.8	0.0	-	-	12.8	68.2	18.9	0.0	-	-	33.5	46.5	20.0	0.0	-	-	13.8	49.3	36.8	0.0	-	-	-
Total %	7.0	14.6	6.0	0.0	-	27.7	3.0	16.1	4.5	0.0	-	23.5	8.3	11.4	4.9	0.0	-	24.6	3.3	11.9	8.9	0.0	-	24.2	-
PHF	0.846	0.852	0.792	0.000	-	0.888	0.679	0.815	0.778	0.000	-	0.822	0.813	0.857	0.861	0.000	-	0.901	0.750	0.781	0.824	0.000	-	0.809	0.914
Lights	44	89	36	0	-	169	19	95	24	0	-	138	49	63	30	0	-	142	20	66	54	0	-	140	589
% Lights	100.0	96.7	94.7	-	-	97.1	100.0	94.1	85.7	-	-	93.2	94.2	87.5	96.8	-	-	91.6	95.2	88.0	96.4	-	-	92.1	93.6
Mediums	0	3	0	0	-	3	0	0	2	0	-	2	1	4	1	0	-	6	0	1	1	0	-	2	13
% Mediums	0.0	3.3	0.0	-	-	1.7	0.0	0.0	7.1	-	-	1.4	1.9	5.6	3.2	-	-	3.9	0.0	1.3	1.8	-	-	1.3	2.1
Articulated Trucks	0	0	2	0	-	2	0	6	2	0	-	8	2	5	0	0	-	7	1	8	1	0	-	10	27
% Articulated Trucks	0.0	0.0	5.3	-	-	1.1	0.0	5.9	7.1	-	-	5.4	3.8	6.9	0.0	-	-	4.5	4.8	10.7	1.8	-	-	6.6	4.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data Plot (12:30 PM)

Start Time	Waterloo Street Eastbound						Snyder's Road Westbound						Nafziger Road Northbound						Nafziger Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
5:00 PM	27	41	19	0	0	87	12	51	16	0	0	79	40	33	14	0	0	87	8	20	25	0	0	53	306
5:15 PM	14	30	18	0	0	62	16	47	9	0	0	72	33	20	6	0	0	59	7	29	36	0	0	72	265
5:30 PM	12	40	20	0	0	72	9	45	14	0	0	68	67	24	20	0	0	111	8	32	46	0	0	86	337
5:45 PM	13	35	11	0	0	59	14	43	11	0	0	68	29	27	12	0	0	68	8	20	42	0	0	70	265
Total	66	146	68	0	0	280	51	186	50	0	0	287	169	104	52	0	0	325	31	101	149	0	0	281	1173
Approach %	23.6	52.1	24.3	0.0	-	-	17.8	64.8	17.4	0.0	-	-	52.0	32.0	16.0	0.0	-	-	11.0	35.9	53.0	0.0	-	-	-
Total %	5.6	12.4	5.8	0.0	-	23.9	4.3	15.9	4.3	0.0	-	24.5	14.4	8.9	4.4	0.0	-	27.7	2.6	8.6	12.7	0.0	-	24.0	-
PHF	0.611	0.890	0.850	0.000	-	0.805	0.797	0.912	0.781	0.000	-	0.908	0.631	0.788	0.650	0.000	-	0.732	0.969	0.789	0.810	0.000	-	0.817	0.870
Lights	64	139	66	0	-	269	49	184	49	0	-	282	168	98	52	0	-	318	29	93	148	0	-	270	1139
% Lights	97.0	95.2	97.1	-	-	96.1	96.1	98.9	98.0	-	-	98.3	99.4	94.2	100.0	-	-	97.8	93.5	92.1	99.3	-	-	96.1	97.1
Mediums	2	3	1	0	-	6	1	2	1	0	-	4	1	3	0	0	-	4	1	3	1	0	-	5	19
% Mediums	3.0	2.1	1.5	-	-	2.1	2.0	1.1	2.0	-	-	1.4	0.6	2.9	0.0	-	-	1.2	3.2	3.0	0.7	-	-	1.8	1.6
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	3	0	0	-	3	1	5	0	0	-	6	9
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	2.9	0.0	-	-	0.9	3.2	5.0	0.0	-	-	2.1	0.8
Bicycles on Road	0	4	1	0	-	5	1	0	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	6
% Bicycles on Road	0.0	2.7	1.5	-	-	1.8	2.0	0.0	0.0	-	-	0.3	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.5
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Turning Movement Peak Hour Data Plot (5:00 PM)



Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Waterloo Street & Nafziger Road
Site Code:
Start Date: 09/18/2018
Page No: 10

Appendix C

Base Year Traffic Operations Reports



Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Existing AM

	→	↗	↖	←	↙	↘
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Traffic Volume (vph)	300	4	6	211	22	58
Future Volume (vph)	300	4	6	211	22	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.998				0.902	
Flt Protected				0.999	0.986	
Satd. Flow (prot)	1842	0	0	1761	1666	0
Flt Permitted				0.999	0.986	
Satd. Flow (perm)	1842	0	0	1761	1666	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		6	6			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	8%	0%	2%
Adj. Flow (vph)	300	4	6	211	22	58
Shared Lane Traffic (%)						
Lane Group Flow (vph)	304	0	0	217	80	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 27.9%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Existing AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	300	4	6	211	22	58
Future Volume (Veh/h)	300	4	6	211	22	58
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	300	4	6	211	22	58
Pedestrians				1	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			310		531	309
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			310		531	309
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	92
cM capacity (veh/h)			1256		507	727
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	304	217	80			
Volume Left	0	6	22			
Volume Right	4	0	58			
cSH	1700	1256	650			
Volume to Capacity	0.18	0.00	0.12			
Queue Length 95th (m)	0.0	0.1	3.4			
Control Delay (s)	0.0	0.3	11.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.3	11.3			
Approach LOS			B			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization	27.9%			ICU Level of Service	A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Existing AM

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	7	353	205	12	96	17
Future Volume (vph)	7	353	205	12	96	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.993		0.980	
Flt Protected		0.999			0.959	
Satd. Flow (prot)	0	1844	1747	0	1786	0
Flt Permitted		0.999			0.959	
Satd. Flow (perm)	0	1844	1747	0	1786	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2	1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	8%	8%	0%	0%
Adj. Flow (vph)	7	353	205	12	96	17
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	360	217	0	113	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	37.2%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Existing AM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	7	353	205	12	96	17
Future Volume (Veh/h)	7	353	205	12	96	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	353	205	12	96	17
Pedestrians			1		2	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	219				581	213
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	219				581	213
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				80	98
cM capacity (veh/h)	1360				476	831
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	360	217	113			
Volume Left	7	0	96			
Volume Right	0	12	17			
cSH	1360	1700	508			
Volume to Capacity	0.01	0.13	0.22			
Queue Length 95th (m)	0.1	0.0	6.7			
Control Delay (s)	0.2	0.0	14.1			
Lane LOS	A		B			
Approach Delay (s)	0.2	0.0	14.1			
Approach LOS			B			
Intersection Summary						
Average Delay			2.4			
Intersection Capacity Utilization			37.2%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Existing PM

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	268	25	45	343	8	21
Future Volume (vph)	268	25	45	343	8	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.988				0.902	
Flt Protected				0.994	0.986	
Satd. Flow (prot)	1827	0	0	1824	1690	0
Flt Permitted				0.994	0.986	
Satd. Flow (perm)	1827	0	0	1824	1690	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		4	4		2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	4%	0%	0%
Adj. Flow (vph)	268	25	45	343	8	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	293	0	0	388	29	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	49.9%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Existing PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				 	 	
Traffic Volume (veh/h)	268	25	45	343	8	21
Future Volume (Veh/h)	268	25	45	343	8	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	268	25	45	343	8	21
Pedestrians	2			1	4	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			297		720	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			297		720	286
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		98	97
cM capacity (veh/h)			1272		382	755
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	293	388	29			
Volume Left	0	45	8			
Volume Right	25	0	21			
cSH	1700	1272	595			
Volume to Capacity	0.17	0.04	0.05			
Queue Length 95th (m)	0.0	0.9	1.2			
Control Delay (s)	0.0	1.2	11.4			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.2	11.4			
Approach LOS		B				
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			49.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Existing PM

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	11	231	417	80	26	4
Future Volume (vph)	11	231	417	80	26	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.978		0.982	
Flt Protected		0.998			0.958	
Satd. Flow (prot)	0	1861	1855	0	1787	0
Flt Permitted		0.998			0.958	
Satd. Flow (perm)	0	1861	1855	0	1787	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	0%
Adj. Flow (vph)	11	231	417	80	26	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	242	497	0	30	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	37.2%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Existing PM

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	231	417	80	26	4
Future Volume (Veh/h)	11	231	417	80	26	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	11	231	417	80	26	4
Pedestrians		1			2	
Lane Width (m)		3.6			3.6	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	499				712	460
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	499				712	460
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				93	99
cM capacity (veh/h)	1074				397	604
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	242	497	30			
Volume Left	11	0	26			
Volume Right	0	80	4			
cSH	1074	1700	416			
Volume to Capacity	0.01	0.29	0.07			
Queue Length 95th (m)	0.2	0.0	1.9			
Control Delay (s)	0.5	0.0	14.3			
Lane LOS	A		B			
Approach Delay (s)	0.5	0.0	14.3			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			37.2%	ICU Level of Service	A	
Analysis Period (min)			15			

Appendix D

2026 Background Traffic Operations Reports



Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2026 AM

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	↖
Traffic Volume (vph)	351	5	7	247	26	68
Future Volume (vph)	351	5	7	247	26	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.998				0.902	
Flt Protected				0.999	0.986	
Satd. Flow (prot)	1842	0	0	1761	1666	0
Flt Permitted				0.999	0.986	
Satd. Flow (perm)	1842	0	0	1761	1666	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		6	6			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	8%	0%	2%
Adj. Flow (vph)	351	5	7	247	26	68
Shared Lane Traffic (%)						
Lane Group Flow (vph)	356	0	0	254	94	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 31.4%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2026 AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	351	5	7	247	26	68
Future Volume (Veh/h)	351	5	7	247	26	68
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	351	5	7	247	26	68
Pedestrians				1	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			362		620	360
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			362		620	360
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		94	90
cM capacity (veh/h)			1202		450	680
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	356	254	94			
Volume Left	0	7	26			
Volume Right	5	0	68			
cSH	1700	1202	596			
Volume to Capacity	0.21	0.01	0.16			
Queue Length 95th (m)	0.0	0.1	4.5			
Control Delay (s)	0.0	0.3	12.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.3	12.2			
Approach LOS		B				
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization	31.4%			ICU Level of Service	A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2026 AM

	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (vph)	8	414	240	14	112	20
Future Volume (vph)	8	414	240	14	112	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.993		0.980	
Flt Protected		0.999			0.959	
Satd. Flow (prot)	0	1844	1747	0	1786	0
Flt Permitted		0.999			0.959	
Satd. Flow (perm)	0	1844	1747	0	1786	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2	1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	8%	8%	0%	0%
Adj. Flow (vph)	8	414	240	14	112	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	422	254	0	132	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 42.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2026 AM

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	414	240	14	112	20
Future Volume (Veh/h)	8	414	240	14	112	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	8	414	240	14	112	20
Pedestrians			1		2	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	256				680	249
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	256				680	249
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				73	97
cM capacity (veh/h)	1318				416	793
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	422	254	132			
Volume Left	8	0	112			
Volume Right	0	14	20			
cSH	1318	1700	448			
Volume to Capacity	0.01	0.15	0.29			
Queue Length 95th (m)	0.1	0.0	9.7			
Control Delay (s)	0.2	0.0	16.3			
Lane LOS	A		C			
Approach Delay (s)	0.2	0.0	16.3			
Approach LOS			C			
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization	42.3%			ICU Level of Service	A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2026 PM

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	314	29	53	402	9	25
Future Volume (vph)	314	29	53	402	9	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.989				0.901	
Flt Protected				0.994	0.987	
Satd. Flow (prot)	1829	0	0	1824	1690	0
Flt Permitted				0.994	0.987	
Satd. Flow (perm)	1829	0	0	1824	1690	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		4	4		2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	4%	0%	0%
Adj. Flow (vph)	314	29	53	402	9	25
Shared Lane Traffic (%)						
Lane Group Flow (vph)	343	0	0	455	34	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	56.1%			ICU Level of Service B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2026 PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	314	29	53	402	9	25
Future Volume (Veh/h)	314	29	53	402	9	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	314	29	53	402	9	25
Pedestrians	2			1	4	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			347		842	334
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			347		842	334
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		97	96
cM capacity (veh/h)			1219		321	710
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	343	455	34			
Volume Left	0	53	9			
Volume Right	29	0	25			
cSH	1700	1219	537			
Volume to Capacity	0.20	0.04	0.06			
Queue Length 95th (m)	0.0	1.1	1.6			
Control Delay (s)	0.0	1.3	12.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.3	12.2			
Approach LOS		B				
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			56.1%	ICU Level of Service	B	
Analysis Period (min)			15			

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2026 PM

	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (vph)	13	271	489	94	30	5
Future Volume (vph)	13	271	489	94	30	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.978		0.981	
Flt Protected		0.998			0.959	
Satd. Flow (prot)	0	1861	1855	0	1787	0
Flt Permitted		0.998			0.959	
Satd. Flow (perm)	0	1861	1855	0	1787	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	0%
Adj. Flow (vph)	13	271	489	94	30	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	284	583	0	35	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 41.8%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2026 PM

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	271	489	94	30	5
Future Volume (Veh/h)	13	271	489	94	30	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	13	271	489	94	30	5
Pedestrians		1			2	
Lane Width (m)		3.6			3.6	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	585				835	539
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	585				835	539
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				91	99
cM capacity (veh/h)	998				335	545
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	284	583	35			
Volume Left	13	0	30			
Volume Right	0	94	5			
cSH	998	1700	355			
Volume to Capacity	0.01	0.34	0.10			
Queue Length 95th (m)	0.3	0.0	2.6			
Control Delay (s)	0.5	0.0	16.3			
Lane LOS	A		C			
Approach Delay (s)	0.5	0.0	16.3			
Approach LOS			C			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization	41.8%			ICU Level of Service	A	
Analysis Period (min)	15					

Appendix E

2026 Total Traffic Operations Reports



Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 AM

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	357	22	34	264	77	151
Future Volume (vph)	357	22	34	264	77	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.992				0.911	
Flt Protected				0.994	0.983	
Satd. Flow (prot)	1833	0	0	1764	1679	0
Flt Permitted				0.994	0.983	
Satd. Flow (perm)	1833	0	0	1764	1679	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		6	6			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	8%	0%	2%
Adj. Flow (vph)	357	22	34	264	77	151
Shared Lane Traffic (%)						
Lane Group Flow (vph)	379	0	0	298	228	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	59.6%			ICU Level of Service B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	357	22	34	264	77	151
Future Volume (Veh/h)	357	22	34	264	77	151
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	357	22	34	264	77	151
Pedestrians				1	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			385		706	375
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			385		706	375
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		80	77
cM capacity (veh/h)			1179		392	667
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	379	298	228			
Volume Left	0	34	77			
Volume Right	22	0	151			
cSH	1700	1179	539			
Volume to Capacity	0.22	0.03	0.42			
Queue Length 95th (m)	0.0	0.7	16.7			
Control Delay (s)	0.0	1.2	16.5			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.2	16.5			
Approach LOS		C				
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization			59.6%	ICU Level of Service	B	
Analysis Period (min)			15			

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2026 AM

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	8	503	284	14	112	20
Future Volume (vph)	8	503	284	14	112	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.994		0.980	
Flt Protected		0.999			0.959	
Satd. Flow (prot)	0	1844	1749	0	1786	0
Flt Permitted		0.999			0.959	
Satd. Flow (perm)	0	1844	1749	0	1786	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2	1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	8%	8%	0%	0%
Adj. Flow (vph)	8	503	284	14	112	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	511	298	0	132	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	47.0%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2026 AM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	8	503	284	14	112	20
Future Volume (Veh/h)	8	503	284	14	112	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	8	503	284	14	112	20
Pedestrians			1		2	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	300				813	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	300				813	293
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				68	97
cM capacity (veh/h)	1270				348	750
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	511	298	132			
Volume Left	8	0	112			
Volume Right	0	14	20			
cSH	1270	1700	378			
Volume to Capacity	0.01	0.18	0.35			
Queue Length 95th (m)	0.2	0.0	12.3			
Control Delay (s)	0.2	0.0	19.5			
Lane LOS	A		C			
Approach Delay (s)	0.2	0.0	19.5			
Approach LOS			C			
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization			47.0%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 AM

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (vph)	609	6	82	281	17	250
Future Volume (vph)	609	6	82	281	17	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.999				0.874	
Flt Protected				0.989	0.997	
Satd. Flow (prot)	1861	0	0	1842	1623	0
Flt Permitted				0.989	0.997	
Satd. Flow (perm)	1861	0	0	1842	1623	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	76.0			328.5	80.6	
Travel Time (s)	5.5			23.7	5.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	609	6	82	281	17	250
Shared Lane Traffic (%)						
Lane Group Flow (vph)	615	0	0	363	267	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 78.1%
Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 AM

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (veh/h)	609	6	82	281	17	250
Future Volume (Veh/h)	609	6	82	281	17	250
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	609	6	82	281	17	250
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			615		1057	612
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			615		1057	612
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		93	49
cM capacity (veh/h)			965		228	493

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	615	363	267
Volume Left	0	82	17
Volume Right	6	0	250
cSH	1700	965	459
Volume to Capacity	0.36	0.09	0.58
Queue Length 95th (m)	0.0	2.2	29.0
Control Delay (s)	0.0	2.8	23.2
Lane LOS		A	C
Approach Delay (s)	0.0	2.8	23.2
Approach LOS			C

Intersection Summary

Average Delay 5.8
Intersection Capacity Utilization 78.1%
Analysis Period (min) 15

Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 PM

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	332	84	142	413	41	77
Future Volume (vph)	332	84	142	413	41	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.973				0.912	
Flt Protected				0.987	0.983	
Satd. Flow (prot)	1805	0	0	1821	1703	0
Flt Permitted				0.987	0.983	
Satd. Flow (perm)	1805	0	0	1821	1703	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		4	4		2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	4%	0%	0%
Adj. Flow (vph)	332	84	142	413	41	77
Shared Lane Traffic (%)						
Lane Group Flow (vph)	416	0	0	555	118	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 69.5%	ICU Level of Service C					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	332	84	142	413	41	77
Future Volume (Veh/h)	332	84	142	413	41	77
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	332	84	142	413	41	77
Pedestrians	2			1	4	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			420		1077	379
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			420		1077	379
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		81	88
cM capacity (veh/h)			1146		213	670
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	416	555	118			
Volume Left	0	142	41			
Volume Right	84	0	77			
cSH	1700	1146	384			
Volume to Capacity	0.24	0.12	0.31			
Queue Length 95th (m)	0.0	3.4	10.3			
Control Delay (s)	0.0	3.2	18.5			
Lane LOS		A	C			
Approach Delay (s)	0.0	3.2	18.5			
Approach LOS			C			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization	69.5%			ICU Level of Service	C	
Analysis Period (min)	15					

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2026 PM

	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (vph)	13	341	589	94	30	5
Future Volume (vph)	13	341	589	94	30	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.981		0.981	
Flt Protected		0.998			0.959	
Satd. Flow (prot)	0	1860	1861	0	1787	0
Flt Permitted		0.998			0.959	
Satd. Flow (perm)	0	1860	1861	0	1787	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	0%
Adj. Flow (vph)	13	341	589	94	30	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	354	683	0	35	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 47.1%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2026 PM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Lane Configurations						
Traffic Volume (veh/h)	13	341	589	94	30	5
Future Volume (Veh/h)	13	341	589	94	30	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	13	341	589	94	30	5
Pedestrians		1			2	
Lane Width (m)		3.6			3.6	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	685				1005	639
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	685				1005	639
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				89	99
cM capacity (veh/h)	916				266	478
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	354	683	35			
Volume Left	13	0	30			
Volume Right	0	94	5			
cSH	916	1700	284			
Volume to Capacity	0.01	0.40	0.12			
Queue Length 95th (m)	0.3	0.0	3.3			
Control Delay (s)	0.5	0.0	19.5			
Lane LOS	A		C			
Approach Delay (s)	0.5	0.0	19.5			
Approach LOS			C			
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization	47.1%			ICU Level of Service	A	
Analysis Period (min)	15					

Lanes, Volumes, Timings
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 PM

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	↖
Traffic Volume (vph)	353	18	267	671	11	158
Future Volume (vph)	353	18	267	671	11	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.993				0.874	
Frt Protected				0.986	0.997	
Satd. Flow (prot)	1850	0	0	1837	1623	0
Frt Permitted				0.986	0.997	
Satd. Flow (perm)	1850	0	0	1837	1623	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	76.0			328.5	80.6	
Travel Time (s)	5.5			23.7	5.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	353	18	267	671	11	158
Shared Lane Traffic (%)						
Lane Group Flow (vph)	371	0	0	938	169	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 90.1%
Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2026 PM

	→	↖	↗	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	↖
Traffic Volume (veh/h)	353	18	267	671	11	158
Future Volume (Veh/h)	353	18	267	671	11	158
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	353	18	267	671	11	158
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			371		1567	362
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			371		1567	362
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			78		88	77
cM capacity (veh/h)			1188		95	683

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	371	938	169
Volume Left	0	267	11
Volume Right	18	0	158
cSH	1700	1188	486
Volume to Capacity	0.22	0.22	0.35
Queue Length 95th (m)	0.0	6.9	12.3
Control Delay (s)	0.0	4.9	16.3
Lane LOS		A	C
Approach Delay (s)	0.0	4.9	16.3
Approach LOS			C

Intersection Summary

Average Delay 5.0
Intersection Capacity Utilization 90.1%
Analysis Period (min) 15

Appendix F

2031 Background Traffic Operations Reports



Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2031 AM

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	388	5	8	273	28	75
Future Volume (vph)	388	5	8	273	28	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.998				0.902	
Flt Protected				0.999	0.987	
Satd. Flow (prot)	1842	0	0	1761	1667	0
Flt Permitted				0.999	0.987	
Satd. Flow (perm)	1842	0	0	1761	1667	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		6	6			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	8%	0%	2%
Adj. Flow (vph)	388	5	8	273	28	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	393	0	0	281	103	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	34.0%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2031 AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	388	5	8	273	28	75
Future Volume (Veh/h)	388	5	8	273	28	75
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	388	5	8	273	28	75
Pedestrians				1	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type	None		None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			399		686	398
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			399		686	398
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	88
cM capacity (veh/h)			1165		412	648
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	393	281	103			
Volume Left	0	8	28			
Volume Right	5	0	75			
cSH	1700	1165	561			
Volume to Capacity	0.23	0.01	0.18			
Queue Length 95th (m)	0.0	0.2	5.3			
Control Delay (s)	0.0	0.3	12.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.3	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			34.0%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2031 AM

	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (vph)	9	457	265	16	124	22
Future Volume (vph)	9	457	265	16	124	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.992		0.980		
Flt Protected		0.999		0.959		
Satd. Flow (prot)	0	1844	1745	0	1786	0
Flt Permitted		0.999		0.959		
Satd. Flow (perm)	0	1844	1745	0	1786	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2	1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	8%	8%	0%	0%
Adj. Flow (vph)	9	457	265	16	124	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	466	281	0	146	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 46.1%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2031 AM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	9	457	265	16	124	22
Future Volume (Veh/h)	9	457	265	16	124	22
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	457	265	16	124	22
Pedestrians			1		2	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	283				751	275
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	283				751	275
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				67	97
cM capacity (veh/h)	1289				378	767
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	466	281	146			
Volume Left	9	0	124			
Volume Right	0	16	22			
cSH	1289	1700	409			
Volume to Capacity	0.01	0.17	0.36			
Queue Length 95th (m)	0.2	0.0	12.7			
Control Delay (s)	0.2	0.0	18.6			
Lane LOS	A		C			
Approach Delay (s)	0.2	0.0	18.6			
Approach LOS			C			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization 46.1%			ICU Level of Service		A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2031 PM

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↖	↗
Traffic Volume (vph)	347	32	58	444	10	27
Future Volume (vph)	347	32	58	444	10	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.989				0.901	
Flt Protected				0.994	0.987	
Satd. Flow (prot)	1829	0	0	1824	1690	0
Flt Permitted				0.994	0.987	
Satd. Flow (perm)	1829	0	0	1824	1690	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		4	4		2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	4%	0%	0%
Adj. Flow (vph)	347	32	58	444	10	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	379	0	0	502	37	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 60.5%	ICU Level of Service B					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Background 2031 PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	347	32	58	444	10	27
Future Volume (Veh/h)	347	32	58	444	10	27
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	347	32	58	444	10	27
Pedestrians	2			1	4	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			383		929	368
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			383		929	368
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		96	96
cM capacity (veh/h)			1183		283	679
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	379	502	37			
Volume Left	0	58	10			
Volume Right	32	0	27			
cSH	1700	1183	493			
Volume to Capacity	0.22	0.05	0.08			
Queue Length 95th (m)	0.0	1.2	1.9			
Control Delay (s)	0.0	1.4	12.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.4	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay				1.3		
Intersection Capacity Utilization	60.5%			ICU Level of Service	B	
Analysis Period (min)	15					

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2031 PM

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	14	299	539	103	34	5
Future Volume (vph)	14	299	539	103	34	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.978		0.983	
Flt Protected		0.998			0.958	
Satd. Flow (prot)	0	1861	1855	0	1789	0
Flt Permitted		0.998			0.958	
Satd. Flow (perm)	0	1861	1855	0	1789	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	0%
Adj. Flow (vph)	14	299	539	103	34	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	313	642	0	39	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	45.0%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Background 2031 PM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	14	299	539	103	34	5
Future Volume (Veh/h)	14	299	539	103	34	5
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	299	539	103	34	5
Pedestrians		1			2	
Lane Width (m)		3.6			3.6	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type	None	None				
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	644				920	594
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644				920	594
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				89	99
cM capacity (veh/h)	949				298	508
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	313	642	39			
Volume Left	14	0	34			
Volume Right	0	103	5			
cSH	949	1700	315			
Volume to Capacity	0.01	0.38	0.12			
Queue Length 95th (m)	0.4	0.0	3.3			
Control Delay (s)	0.5	0.0	18.0			
Lane LOS	A		C			
Approach Delay (s)	0.5	0.0	18.0			
Approach LOS			C			
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			45.0%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix G

2031 Total Traffic Operations Reports



Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 AM

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Traffic Volume (vph)	394	22	35	290	79	158
Future Volume (vph)	394	22	35	290	79	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.993				0.910	
Flt Protected				0.995	0.984	
Satd. Flow (prot)	1835	0	0	1765	1679	0
Flt Permitted				0.995	0.984	
Satd. Flow (perm)	1835	0	0	1765	1679	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		6	6			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	8%	0%	2%
Adj. Flow (vph)	394	22	35	290	79	158
Shared Lane Traffic (%)						
Lane Group Flow (vph)	416	0	0	325	237	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	63.5%			ICU Level of Service B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	394	22	35	290	79	158
Future Volume (Veh/h)	394	22	35	290	79	158
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	394	22	35	290	79	158
Pedestrians				1	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			422		771	412
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			422		771	412
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		78	75
cM capacity (veh/h)			1142		358	636
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	416	325	237			
Volume Left	0	35	79			
Volume Right	22	0	158			
cSH	1700	1142	505			
Volume to Capacity	0.24	0.03	0.47			
Queue Length 95th (m)	0.0	0.8	19.7			
Control Delay (s)	0.0	1.2	18.3			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.2	18.3			
Approach LOS			C			
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			63.5%	ICU Level of Service	B	
Analysis Period (min)			15			

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2031 AM

	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (vph)	9	546	309	16	124	22
Future Volume (vph)	9	546	309	16	124	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.993		0.980		
Flt Protected		0.999		0.959		
Satd. Flow (prot)	0	1844	1747	0	1786	0
Flt Permitted		0.999		0.959		
Satd. Flow (perm)	0	1844	1747	0	1786	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2	1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	8%	8%	0%	0%
Adj. Flow (vph)	9	546	309	16	124	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	555	325	0	146	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 50.8%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2031 AM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	9	546	309	16	124	22
Future Volume (Veh/h)	9	546	309	16	124	22
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	546	309	16	124	22
Pedestrians			1		2	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	327				884	319
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	327				884	319
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				61	97
cM capacity (veh/h)	1242				315	725
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	555	325	146			
Volume Left	9	0	124			
Volume Right	0	16	22			
cSH	1242	1700	345			
Volume to Capacity	0.01	0.19	0.42			
Queue Length 95th (m)	0.2	0.0	16.3			
Control Delay (s)	0.2	0.0	22.9			
Lane LOS	A		C			
Approach Delay (s)	0.2	0.0	22.9			
Approach LOS			C			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization		50.8%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 AM

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (vph)	664	6	82	308	17	250
Future Volume (vph)	664	6	82	308	17	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.999				0.874	
Flt Protected				0.990	0.997	
Satd. Flow (prot)	1861	0	0	1844	1623	0
Flt Permitted				0.990	0.997	
Satd. Flow (perm)	1861	0	0	1844	1623	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	76.0			328.5	80.6	
Travel Time (s)	5.5			23.7	5.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	664	6	82	308	17	250
Shared Lane Traffic (%)						
Lane Group Flow (vph)	670	0	0	390	267	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 82.5%
Analysis Period (min) 15

ICU Level of Service E

HCM Unsignalized Intersection Capacity Analysis
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 AM

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (veh/h)	664	6	82	308	17	250
Future Volume (Veh/h)	664	6	82	308	17	250
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	664	6	82	308	17	250
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			670		1139	667
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			670		1139	667
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		92	46
cM capacity (veh/h)			920		203	459

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	670	390	267
Volume Left	0	82	17
Volume Right	6	0	250
cSH	1700	920	425
Volume to Capacity	0.39	0.09	0.63
Queue Length 95th (m)	0.0	2.3	33.5
Control Delay (s)	0.0	2.8	26.8
Lane LOS		A	D
Approach Delay (s)	0.0	2.8	26.8
Approach LOS			D

Intersection Summary

Average Delay 6.2
Intersection Capacity Utilization 82.5%
Analysis Period (min) 15

ICU Level of Service E

Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	↖
Traffic Volume (vph)	365	87	147	455	42	79
Future Volume (vph)	365	87	147	455	42	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.974				0.912	
Flt Protected				0.988	0.983	
Satd. Flow (prot)	1807	0	0	1822	1703	0
Flt Permitted				0.988	0.983	
Satd. Flow (perm)	1807	0	0	1822	1703	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		4	4		2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	4%	0%	0%
Adj. Flow (vph)	365	87	147	455	42	79
Shared Lane Traffic (%)						
Lane Group Flow (vph)	452	0	0	602	121	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 74.1%	ICU Level of Service D					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	365	87	147	455	42	79
Future Volume (Veh/h)	365	87	147	455	42	79
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	365	87	147	455	42	79
Pedestrians	2			1	4	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			456		1164	414
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			456		1164	414
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		78	88
cM capacity (veh/h)			1112		187	640
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	452	602	121			
Volume Left	0	147	42			
Volume Right	87	0	79			
cSH	1700	1112	348			
Volume to Capacity	0.27	0.13	0.35			
Queue Length 95th (m)	0.0	3.6	12.1			
Control Delay (s)	0.0	3.3	20.7			
Lane LOS		A	C			
Approach Delay (s)	0.0	3.3	20.7			
Approach LOS			C			
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization	74.1%			ICU Level of Service	D	
Analysis Period (min)	15					

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	14	369	639	103	34	5
Future Volume (vph)	14	369	639	103	34	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.981		0.983		
Flt Protected		0.998		0.958		
Satd. Flow (prot)	0	1860	1861	0	1789	0
Flt Permitted		0.998		0.958		
Satd. Flow (perm)	0	1860	1861	0	1789	0
Link Speed (k/h)		50		50		
Link Distance (m)		164.9		110.0		
Travel Time (s)		11.9		7.9		
Confl. Peds. (#/hr)	2			2	1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	0%
Adj. Flow (vph)	14	369	639	103	34	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	383	742	0	39	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	50.2%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	14	369	639	103	34	5
Future Volume (Veh/h)	14	369	639	103	34	5
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	369	639	103	34	5
Pedestrians		1			2	
Lane Width (m)		3.6			3.6	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type	None	None				
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	744				1090	694
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744				1090	694
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				86	99
cM capacity (veh/h)	871				236	445
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	383	742	39			
Volume Left	14	0	34			
Volume Right	0	103	5			
cSH	871	1700	251			
Volume to Capacity	0.02	0.44	0.16			
Queue Length 95th (m)	0.4	0.0	4.3			
Control Delay (s)	0.5	0.0	21.9			
Lane LOS	A		C			
Approach Delay (s)	0.5	0.0	21.9			
Approach LOS			C			
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↖	↗
Traffic Volume (vph)	384	18	267	732	11	158
Future Volume (vph)	384	18	267	732	11	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994				0.874	
Frt Protected				0.987	0.997	
Satd. Flow (prot)	1852	0	0	1839	1623	0
Frt Permitted				0.987	0.997	
Satd. Flow (perm)	1852	0	0	1839	1623	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	76.0			328.5	80.6	
Travel Time (s)	5.5			23.7	5.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	384	18	267	732	11	158
Shared Lane Traffic (%)						
Lane Group Flow (vph)	402	0	0	999	169	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 95.0%
Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↖	↗
Traffic Volume (veh/h)	384	18	267	732	11	158
Future Volume (Veh/h)	384	18	267	732	11	158
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	384	18	267	732	11	158
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			402		1659	393
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			402		1659	393
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			77		87	76
cM capacity (veh/h)			1157		83	656

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	402	999	169
Volume Left	0	267	11
Volume Right	18	0	158
cSH	1700	1157	452
Volume to Capacity	0.24	0.23	0.37
Queue Length 95th (m)	0.0	7.1	13.7
Control Delay (s)	0.0	5.1	17.7
Lane LOS		A	C
Approach Delay (s)	0.0	5.1	17.7
Approach LOS			C

Intersection Summary

Average Delay 5.1
Intersection Capacity Utilization 95.0%
Analysis Period (min) 15

Appendix H

2031 Total Queuing Analysis Reports



Lanes, Volumes, Timings
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖		↖	↖	↖	↖
Traffic Volume (vph)	365	87	147	455	42	79
Future Volume (vph)	365	87	147	455	42	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	30.0		0.0	0.0
Storage Lanes		0	1		1	0
Taper Length (m)			15.0		0.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.974				0.912	
Flt Protected			0.950		0.983	
Satd. Flow (prot)	1807	0	1805	1827	1703	0
Flt Permitted			0.950		0.983	
Satd. Flow (perm)	1807	0	1805	1827	1703	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.6			164.9	81.4	
Travel Time (s)	4.5			11.9	5.9	
Confl. Peds. (#/hr)		4	4		2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	0%	0%	4%	0%	0%
Adj. Flow (vph)	365	87	147	455	42	79
Shared Lane Traffic (%)						
Lane Group Flow (vph)	452	0	147	455	121	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 50.2%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
1: Laschinger Boulevard & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	→	↖	↗	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖		↖	↖	↖	↖
Traffic Volume (veh/h)	365	87	147	455	42	79
Future Volume (Veh/h)	365	87	147	455	42	79
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	365	87	147	455	42	79
Pedestrians	2			1	4	
Lane Width (m)	3.6			3.6	3.6	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			456		1164	414
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			456		1164	414
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		78	88
cM capacity (veh/h)			1112		187	640
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	452	147	455	121		
Volume Left	0	147	0	42		
Volume Right	87	0	0	79		
cSH	1700	1112	1700	348		
Volume to Capacity	0.27	0.13	0.27	0.35		
Queue Length 95th (m)	0.0	3.6	0.0	12.1		
Control Delay (s)	0.0	8.7	0.0	20.7		
Lane LOS		A		C		
Approach Delay (s)	0.0	2.1		20.7		
Approach LOS				C		
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	14	369	639	103	34	5
Future Volume (vph)	14	369	639	103	34	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.981		0.983	
Flt Protected		0.998			0.958	
Satd. Flow (prot)	0	1860	1861	0	1789	0
Flt Permitted		0.998			0.958	
Satd. Flow (perm)	0	1860	1861	0	1789	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		164.9	140.7		110.0	
Travel Time (s)		11.9	10.1		7.9	
Confl. Peds. (#/hr)	2			2		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	2%	0%	1%	0%	0%
Adj. Flow (vph)	14	369	639	103	34	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	383	742	0	39	0
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	50.2%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
2: Waterloo Street & Hostetler Road

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (veh/h)	14	369	639	103	34	5
Future Volume (Veh/h)	14	369	639	103	34	5
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	369	639	103	34	5
Pedestrians		1			2	
Lane Width (m)		3.6			3.6	
Walking Speed (m/s)		1.2			1.2	
Percent Blockage		0			0	
Right turn flare (veh)						
Median type	None	None				
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	744				1090	694
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744				1090	694
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				86	99
cM capacity (veh/h)	871				236	445
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	383	742	39			
Volume Left	14	0	34			
Volume Right	0	103	5			
cSH	871	1700	251			
Volume to Capacity	0.02	0.44	0.16			
Queue Length 95th (m)	0.4	0.0	4.3			
Control Delay (s)	0.5	0.0	21.9			
Lane LOS	A		C			
Approach Delay (s)	0.5	0.0	21.9			
Approach LOS			C			
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			50.2%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖		↗	↖	↗	
Traffic Volume (vph)	384	18	267	732	11	158
Future Volume (vph)	384	18	267	732	11	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		0.0	70.0		0.0	0.0
Storage Lanes		0	1		1	0
Taper Length (m)			15.0		7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994				0.874	
Flt Protected			0.950		0.997	
Satd. Flow (prot)	1852	0	1770	1863	1623	0
Flt Permitted			0.950		0.997	
Satd. Flow (perm)	1852	0	1770	1863	1623	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	76.0			328.5	80.6	
Travel Time (s)	5.5			23.7	5.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	384	18	267	732	11	158
Shared Lane Traffic (%)						
Lane Group Flow (vph)	402	0	267	732	169	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 56.5%
Analysis Period (min) 15

ICU Level of Service B

HCM Unsignalized Intersection Capacity Analysis
3: Street Two & Waterloo Street

(210005) 1209 Waterloo St, Wilmont
Total 2031 PM

	→	↖	↗	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖		↗	↖	↗	
Traffic Volume (veh/h)	384	18	267	732	11	158
Future Volume (Veh/h)	384	18	267	732	11	158
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	384	18	267	732	11	158
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			402		1659	393
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			402		1659	393
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			77		87	76
cM capacity (veh/h)			1157		83	656

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	402	267	732	169
Volume Left	0	267	0	11
Volume Right	18	0	0	158
cSH	1700	1157	1700	452
Volume to Capacity	0.24	0.23	0.43	0.37
Queue Length 95th (m)	0.0	7.1	0.0	13.7
Control Delay (s)	0.0	9.0	0.0	17.7
Lane LOS		A		C
Approach Delay (s)	0.0	2.4		17.7
Approach LOS				C

Intersection Summary

Average Delay 3.4
Intersection Capacity Utilization 56.5%
Analysis Period (min) 15

ICU Level of Service B

Queuing and Blocking Report

Total 2031 PM

03-09-2022

Intersection: 1: Laschinger Boulevard & Waterloo Street

Movement	EB	WB	NB
Directions Served	TR	L	LR
Maximum Queue (m)	6.7	20.4	21.3
Average Queue (m)	0.4	10.4	11.0
95th Queue (m)	3.1	19.4	17.9
Link Distance (m)	52.8		70.9
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)		30.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Waterloo Street & Hostetler Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	15.8	9.1	15.5
Average Queue (m)	1.4	0.3	7.0
95th Queue (m)	7.8	3.0	14.0
Link Distance (m)	150.4	122.6	99.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Street Two & Waterloo Street

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (m)	27.3	28.6
Average Queue (m)	13.8	12.9
95th Queue (m)	22.5	22.7
Link Distance (m)		67.8
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	70.0	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0
