

INTERIM ROADWAY IMPACT FEE STUDY

Town of Keenesburg

Prepared for:

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TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION.....	1
II. METHODOLOGY	2
II.A. Traffic Projections.....	2
II.B. 2027 Roadway Improvements.....	3
III. IMPROVEMENT COSTS	5
IV. IMPACT FEE CALCULATION	7
IV.A. Development Share of Traffic Impacts.....	7
IV.B. Town Participation.....	8
IV.C. Comparison to Other Towns.....	8
V. SUMMARY	9

Appendices

Appendix A. Traffic Volumes and Analysis

Appendix B. Improvement Costs

List of Figures

	<u>Page</u>
Figure 1. Improvement Locations	4

List of Tables

	<u>Page</u>
Table 1. 2027 Opinion of Probable Improvement Costs.....	5
Table 2. 2027 Costs Allocated to Development.....	6
Table 3. ITE Trip Generation Rates	7
Table 4. Impact Fee Calculation	7
Table 5. Roadway Impact Fee Comparison.....	8
Table 6. Current to Proposed Fee Comparison.....	8
Table 7. Proposed Roadway Impact Fee Schedule	9

I. INTRODUCTION

The Town of Keenesburg currently assesses roadway impact fees on new development to help offset the effects of growth on the arterial street system. With the increasing pressure for new development that Keenesburg has experienced in recent years, the need to update the current roadway impact fees is seen as a priority.

The Town is currently in the process of developing a Comprehensive Plan, which will include a Transportation Master Plan (TMP) to identify future roadway improvements to support the long-range vision for Keenesburg. The TMP can then be used to develop a long-range Capital Improvement Plan and Roadway Impact Fee schedule. Prior to completion of the TMP, the purpose of this study is to establish an interim impact fee schedule to help fund capital improvement projects driven by developments anticipated in the near term.

The interim impact fee methodology documented in this study consists of the following basic steps:

1. Develop traffic projections for the five-year horizon based on available studies provided by developer and on background traffic increases due to regional growth expectations.
2. Identify the consequent arterial road improvements needed to accommodate the projected growth to the year 2027 and estimate the associated probable construction costs.
3. Determine the proportion of the above costs that would be attributable to growth.
4. Calculate a cost-per-trip of growth-related improvements.
5. Apply trip generation characteristics of the various land use categories to determine the applicable impact fees to cover the improvement costs.

In Keenesburg, and in any other local government, not all capital construction costs are associated with growth. Some capital costs are for repairs or facility replacement, or for routine maintenance, such as repaving or chip-sealing, and these costs are generally not eligible for impact fees.

Some capital costs are for improvements needed to address existing deficiencies, and this type is also not generally impact fee eligible. The test for this type of improvement is “Would the Town need to do the improvement even if there were no anticipated growth”? If so, it is not eligible. An example would be the Colorado Department of Transportation (CDOT) planned roundabout at State Highway (SH) 52/Weld County Road (WCR) 59, which is needed to remedy current traffic congestion and safety concerns.

However, any facility or improvement that is needed to serve new growth is eligible for impact fees. If the Town would not consider the project unless development occurs, then 100 percent of the associated capital costs are impact fee eligible. Some improvements, although needed to accommodate growth, would also benefit existing users. This type of improvement is eligible on a proportionate share of growth to total traffic.

It is typical for local agencies to enter into agreements with developers to construct improvements that would otherwise be built using impact fees. In return, the Town issues credits to the developer against the impact fee requirement.

The following sections of this report provide further detail on the methodology and analysis to determine the interim impact fees for the Town of Keenesburg.

II. METHODOLOGY

II.A. Traffic Projections

Traffic projections for the Town's arterial roads would consist of three components: existing traffic volumes, development generated traffic volumes, and background growth.

Existing Counts

Existing (year 2021) AM and PM peak hour volumes traffic volume counts were extracted from recent traffic impact studies conducted for proposed developments in Keenesburg. These counts were adjusted to reflect the effects of COVID on area travel demand.

Development Generated Traffic Volumes

Development generated roadway traffic volumes for these sites were also extracted from the available studies. These developments include the following major traffic generators:

- Vista West (Residential)
- Summerfield – North and South sites (Residential)
- 245 Market Street (Retail/Convenience/Gas)
- Marketplace East (Retail/Fast Food)
- Colorado Sand Company (Industrial)
- Kum & Go (Retail/Convenience/Gas)
- 1st Avenue & Market Street (Commercial/Fast Food)

It is estimated that developments currently in process with the Town could reasonably be assumed to be complete by 2027. The MSP Stewart (Residential) development site has also been under consideration for development potentially beginning before 2027. It is estimated that MSP Stewart could be about 50 percent complete by 2027. Because a traffic study has yet to be conducted for this site, the travel demand potential was estimated using industry standard data per the Institute of Transportation Engineer's *Trip Generation, 11th Edition* (ITE).

Background Growth

Background growth, which represents regional traffic increases due to new development occurring outside of Keenesburg, was estimated using CDOT growth factors for I-76, representative of the general area encompassing the Town. As calculated from the CDOT data, an annual background growth rate of approximately 1.9 percent was applied to existing traffic volumes on area roadways.

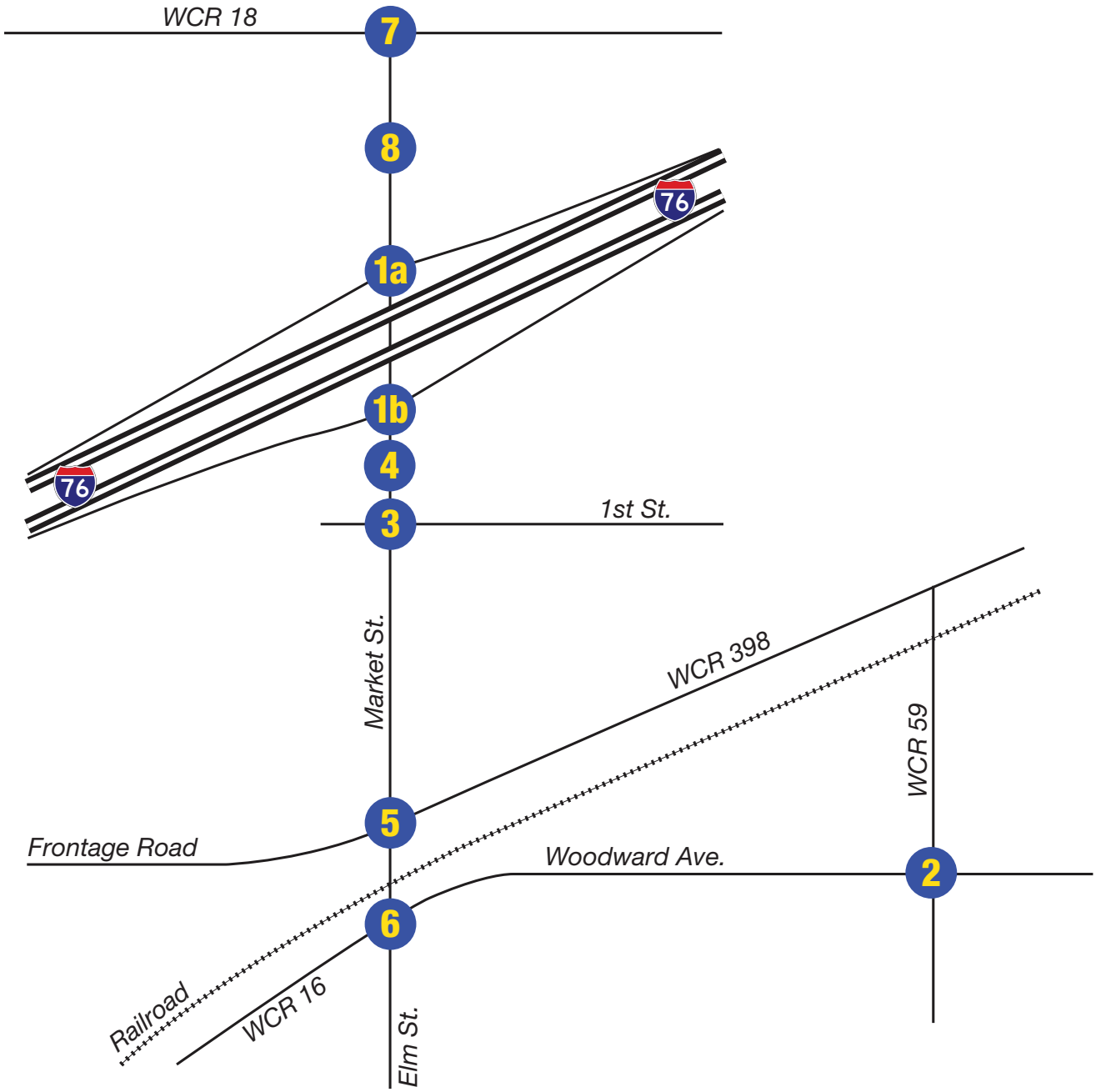
II.B. 2027 Roadway Improvements

The above traffic volume components were combined into total year 2027 traffic volumes and assigned to primary Town roadways and intersections to serve as the basis for capacity analyses. Level of Service (LOS) is a qualitative measure of traffic operational conditions, based on roadway capacity and motorist delay. The *Highway Capacity Manual* (6th Edition) defines six levels of service, ranging from A to F, with LOS A representing the best possible operating conditions and LOS F representing over-capacity, or congested conditions. In developed areas, LOS D is typically considered to be acceptable for peak hour traffic operations.

The capacity analyses indicate the need for improvements at eight locations as depicted on **Figure I**. The improvements include intersection geometric and/or traffic control improvements primarily along Market Street between WCR 18 and WCR 16, plus the intersection at Woodward Avenue and WCR 59 (proximate to Hoff Elementary School). The improvements are summarized as follows:

1. **I-76/Market Street Interchange.** The existing STOP-controlled intersections on the I-76 ramps at Market Street would require roundabouts to maintain acceptable traffic operations in 2027.
2. **Woodward Avenue/WCR 59.** The existing All-Way STOP-control at this intersection would warrant upgrading to a traffic signal per criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD) (FHWA, 2009).
3. **Market Street/Ist Avenue.** The existing STOP-control on Ist Avenue at Market Street would experience LOS F by 2027. This intersection would warrant upgrading to a traffic signal per MUTCD criteria. Turn lane improvements are also anticipated.
4. **Market Street, Ist Avenue to I-76.** This roadway segment should be improved to a three-lane section by 2027 to be consistent with the cross section south of Ist Avenue and to facilitate intersection improvements.
5. **Market Street/Frontage Road/WCR 398.** The existing STOP-control eastbound/westbound at Market Street would experience LOS E or F by 2027. This intersection would warrant upgrading to a traffic signal per MUTCD criteria.
6. **Elm Street/WCR 16/Woodward Avenue.** Geometric and traffic control improvements are indicated to maintain acceptable LOS. The existing Stop sign/Yield sign configuration is atypical but currently necessary given the proximity to an existing Railroad grade crossing. Reconfiguration would be needed to maintain acceptable LOS. Alternatively, this intersection could potentially warrant a traffic signal. If signalized, some level of coordination with the existing automatic gates/bells/lights would be needed.
7. **Market Street/WCR 18.** This intersection is currently undergoing geometric upgrades, which are driven by development along WCR 59. These upgrades serve the Town's arterial street system and are eligible for inclusion in the impact fees. The existing All-Way Stop sign control will be adequate for the projected 2027 traffic levels.
8. **Market Street, I-76 to WCR 18.** The northbound side of this roadway segment should be improved to match the west side by 2027 to serve planned commercial development along the east side of Market Street.

The projected traffic volumes, intersection geometrics, traffic control and LOS results for the above improvement concepts are graphically depicted in **Appendix A**, which also contains the corresponding intersection LOS analysis worksheets.



III. IMPROVEMENT COSTS

Preliminary opinions of probable cost were developed for the eight identified improvements using CDOT Unit Cost data for 2021 and typical percentage item costs. Cost calculations for intersection lane improvements and roundabout costs are included in **Appendix B**.

Table 1 summarizes the preliminary opinions of probable cost for the identified improvements. As can be seen, the total cost for year 2027 roadway improvements is projected to be \$8,869,500.

Table 1. 2027 Opinion of Probable Improvement Costs

Improvement Location	Description	2027 Total Cost
1	Market St/I-76 Interchange Roundabouts	\$5,306,000
2	Woodward Ave/CR 59 Signal	\$400,000
3	1st Ave/Market Street Signal	\$400,000
4	Market Street 1st Ave to I-76 Lane improvements	\$280,500
5	Market Street/ CR 398	\$400,000
6	CR 16/Elm St/Woodward Ave Signal, lane improvements	\$757,000
7	Market St/CR 18 intersection improvements	\$816,000
8	Market St, I-76 to CR 18	\$510,000
	Total Cost to 2027	\$8,869,500

As previously discussed, any facility or improvement that is needed to serve new growth is eligible for impact fees. If the Town would only consider implementing a project with new development, then 100 percent of the associated capital costs are impact fee eligible. Some improvements, although needed to accommodate growth, would also benefit existing users. This type of improvement is eligible on a proportionate share of growth to total traffic. The cost share for projects in Keenesburg was based on the traffic analyses and allocated as indicated in **Table 2**.

Table 2. 2027 Costs Allocated to Development

Improvement Location	Description	Development Allocation	Percent Attributed to Growth
1	Market St/I-76 Interchange Roundabouts	\$5,306,000	1.00
2	Woodward Ave/CR 59 Signal	\$180,000	0.45
3	1st Ave/Market Street Signal	\$400,000	1.00
4	Market Street 1st Ave to I-76 Lane improvements	\$185,130	0.66
5	Market Street/ CR 398	\$400,000	1.00
6	CR 16/Elm St/Woodward Ave Signal, lane improvements	\$514,760	0.68
7	Market St/CR 18 intersection improvements	\$816,000	1.00
8	Market St, I-76 to CR 18	\$510,000	1.00
2027 Cost Attributable to New Development		\$8,311,890	

As shown, the cost attributable to new development is \$8,311,890.00. This is the total cost to serve as the basis for the interim roadway impact fees.

IV. IMPACT FEE CALCULATION

IV.A. Development Share of Traffic Impacts

Based on the traffic analyses documented in the available traffic impact studies, and on our estimates for the MSP Stewart site, the total potential new trips generated by development in Keenesburg would be approximately 16,580 vehicle trips per day in 2027. By dividing the allocated cost of \$8,311,890.00 by 16,580 trips, a ratio of \$501.00 per trip is calculated.

The allocation of the roadway impact fees is then distributed according to the total daily trips generated by each particular land use. For this analysis, industry standard ITE rates have been applied.

Table 3. ITE Trip Generation Rates

Land Use	Unit	Daily Trip Rate
Single Family Residential (1)	Lot	9.43
Multifamily Residential (2)	Dwelling Unit	6.74
Commercial/Retail (3)	1,000 SF	18.6
Office (4)	1,000 SF	10.84
Warehouse (5)	1,000 SF	1.71
Industrial (6)	1,000 SF	4.87
Institutional (7)	1,000 SF	10.77

Notes:

1. ITE Code 201 Single Family Detached Housing
2. ITE Code 220 Low Rise Multifamily Housing
3. ITE Code 820 Shopping Center
4. ITE Code 710 General Office Building
5. ITE Code 150 Warehousing
6. ITE Code 110 General Light Industrial
7. ITE Codes 520, 522, and 525. Average of rates for Elementary, Middle, and High Schools

Table 4. Impact Fee Calculation

5-Year Impact Fee Calculation			
Land Use	Unit	Daily Trip Rate	Impact Fee
Single Family Residential	Lot	9.43	\$4,727
Multifamily Residential	Dwelling Unit	6.74	\$3,379
Commercial/Retail	1,000 SF	18.6	\$9,325
Office	1,000 SF	10.84	\$5,434
Warehouse	1,000 SF	1.71	\$857
Industrial	1,000 SF	4.87	\$2,441
Institutional	1,000 SF	10.77	\$5,399

The above impacts would be the maximum defensible amounts based on the current available data. The Town of Keenesburg could choose to impose lesser amounts, but that would increase the Town's overall liability as described in the following section.

IV.B. Town Participation

As previously mentioned, The total cost of improvements would be \$ 8,869,500. Because some of the identified improvements are only partially due to new development, the Town would assume responsibility for the difference between the total costs and developer impact fees. By subtracting the impact fee basis of \$8,311,890, the Town participation in the identified improvements is \$557,610.

IV.C. Comparison to Other Towns

To assist the Town in determining the appropriate Roadway Impact Fees, the following table provides a comparison to fees currently charged in other front range municipalities.

Table 5. Roadway Impact Fee Comparison

Land Use	Erie	Mead	Johnstown	Proposed Keenesburg
SF Residential	\$3,975	\$6,167	\$2,916	\$4727
MF Residential	\$2,449	\$4,237	\$2,605	\$3,379
Commercial/Retail	\$4,973	\$3,881	\$5,170	\$9,325
Office	\$1,895	\$2,913	\$3,130	\$5,434
Industrial	\$765	\$1,622	\$2,020	\$2,441

A comparison to the current fee schedule in Keenesburg is as follows:

Table 6. Current to Proposed Fee Comparison

Land Use	Current Roadway Impact Fee	Proposed Roadway Impact Fee	Per Unit
Single Family Residential, per lot	\$2,273	\$4727	Lot
Multi-Family Residential, per unit	\$1,706	\$3379	Dwelling Unit
Commercial / Retail	\$2,046	\$9325	1,000 Square feet
Office	\$3,718	\$5434	1,000 Square feet
Warehouse	\$1,157	\$857	1,000 Square feet
Industrial	\$579	\$2441	1,000 Square feet
Institutional	\$3,281	\$5399	1,000 Square feet

V. SUMMARY

This report has evaluated potential roadway improvements likely to be needed to accommodate growth and development in Keenesburg between now and the year 2027. Preliminary cost opinions for these improvements in conjunction with traffic volume projections for new development, yield a cost-per-trip that has been distributed to the various land uses based on trip generation. The findings of this analysis can be summarized as follows:

- Total cost of the improvements is estimated at \$8,869,500.
- New development in Keenesburg would be responsible for \$8,311,890 (approximately 93.7 percent of the total). This would be recovered over the next five years through roadway impact fees.
- The Town would be responsible to fund approximately \$557,610 of the improvement costs.
- The following impact fees would represent the defensible maximum based on the analyses.

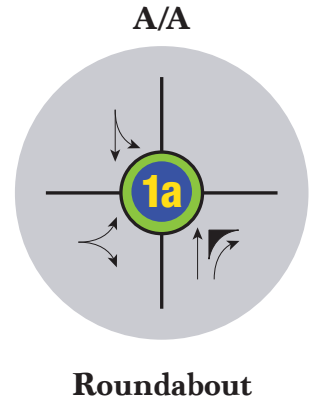
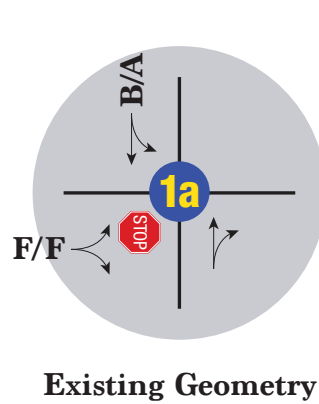
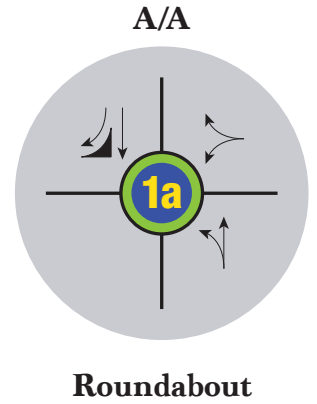
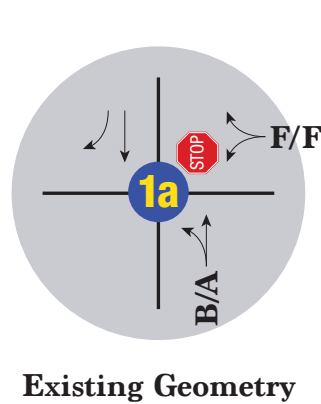
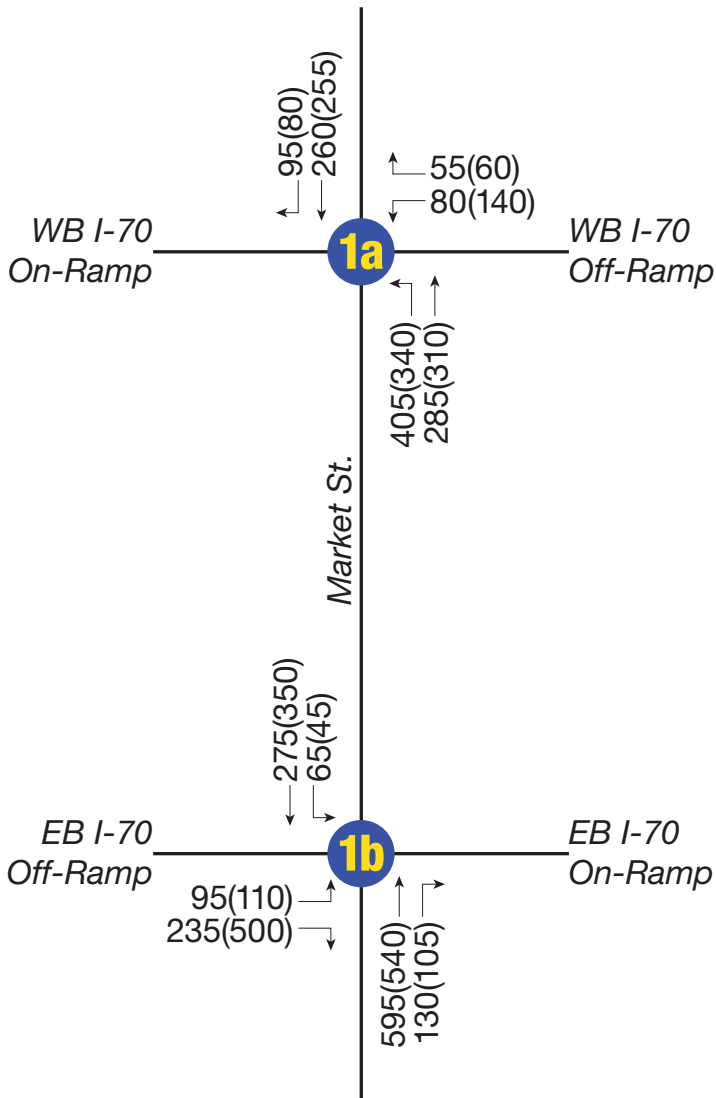
Table 7. Proposed Roadway Impact Fee Schedule

Land Use	Proposed Roadway Impact Fee	Per Unit
Single Family Residential, per lot	\$4727	Lot
Multi-Family Residential, per unit	\$3379	Dwelling Unit
Commercial / Retail	\$9325	1,000 Square feet
Office	\$5434	1,000 Square feet
Warehouse	\$857	1,000 Square feet
Industrial	\$2441	1,000 Square feet
Institutional	\$5399	1,000 Square feet

The proposed fee schedule represents general increases for all land uses except Warehouse, which is calculated to be lower than currently imposed. Increased fees could be a disincentive for development; therefore, the Town may consider the following strategies:

- Adopt a lesser fee schedule for some or all of the land use categories.
- Adopt the proposed maximum defensible fees but charge at a reduced rate on a case-by-case basis.
- Phase in the maximum fees over a period of several years.
- Reduce the retail fees only and make up the shortfall through sales taxes.

APPENDIX A. TRAFFIC VOLUMES AND ANALYSIS



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

X/X = AM/PM Peak Hour Intersection Level of Service

= Stop Sign

= Study Intersection

= Roundabout

Intersection												
Int Delay, s/veh	67.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕			↕			↑	↗
Traffic Vol, veh/h	0	0	0	80	0	55	405	285	0	0	260	95
Future Vol, veh/h	0	0	0	80	0	55	405	285	0	0	260	95
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	95	0	65	482	339	0	0	310	113

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	1670	1726	339	423	0	-	0
Stage 1	1303	1303	-	-	-	-	-
Stage 2	367	423	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	106	89	703	1136	-	0	-
Stage 1	254	231	-	-	0	0	-
Stage 2	701	588	-	-	0	0	-
Platoon blocked, %					-	-	-
Mov Cap-1 Maneuver	~ 51	0	703	1136	-	-	-
Mov Cap-2 Maneuver	~ 51	0	-	-	-	-	-
Stage 1	121	0	-	-	-	-	-
Stage 2	701	0	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	\$ 557.1	6.2	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBTWBLn1	SBT	SBR
Capacity (veh/h)	1136	- 82	-	-
HCM Lane V/C Ratio	0.424	- 1.96	-	-
HCM Control Delay (s)	10.5	\$ 557.1	-	-
HCM Lane LOS	B	A F	-	-
HCM 95th %tile Q(veh)	2.2	- 14.1	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection												
Int Delay, s/veh	25.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↔			↕	
Traffic Vol, veh/h	95	0	235	0	0	0	0	595	130	65	275	0
Future Vol, veh/h	95	0	235	0	0	0	0	595	130	65	275	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	113	0	280	0	0	0	0	708	155	77	327	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1267	1344	327	-	0	0	863	0	0
Stage 1	481	481	-	-	-	-	-	-	-
Stage 2	786	863	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	186	152	714	0	-	-	779	-	0
Stage 1	622	554	-	0	-	-	-	-	0
Stage 2	449	372	-	0	-	-	-	-	0
Platoon blocked, %									
Mov Cap-1 Maneuver	163	0	714	-	-	-	779	-	-
Mov Cap-2 Maneuver	163	0	-	-	-	-	-	-	-
Stage 1	622	0	-	-	-	-	-	-	-
Stage 2	395	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	106.4	0	1.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	362	779	-
HCM Lane V/C Ratio	-	-	1.085	0.099	-
HCM Control Delay (s)	-	-	106.4	10.1	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	14.2	0.3	-

Intersection					
Intersection Delay, s/veh	9.2				
Intersection LOS	A				
Approach	EB	WB	NB	SB	
Entry Lanes	0	1	1	1	
Conflicting Circle Lanes	1	1	1	1	
Adj Approach Flow, veh/h	0	160	821	423	
Demand Flow Rate, veh/h	0	163	838	431	
Vehicles Circulating, veh/h	413	838	0	589	
Vehicles Exiting, veh/h	492	0	413	346	
Ped Vol Crossing Leg, #/h	0	0	0	0	
Ped Cap Adj	1.000	1.000	1.000	1.000	
Approach Delay, s/veh	0.0	6.7	9.7	9.1	
Approach LOS	-	A	A	A	
Lane	Left	Bypass	Left	Left	Bypass
Designated Moves	LT	R	LT	T	R
Assumed Moves	LT	R	LT	T	R
RT Channelized		Yield			Yield
Lane Util	1.000		1.000	1.000	
Follow-Up Headway, s	2.609		2.609	2.609	
Critical Headway, s	4.976	66	4.976	4.976	115
Entry Flow, veh/h	97	970	838	316	835
Cap Entry Lane, veh/h	587	0.980	1380	757	0.980
Entry HV Adj Factor	0.979	65	0.980	0.980	113
Flow Entry, veh/h	95	951	821	310	819
Cap Entry, veh/h	575	0.068	1352	742	0.138
V/C Ratio	0.165	4.4	0.607	0.418	5.8
Control Delay, s/veh	8.3	A	9.7	10.4	A
LOS	A	0	A	B	0
95th %tile Queue, veh	1		4	2	

Intersection					
Intersection Delay, s/veh	8.2				
Intersection LOS	A				
Approach	EB	WB	NB	SB	
Entry Lanes	1	0	1	1	
Conflicting Circle Lanes	1	1	1	1	
Adj Approach Flow, veh/h	393	0	863	404	
Demand Flow Rate, veh/h	401	0	880	413	
Vehicles Circulating, veh/h	413	837	194	0	
Vehicles Exiting, veh/h	0	79	334	837	
Ped Vol Crossing Leg, #/h	0	0	0	0	
Ped Cap Adj	1.000	1.000	1.000	1.000	
Approach Delay, s/veh	6.3	0.0	10.5	5.3	
Approach LOS	A	-	B	A	
Lane	Left	Bypass	Left	Bypass	Left
Designated Moves	LT	R	T	R	LT
Assumed Moves	LT	R	T	R	LT
RT Channelized		Yield		Yield	
Lane Util	1.000		1.000		1.000
Follow-Up Headway, s	2.609		2.609		2.609
Critical Headway, s	4.976	286	4.976	158	4.976
Entry Flow, veh/h	115	982	722	1273	413
Cap Entry Lane, veh/h	906	0.980	1132	0.980	1380
Entry HV Adj Factor	0.983	280	0.980	155	0.979
Flow Entry, veh/h	113	962	708	1248	404
Cap Entry, veh/h	890	0.291	1110	0.124	1351
V/C Ratio	0.127	6.7	0.638	3.9	0.299
Control Delay, s/veh	5.3	A	12.0	A	5.3
LOS	A	1	B	0	A
95th %tile Queue, veh	0		5		1

Intersection												
Int Delay, s/veh	86.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕			↕			↑	↗
Traffic Vol, veh/h	0	0	0	140	0	60	340	310	0	0	255	80
Future Vol, veh/h	0	0	0	140	0	60	340	310	0	0	255	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	157	0	67	382	348	0	0	287	90

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1444	1489	348
Stage 1	1112	1112	-
Stage 2	332	377	-
Critical Hdwy	6.42	6.52	6.22
Critical Hdwy Stg 1	5.42	5.52	-
Critical Hdwy Stg 2	5.42	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	~ 145	124	695
Stage 1	315	284	-
Stage 2	727	616	-
Platoon blocked, %			
Mov Cap-1 Maneuver	~ 87	0	695
Mov Cap-2 Maneuver	~ 87	0	-
Stage 1	189	0	-
Stage 2	727	0	-

Approach	WB	NB	SB
HCM Control Delay, s	\$ 498.9	5	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBTWBLn1	SBT	SBR
Capacity (veh/h)	1181	-	118	-
HCM Lane V/C Ratio	0.323	-	1.904	-
HCM Control Delay (s)	9.5	\$ 498.9	-	-
HCM Lane LOS	A	A	F	-
HCM 95th %tile Q(veh)	1.4	-	18	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection												
Int Delay, s/veh	91.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↔			↕	
Traffic Vol, veh/h	110	0	500	0	0	0	0	540	105	45	350	0
Future Vol, veh/h	110	0	500	0	0	0	0	540	105	45	350	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	124	0	562	0	0	0	0	607	118	51	393	0

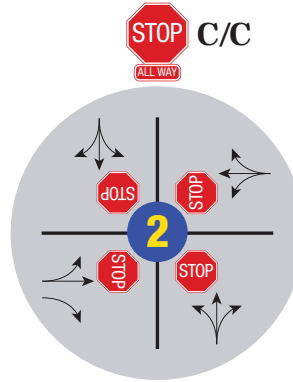
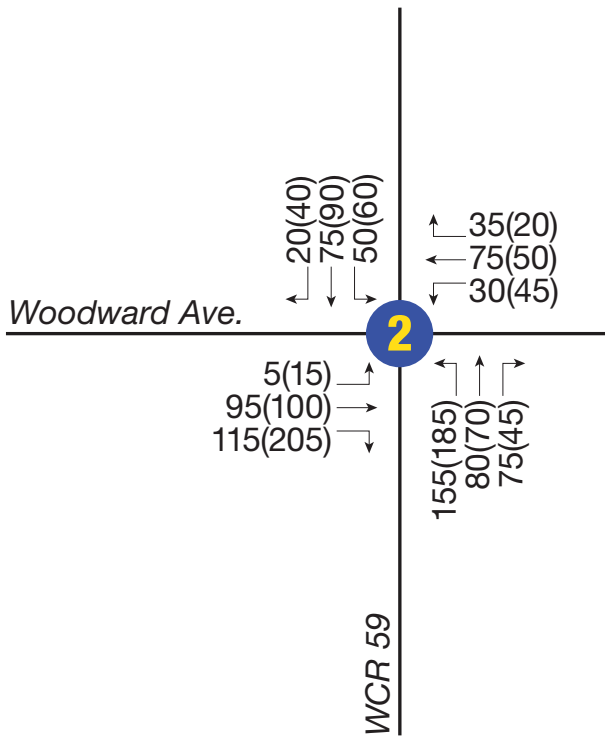
Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1161	1220	393	-	0	0	725	0	0
Stage 1	495	495	-	-	-	-	-	-	-
Stage 2	666	725	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	216	180	656	0	-	-	878	-	0
Stage 1	613	546	-	0	-	-	-	-	0
Stage 2	511	430	-	0	-	-	-	-	0
Platoon blocked, %									
Mov Cap-1 Maneuver	200	0	656	-	-	-	878	-	-
Mov Cap-2 Maneuver	200	0	-	-	-	-	-	-	-
Stage 1	613	0	-	-	-	-	-	-	-
Stage 2	473	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	247.9	0	1.1
HCM LOS	F		

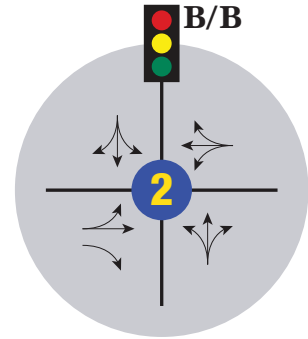
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	465	878	-
HCM Lane V/C Ratio	-	-	1.474	0.058	-
HCM Control Delay (s)	-	-	247.9	9.4	0
HCM Lane LOS	-	-	F	A	A
HCM 95th %tile Q(veh)	-	-	34.9	0.2	-

Intersection					
Intersection Delay, s/veh	7.3				
Intersection LOS	A				
Approach	EB	WB	NB	SB	
Entry Lanes	0	1	1	1	
Conflicting Circle Lanes	1	1	1	1	
Adj Approach Flow, veh/h	0	219	646	354	
Demand Flow Rate, veh/h	0	223	659	361	
Vehicles Circulating, veh/h	430	659	0	493	
Vehicles Exiting, veh/h	338	0	430	321	
Ped Vol Crossing Leg, #/h	0	0	0	0	
Ped Cap Adj	1.000	1.000	1.000	1.000	
Approach Delay, s/veh	0.0	6.7	7.5	7.3	
Approach LOS	-	A	A	A	
Lane	Left	Bypass	Left	Left	Bypass
Designated Moves	LT	R	LT	T	R
Assumed Moves	LT	R	LT	T	R
RT Channelized		Yield			Yield
Lane Util	1.000		1.000	1.000	
Follow-Up Headway, s	2.609		2.609	2.609	
Critical Headway, s	4.976	68	4.976	4.976	86
Entry Flow, veh/h	155	995	659	275	978
Cap Entry Lane, veh/h	705	0.980	1380	835	0.980
Entry HV Adj Factor	0.981	67	0.980	0.980	84
Flow Entry, veh/h	152	975	646	270	958
Cap Entry, veh/h	691	0.069	1352	818	0.088
V/C Ratio	0.220	4.3	0.478	0.330	4.6
Control Delay, s/veh	7.8	A	7.5	8.2	A
LOS	A	0	A	A	0
95th %tile Queue, veh	1		3	1	

Intersection					
Intersection Delay, s/veh	7.7				
Intersection LOS	A				
Approach	EB	WB	NB	SB	
Entry Lanes	1	0	1	1	
Conflicting Circle Lanes	1	1	1	1	
Adj Approach Flow, veh/h	595	0	652	422	
Demand Flow Rate, veh/h	607	0	665	430	
Vehicles Circulating, veh/h	430	659	166	0	
Vehicles Exiting, veh/h	0	52	378	659	
Ped Vol Crossing Leg, #/h	0	0	0	0	
Ped Cap Adj	1.000	1.000	1.000	1.000	
Approach Delay, s/veh	9.8	0.0	7.4	5.4	
Approach LOS	A	-	A	A	
Lane	Left	Bypass	Left	Bypass	Left
Designated Moves	LT	R	T	R	LT
Assumed Moves	LT	R	T	R	LT
RT Channelized		Yield		Yield	
Lane Util	1.000		1.000		1.000
Follow-Up Headway, s	2.609		2.609		2.609
Critical Headway, s	4.976	493	4.976	120	4.976
Entry Flow, veh/h	114	938	545	1309	430
Cap Entry Lane, veh/h	890	0.980	1165	0.980	1380
Entry HV Adj Factor	0.982	483	0.980	118	0.980
Flow Entry, veh/h	112	920	534	1283	422
Cap Entry, veh/h	874	0.525	1142	0.092	1353
V/C Ratio	0.128	10.8	0.468	3.6	0.312
Control Delay, s/veh	5.4	B	8.2	A	5.4
LOS	A	3	A	0	A
95th %tile Queue, veh	0		3		1



Existing Geometry




If Signalized


LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

X/X = AM/PM Peak Hour Intersection Level of Service

 = Stop Sign

 = Traffic Signal

 = Study Intersection

Intersection	
Intersection Delay, s/veh	18.6
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕			↕			↕	
Traffic Vol, veh/h	5	95	115	30	75	35	155	80	75	50	75	20
Future Vol, veh/h	5	95	115	30	75	35	155	80	75	50	75	20
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	142	172	45	112	52	231	119	112	75	112	30
Number of Lanes	0	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	2
HCM Control Delay	12.5	14.3	27	14
HCM LOS	B	B	D	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	50%	5%	0%	21%	34%
Vol Thru, %	26%	95%	0%	54%	52%
Vol Right, %	24%	0%	100%	25%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	310	100	115	140	145
LT Vol	155	5	0	30	50
Through Vol	80	95	0	75	75
RT Vol	75	0	115	35	20
Lane Flow Rate	463	149	172	209	216
Geometry Grp	2	7	7	5	2
Degree of Util (X)	0.776	0.297	0.307	0.395	0.397
Departure Headway (Hd)	6.038	7.173	6.43	6.806	6.6
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	597	500	558	527	543
Service Time	4.086	4.932	4.189	4.87	4.662
HCM Lane V/C Ratio	0.776	0.298	0.308	0.397	0.398
HCM Control Delay	27	13	12	14.3	14
HCM Lane LOS	D	B	B	B	B
HCM 95th-tile Q	7.2	1.2	1.3	1.9	1.9

HCM 6th Signalized Intersection Summary
2: CR 59 & Woodward Ave

2027 Total AM Peak Hour AWSC

07/14/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕			↕	
Traffic Volume (veh/h)	5	95	115	30	75	35	155	80	75	50	75	20
Future Volume (veh/h)	5	95	115	30	75	35	155	80	75	50	75	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	142	172	45	112	52	231	119	112	75	112	30
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	83	344	299	129	178	72	536	275	224	394	563	138
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.63	0.63	0.63	0.63	0.63	0.63
Sat Flow, veh/h	32	1824	1585	209	944	382	678	438	357	471	898	220
Grp Volume(v), veh/h	149	0	172	209	0	0	462	0	0	217	0	0
Grp Sat Flow(s),veh/h/ln	1856	0	1585	1536	0	0	1474	0	0	1588	0	0
Q Serve(g_s), s	0.0	0.0	4.8	2.8	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	4.8	6.3	0.0	0.0	7.7	0.0	0.0	2.5	0.0	0.0
Prop In Lane	0.05		1.00	0.22		0.25	0.50		0.24	0.35		0.14
Lane Grp Cap(c), veh/h	427	0	299	379	0	0	1034	0	0	1095	0	0
V/C Ratio(X)	0.35	0.00	0.58	0.55	0.00	0.00	0.45	0.00	0.00	0.20	0.00	0.00
Avail Cap(c_a), veh/h	852	0	668	740	0	0	1034	0	0	1095	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	17.4	0.0	18.0	18.4	0.0	0.0	4.7	0.0	0.0	3.9	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	1.7	1.2	0.0	0.0	1.4	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	1.7	2.1	0.0	0.0	1.7	0.0	0.0	0.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.9	0.0	19.7	19.7	0.0	0.0	6.1	0.0	0.0	4.3	0.0	0.0
LnGrp LOS	B	A	B	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		321			209			462				217
Approach Delay, s/veh		18.9			19.7			6.1				4.3
Approach LOS		B			B			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		35.0		13.7		35.0		13.7				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		30.5		20.5		30.5		20.5				
Max Q Clear Time (g_c+I1), s		9.7		6.8		4.5		8.3				
Green Ext Time (p_c), s		3.2		1.2		1.4		0.9				
Intersection Summary												
HCM 6th Ctrl Delay				11.5								
HCM 6th LOS				B								

Intersection	
Intersection Delay, s/veh	23.8
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔			↔			↔	
Traffic Vol, veh/h	15	100	205	45	50	20	185	70	45	60	90	40
Future Vol, veh/h	15	100	205	45	50	20	185	70	45	60	90	40
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	149	306	67	75	30	276	104	67	90	134	60
Number of Lanes	0	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	2
HCM Control Delay	17.3	15.4	37	19
HCM LOS	C	C	E	C

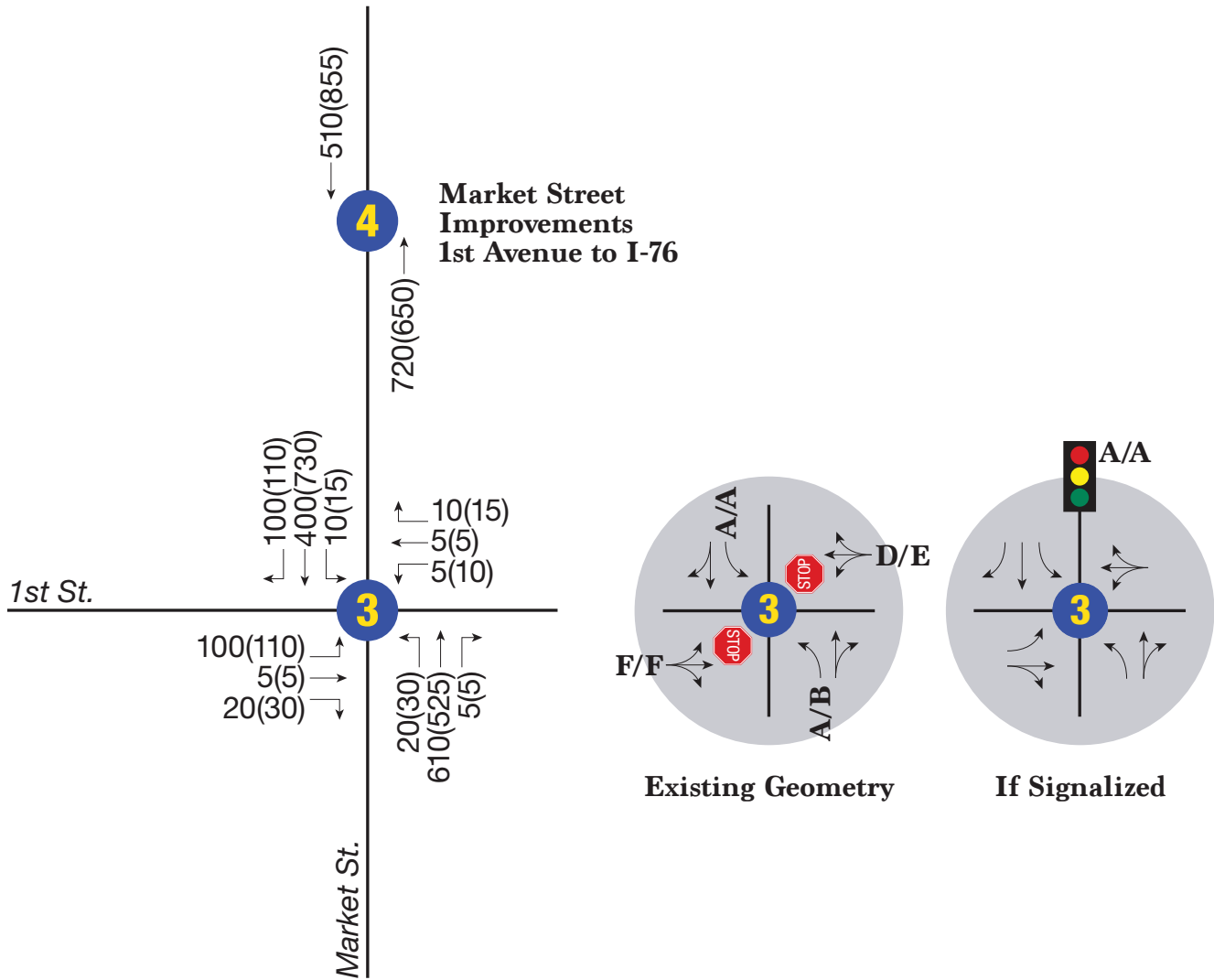
Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	62%	13%	0%	39%	32%
Vol Thru, %	23%	87%	0%	43%	47%
Vol Right, %	15%	0%	100%	17%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	300	115	205	115	190
LT Vol	185	15	0	45	60
Through Vol	70	100	0	50	90
RT Vol	45	0	205	20	40
Lane Flow Rate	448	172	306	172	284
Geometry Grp	2	7	7	5	2
Degree of Util (X)	0.847	0.364	0.582	0.372	0.562
Departure Headway (Hd)	6.813	7.639	6.852	7.8	7.131
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	533	472	529	460	505
Service Time	4.829	5.364	4.576	5.863	5.184
HCM Lane V/C Ratio	0.841	0.364	0.578	0.374	0.562
HCM Control Delay	37	14.7	18.7	15.4	19
HCM Lane LOS	E	B	C	C	C
HCM 95th-tile Q	8.8	1.6	3.7	1.7	3.4

HCM 6th Signalized Intersection Summary
2: CR 59 & Woodward Ave

2027 Total PM Peak Hour AWSC
07/14/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↔			↕			↕	
Traffic Volume (veh/h)	15	100	205	45	50	20	185	70	45	60	90	40
Future Volume (veh/h)	15	100	205	45	50	20	185	70	45	60	90	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	22	149	306	67	75	30	276	104	67	90	134	60
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	104	421	390	183	184	57	594	218	124	342	492	199
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.58	0.58	0.58	0.58	0.58	0.58
Sat Flow, veh/h	109	1713	1585	355	746	233	829	375	212	433	845	342
Grp Volume(v), veh/h	171	0	306	172	0	0	447	0	0	284	0	0
Grp Sat Flow(s),veh/h/ln	1821	0	1585	1334	0	0	1416	0	0	1619	0	0
Q Serve(g_s), s	0.0	0.0	9.4	1.8	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.0	0.0	9.4	5.7	0.0	0.0	8.7	0.0	0.0	4.1	0.0	0.0
Prop In Lane	0.13		1.00	0.39		0.17	0.62		0.15	0.32		0.21
Lane Grp Cap(c), veh/h	526	0	390	424	0	0	936	0	0	1033	0	0
V/C Ratio(X)	0.33	0.00	0.78	0.41	0.00	0.00	0.48	0.00	0.00	0.27	0.00	0.00
Avail Cap(c_a), veh/h	782	0	620	615	0	0	936	0	0	1033	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.4	0.0	18.5	16.7	0.0	0.0	6.2	0.0	0.0	5.4	0.0	0.0
Incr Delay (d2), s/veh	0.4	0.0	3.5	0.6	0.0	0.0	1.7	0.0	0.0	0.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	3.4	1.6	0.0	0.0	2.3	0.0	0.0	1.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.7	0.0	22.0	17.4	0.0	0.0	8.0	0.0	0.0	6.1	0.0	0.0
LnGrp LOS	B	A	C	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		477			172			447			284	
Approach Delay, s/veh		20.1			17.4			8.0			6.1	
Approach LOS		C			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		35.0		17.4		35.0		17.4				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		30.5		20.5		30.5		20.5				
Max Q Clear Time (g_c+I1), s		10.7		11.4		6.1		7.7				
Green Ext Time (p_c), s		3.1		1.4		1.8		0.8				
Intersection Summary												
HCM 6th Ctrl Delay				12.9								
HCM 6th LOS				B								



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

X/X = AM/PM Peak Hour Intersection Level of Service

= Stop Sign

= Traffic Signal

= Study Intersection

Intersection												
Int Delay, s/veh	16											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Vol, veh/h	100	5	20	5	5	10	20	610	5	10	400	100
Future Vol, veh/h	100	5	20	5	5	10	20	610	5	10	400	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	118	6	24	6	6	12	24	718	6	12	471	118

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1332	1326	530	1338	1382	721	589	0	0	724	0	0
Stage 1	554	554	-	769	769	-	-	-	-	-	-	-
Stage 2	778	772	-	569	613	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	131	156	549	130	144	427	986	-	-	879	-	-
Stage 1	517	514	-	394	411	-	-	-	-	-	-	-
Stage 2	389	409	-	507	483	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	120	150	549	117	139	427	986	-	-	879	-	-
Mov Cap-2 Maneuver	120	150	-	117	139	-	-	-	-	-	-	-
Stage 1	505	507	-	385	401	-	-	-	-	-	-	-
Stage 2	364	399	-	473	476	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	158.7	25.9	0.3	0.2
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	986	-	-	138	196	879	-	-
HCM Lane V/C Ratio	0.024	-	-	1.066	0.12	0.013	-	-
HCM Control Delay (s)	8.7	-	-	158.7	25.9	9.2	-	-
HCM Lane LOS	A	-	-	F	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	8	0.4	0	-	-

HCM 6th Signalized Intersection Summary
2: Market St & 1st Ave

2027 Total AM Peak Hour
07/19/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	100	5	20	5	5	10	20	610	5	10	400	100
Future Volume (veh/h)	100	5	20	5	5	10	20	610	5	10	400	100
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	118	6	24	6	6	12	24	718	6	12	471	118
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	323	38	150	123	70	95	640	1275	11	516	1287	1091
Arrive On Green	0.12	0.12	0.12	0.12	0.12	0.12	0.69	0.69	0.69	0.69	0.69	0.69
Sat Flow, veh/h	1395	327	1308	213	610	823	827	1852	15	730	1870	1585
Grp Volume(v), veh/h	118	0	30	24	0	0	24	0	724	12	471	118
Grp Sat Flow(s),veh/h/ln	1395	0	1635	1646	0	0	827	0	1868	730	1870	1585
Q Serve(g_s), s	3.0	0.0	0.8	0.0	0.0	0.0	0.6	0.0	9.0	0.4	4.8	1.1
Cycle Q Clear(g_c), s	3.6	0.0	0.8	0.6	0.0	0.0	5.4	0.0	9.0	9.4	4.8	1.1
Prop In Lane	1.00		0.80	0.25		0.50	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	323	0	188	288	0	0	640	0	1285	516	1287	1091
V/C Ratio(X)	0.37	0.00	0.16	0.08	0.00	0.00	0.04	0.00	0.56	0.02	0.37	0.11
Avail Cap(c_a), veh/h	756	0	697	781	0	0	640	0	1285	516	1287	1091
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.4	0.0	18.3	18.2	0.0	0.0	4.1	0.0	3.6	6.0	3.0	2.4
Incr Delay (d2), s/veh	0.7	0.0	0.4	0.1	0.0	0.0	0.1	0.0	1.8	0.1	0.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.0	0.0	0.5	0.4	0.0	0.0	0.1	0.0	3.4	0.1	1.7	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.1	0.0	18.6	18.3	0.0	0.0	4.2	0.0	5.4	6.1	3.8	2.6
LnGrp LOS	C	A	B	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		148			24			748			601	
Approach Delay, s/veh		19.8			18.3			5.4			3.6	
Approach LOS		B			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		36.0		9.8		36.0		9.8				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		31.5		19.5		31.5		19.5				
Max Q Clear Time (g_c+I1), s		11.0		5.6		11.4		2.6				
Green Ext Time (p_c), s		5.4		0.4		3.4		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			6.3									
HCM 6th LOS			A									

Intersection												
Int Delay, s/veh	38.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Vol, veh/h	110	5	30	10	5	15	30	525	5	15	730	110
Future Vol, veh/h	110	5	30	10	5	15	30	525	5	15	730	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	121	5	33	11	5	16	33	577	5	16	802	121

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1551	1543	863	1560	1601	580	923	0	0	582	0	0
Stage 1	895	895	-	646	646	-	-	-	-	-	-	-
Stage 2	656	648	-	914	955	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 92	115	354	91	106	514	740	-	-	992	-	-
Stage 1	335	359	-	460	467	-	-	-	-	-	-	-
Stage 2	454	466	-	327	337	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 81	108	354	76	100	514	740	-	-	992	-	-
Mov Cap-2 Maneuver	~ 81	108	-	76	100	-	-	-	-	-	-	-
Stage 1	320	353	-	439	446	-	-	-	-	-	-	-
Stage 2	415	445	-	287	332	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	406.6	37.9	0.5	0.2
HCM LOS	F	E		

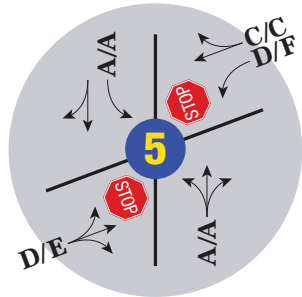
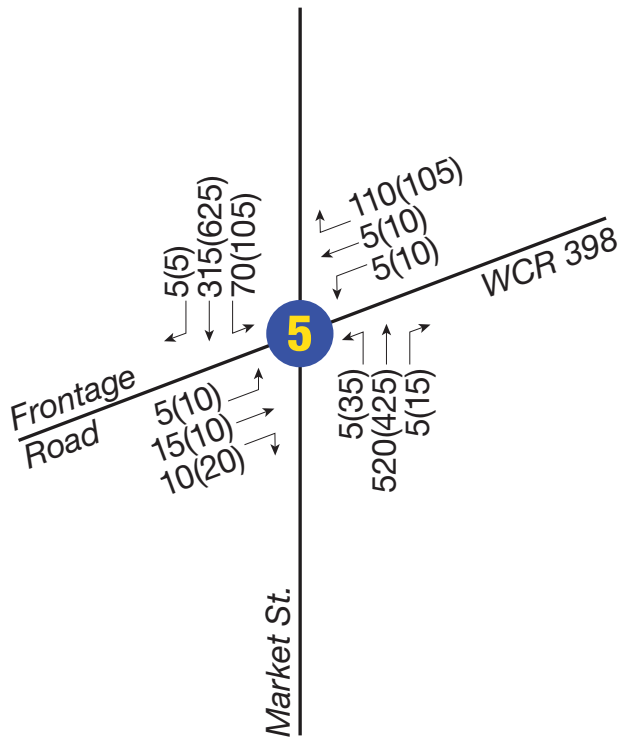
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	740	-	-	97	142	992	-	-
HCM Lane V/C Ratio	0.045	-	-	1.643	0.232	0.017	-	-
HCM Control Delay (s)	10.1	-	-	406.6	37.9	8.7	-	-
HCM Lane LOS	B	-	-	F	E	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	12.6	0.9	0.1	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

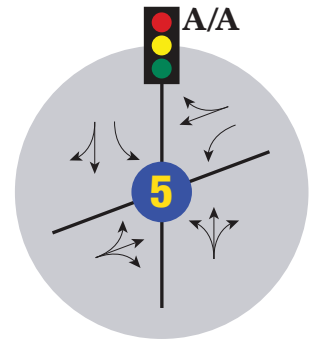
HCM 6th Signalized Intersection Summary
2: Market St & 1st Ave

2027 Total PM Peak Hour
07/19/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	5	30	10	5	15	30	525	5	15	730	110
Future Volume (veh/h)	110	5	30	10	5	15	30	525	5	15	730	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	121	5	33	11	5	16	33	577	5	16	802	121
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	329	25	168	142	59	96	428	1268	11	608	1281	1085
Arrive On Green	0.12	0.12	0.12	0.12	0.12	0.12	0.68	0.68	0.68	0.68	0.68	0.68
Sat Flow, veh/h	1391	213	1405	309	497	806	606	1851	16	833	1870	1585
Grp Volume(v), veh/h	121	0	38	32	0	0	33	0	582	16	802	121
Grp Sat Flow(s),veh/h/ln	1391	0	1618	1612	0	0	606	0	1867	833	1870	1585
Q Serve(g_s), s	2.9	0.0	1.0	0.0	0.0	0.0	1.5	0.0	6.6	0.4	10.9	1.2
Cycle Q Clear(g_c), s	3.6	0.0	1.0	0.8	0.0	0.0	12.4	0.0	6.6	7.0	10.9	1.2
Prop In Lane	1.00		0.87	0.34		0.50	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	329	0	194	298	0	0	428	0	1279	608	1281	1085
V/C Ratio(X)	0.37	0.00	0.20	0.11	0.00	0.00	0.08	0.00	0.46	0.03	0.63	0.11
Avail Cap(c_a), veh/h	753	0	686	766	0	0	428	0	1279	608	1281	1085
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.3	0.0	18.3	18.2	0.0	0.0	7.4	0.0	3.3	4.9	4.0	2.5
Incr Delay (d2), s/veh	0.7	0.0	0.5	0.2	0.0	0.0	0.4	0.0	1.2	0.1	2.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.1	0.0	0.6	0.5	0.0	0.0	0.3	0.0	2.5	0.1	4.4	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	0.0	18.7	18.3	0.0	0.0	7.8	0.0	4.5	5.0	6.3	2.7
LnGrp LOS	C	A	B	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		159			32			615			939	
Approach Delay, s/veh		19.7			18.3			4.7			5.8	
Approach LOS		B			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		36.0		10.0		36.0		10.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		31.5		19.5		31.5		19.5				
Max Q Clear Time (g_c+I1), s		14.4		5.6		12.9		2.8				
Green Ext Time (p_c), s		3.9		0.4		6.3		0.1				
Intersection Summary												
HCM 6th Ctrl Delay				6.9								
HCM 6th LOS				A								






Existing Geometry



If Signalized

LEGEND

- XXX(XXX) = AM(PM) Peak Hour Traffic Volumes
- X/X = AM/PM Peak Hour Intersection Level of Service
-  = Stop Sign
-  = Traffic Signal
-  = Study Intersection

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕		↕	↕	
Traffic Vol, veh/h	5	15	10	5	5	110	5	520	5	70	315	5
Future Vol, veh/h	5	15	10	5	5	110	5	520	5	70	315	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	18	12	6	6	129	6	612	6	82	371	6

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1233	1168	374	1180	1168	615	377	0	0	618	0	0
Stage 1	538	538	-	627	627	-	-	-	-	-	-	-
Stage 2	695	630	-	553	541	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	154	193	672	167	193	491	1181	-	-	962	-	-
Stage 1	527	522	-	471	476	-	-	-	-	-	-	-
Stage 2	433	475	-	517	521	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	103	175	672	141	175	491	1181	-	-	962	-	-
Mov Cap-2 Maneuver	103	175	-	141	175	-	-	-	-	-	-	-
Stage 1	523	478	-	467	472	-	-	-	-	-	-	-
Stage 2	312	471	-	447	477	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.7	16.8	0.1	1.6
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1181	-	-	201	141	455	962	-	-
HCM Lane V/C Ratio	0.005	-	-	0.176	0.042	0.297	0.086	-	-
HCM Control Delay (s)	8.1	0	-	26.7	31.6	16.2	9.1	-	-
HCM Lane LOS	A	A	-	D	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.1	1.2	0.3	-	-

HCM 6th Signalized Intersection Summary
 2: Market St & I-76 Frontage Rd/CR 398

2027 Total AM Peak Hour Signal
 07/19/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↗	
Traffic Volume (veh/h)	5	15	10	5	5	110	5	520	5	70	315	5
Future Volume (veh/h)	5	15	10	5	5	110	5	520	5	70	315	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	18	12	6	6	129	6	612	6	82	371	6
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	183	104	60	511	10	214	146	927	9	254	751	11
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	119	742	430	1380	71	1525	5	1840	18	172	1491	22
Grp Volume(v), veh/h	36	0	0	6	0	135	624	0	0	459	0	0
Grp Sat Flow(s),veh/h/ln	1291	0	0	1380	0	1596	1863	0	0	1685	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.0	0.0	0.0	0.1	0.0	2.0	6.3	0.0	0.0	4.1	0.0	0.0
Prop In Lane	0.17		0.33	1.00		0.96	0.01		0.01	0.18		0.01
Lane Grp Cap(c), veh/h	347	0	0	511	0	224	1082	0	0	1017	0	0
V/C Ratio(X)	0.10	0.00	0.00	0.01	0.00	0.60	0.58	0.00	0.00	0.45	0.00	0.00
Avail Cap(c_a), veh/h	1379	0	0	1379	0	1229	2453	0	0	2134	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.6	0.0	0.0	9.4	0.0	10.2	4.7	0.0	0.0	4.1	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.0	2.6	0.5	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	0.0	0.0	0.0	0.0	1.1	1.3	0.0	0.0	0.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.7	0.0	0.0	9.4	0.0	12.8	5.2	0.0	0.0	4.4	0.0	0.0
LnGrp LOS	A	A	A	A	A	B	A	A	A	A	A	A
Approach Vol, veh/h		36			141			624			459	
Approach Delay, s/veh		9.7			12.6			5.2			4.4	
Approach LOS		A			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		17.3		8.1		17.3		8.1				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		31.5		19.5		31.5		19.5				
Max Q Clear Time (g_c+I1), s		8.3		4.0		6.1		4.0				
Green Ext Time (p_c), s		4.5		0.1		3.5		0.6				
Intersection Summary												
HCM 6th Ctrl Delay				5.9								
HCM 6th LOS				A								

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕		↕	↕	
Traffic Vol, veh/h	10	10	20	10	10	105	35	425	15	105	625	5
Future Vol, veh/h	10	10	20	10	10	105	35	425	15	105	625	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	11	22	11	11	115	38	467	16	115	687	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1534	1479	690	1487	1473	475	692	0	0	483	0	0
Stage 1	920	920	-	551	551	-	-	-	-	-	-	-
Stage 2	614	559	-	936	922	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	95	126	445	103	127	590	903	-	-	1080	-	-
Stage 1	325	350	-	519	515	-	-	-	-	-	-	-
Stage 2	479	511	-	318	349	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	62	106	445	79	107	590	903	-	-	1080	-	-
Mov Cap-2 Maneuver	62	106	-	79	107	-	-	-	-	-	-	-
Stage 1	306	313	-	489	485	-	-	-	-	-	-	-
Stage 2	355	481	-	261	312	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	44.9		20.4		0.7		1.2	
HCM LOS	E		C					

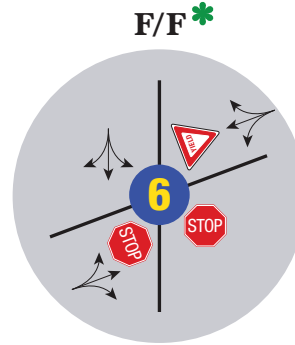
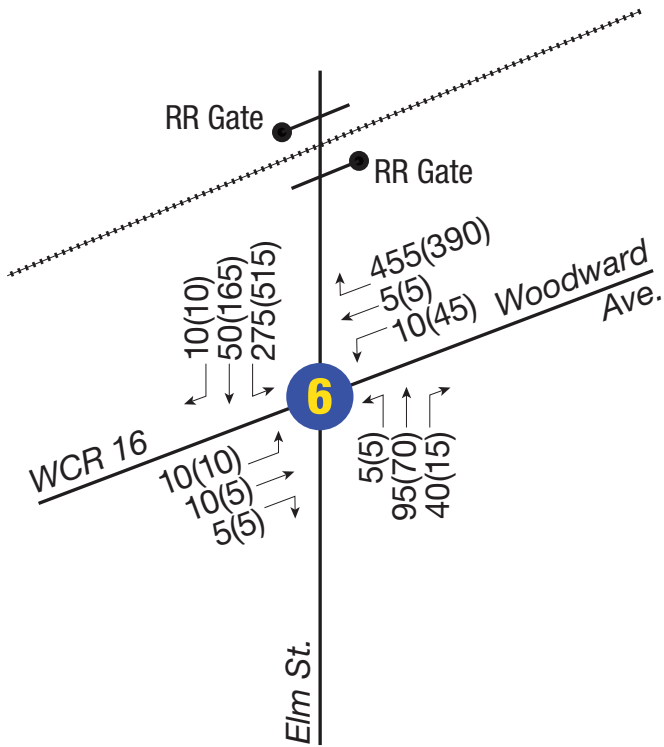
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	903	-	-	133	79	424	1080	-	-
HCM Lane V/C Ratio	0.043	-	-	0.33	0.139	0.298	0.107	-	-
HCM Control Delay (s)	9.2	0	-	44.9	57.8	17.1	8.7	-	-
HCM Lane LOS	A	A	-	E	F	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.3	0.5	1.2	0.4	-	-

HCM 6th Signalized Intersection Summary
 2: Market St & I-76 Frontage Rd/CR 398

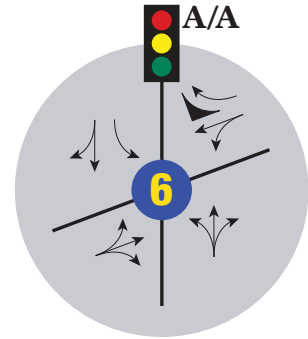
2027 Total PM Peak Hour Signal
 07/19/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕		↖	↗	
Traffic Volume (veh/h)	10	10	20	10	10	105	35	425	15	105	625	5
Future Volume (veh/h)	10	10	20	10	10	105	35	425	15	105	625	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	11	22	11	11	115	38	467	16	115	687	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	184	59	82	472	19	198	168	907	30	835	1010	7
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.54	0.54	0.54	0.54	0.54	0.54
Sat Flow, veh/h	175	436	611	1376	140	1466	56	1666	55	912	1854	13
Grp Volume(v), veh/h	44	0	0	11	0	126	521	0	0	115	0	692
Grp Sat Flow(s),veh/h/ln	1222	0	0	1376	0	1606	1777	0	0	912	0	1868
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	7.5
Cycle Q Clear(g_c), s	2.1	0.0	0.0	0.2	0.0	2.1	5.0	0.0	0.0	1.2	0.0	7.5
Prop In Lane	0.25		0.50	1.00		0.91	0.07		0.03	1.00		0.01
Lane Grp Cap(c), veh/h	325	0	0	472	0	216	1105	0	0	835	0	1017
V/C Ratio(X)	0.14	0.00	0.00	0.02	0.00	0.58	0.47	0.00	0.00	0.14	0.00	0.68
Avail Cap(c_a), veh/h	1191	0	0	1243	0	1117	2076	0	0	1363	0	2098
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.8	0.0	0.0	10.6	0.0	11.4	4.0	0.0	0.0	3.2	0.0	4.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.0	0.0	2.5	0.3	0.0	0.0	0.1	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.1	0.0	1.2	1.0	0.0	0.0	0.2	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.0	0.0	0.0	10.6	0.0	13.9	4.4	0.0	0.0	3.3	0.0	5.4
LnGrp LOS	B	A	A	B	A	B	A	A	A	A	A	A
Approach Vol, veh/h		44			137			521				807
Approach Delay, s/veh		11.0			13.6			4.4				5.1
Approach LOS		B			B			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.8		8.3		19.8		8.3				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		31.5		19.5		31.5		19.5				
Max Q Clear Time (g_c+I1), s		7.0		4.1		9.5		4.1				
Green Ext Time (p_c), s		3.8		0.1		5.8		0.6				
Intersection Summary												
HCM 6th Ctrl Delay				5.8								
HCM 6th LOS				A								



Existing Geometry
 *Estimated LOS
 Due to Atypical
 Traffic Control





If Signalized


LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

X/X = AM/PM Peak Hour Intersection Level of Service

 = Stop Sign

 = Traffic Signal

 = Study Intersection

HCM 6th Signalized Intersection Summary
 2: Market St & I-76 Frontage Rd/CR 398

2027 Total AM Peak Hour Signal
 07/19/2022



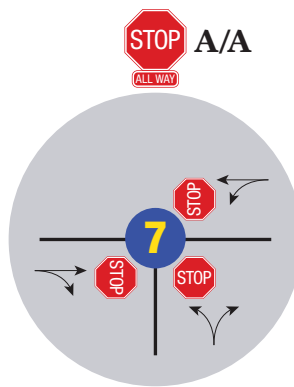
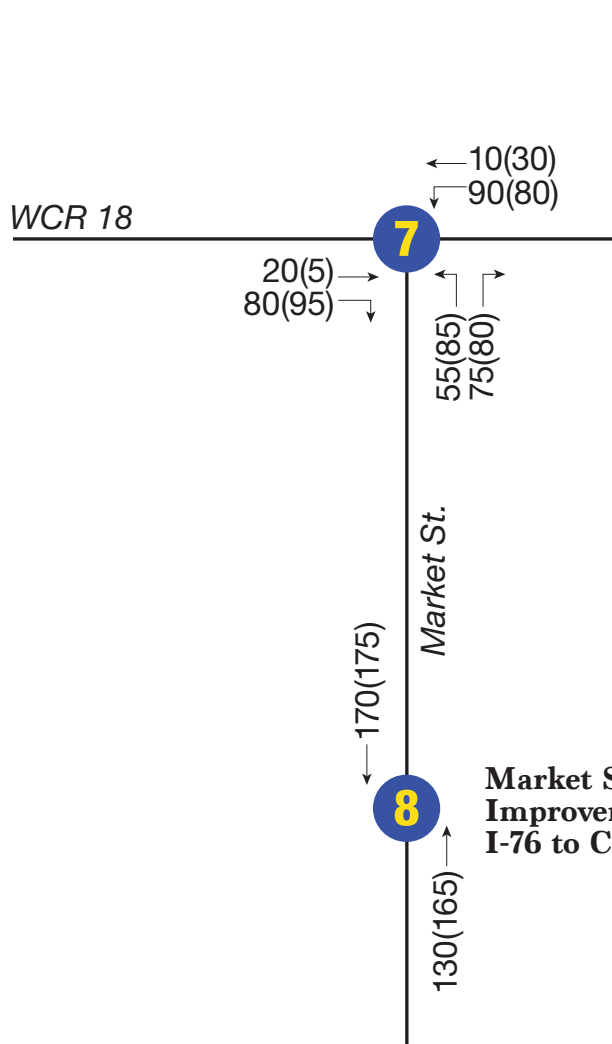
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕			↗	
Traffic Volume (veh/h)	5	15	10	5	5	110	5	520	5	70	315	5
Future Volume (veh/h)	5	15	10	5	5	110	5	520	5	70	315	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	18	12	6	6	129	6	612	6	82	371	6
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	183	104	60	511	10	214	146	927	9	254	751	11
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	119	742	430	1380	71	1525	5	1840	18	172	1491	22
Grp Volume(v), veh/h	36	0	0	6	0	135	624	0	0	459	0	0
Grp Sat Flow(s),veh/h/ln	1291	0	0	1380	0	1596	1863	0	0	1685	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.0	0.0	0.0	0.1	0.0	2.0	6.3	0.0	0.0	4.1	0.0	0.0
Prop In Lane	0.17		0.33	1.00		0.96	0.01		0.01	0.18		0.01
Lane Grp Cap(c), veh/h	347	0	0	511	0	224	1082	0	0	1017	0	0
V/C Ratio(X)	0.10	0.00	0.00	0.01	0.00	0.60	0.58	0.00	0.00	0.45	0.00	0.00
Avail Cap(c_a), veh/h	1379	0	0	1379	0	1229	2453	0	0	2134	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.6	0.0	0.0	9.4	0.0	10.2	4.7	0.0	0.0	4.1	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.0	2.6	0.5	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	0.0	0.0	0.0	0.0	1.1	1.3	0.0	0.0	0.8	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.7	0.0	0.0	9.4	0.0	12.8	5.2	0.0	0.0	4.4	0.0	0.0
LnGrp LOS	A	A	A	A	A	B	A	A	A	A	A	A
Approach Vol, veh/h		36			141			624			459	
Approach Delay, s/veh		9.7			12.6			5.2			4.4	
Approach LOS		A			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		17.3		8.1		17.3		8.1				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		31.5		19.5		31.5		19.5				
Max Q Clear Time (g_c+I1), s		8.3		4.0		6.1		4.0				
Green Ext Time (p_c), s		4.5		0.1		3.5		0.6				
Intersection Summary												
HCM 6th Ctrl Delay				5.9								
HCM 6th LOS				A								

HCM 6th Signalized Intersection Summary
 2: Market St & I-76 Frontage Rd/CR 398

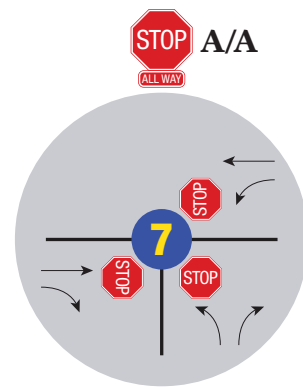
2027 Total PM Peak Hour Signal
 07/19/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕		↖	↗	
Traffic Volume (veh/h)	10	10	20	10	10	105	35	425	15	105	625	5
Future Volume (veh/h)	10	10	20	10	10	105	35	425	15	105	625	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	11	22	11	11	115	38	467	16	115	687	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	184	59	82	472	19	198	168	907	30	835	1010	7
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.54	0.54	0.54	0.54	0.54	0.54
Sat Flow, veh/h	175	436	611	1376	140	1466	56	1666	55	912	1854	13
Grp Volume(v), veh/h	44	0	0	11	0	126	521	0	0	115	0	692
Grp Sat Flow(s),veh/h/ln	1222	0	0	1376	0	1606	1777	0	0	912	0	1868
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	7.5
Cycle Q Clear(g_c), s	2.1	0.0	0.0	0.2	0.0	2.1	5.0	0.0	0.0	1.2	0.0	7.5
Prop In Lane	0.25		0.50	1.00		0.91	0.07		0.03	1.00		0.01
Lane Grp Cap(c), veh/h	325	0	0	472	0	216	1105	0	0	835	0	1017
V/C Ratio(X)	0.14	0.00	0.00	0.02	0.00	0.58	0.47	0.00	0.00	0.14	0.00	0.68
Avail Cap(c_a), veh/h	1191	0	0	1243	0	1117	2076	0	0	1363	0	2098
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.8	0.0	0.0	10.6	0.0	11.4	4.0	0.0	0.0	3.2	0.0	4.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.0	0.0	2.5	0.3	0.0	0.0	0.1	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.1	0.0	1.2	1.0	0.0	0.0	0.2	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.0	0.0	0.0	10.6	0.0	13.9	4.4	0.0	0.0	3.3	0.0	5.4
LnGrp LOS	B	A	A	B	A	B	A	A	A	A	A	A
Approach Vol, veh/h		44			137			521				807
Approach Delay, s/veh		11.0			13.6			4.4				5.1
Approach LOS		B			B			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.8		8.3		19.8		8.3				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		31.5		19.5		31.5		19.5				
Max Q Clear Time (g_c+I1), s		7.0		4.1		9.5		4.1				
Green Ext Time (p_c), s		3.8		0.1		5.8		0.6				
Intersection Summary												
HCM 6th Ctrl Delay				5.8								
HCM 6th LOS				A								



Existing Geometry



Lane Improvements

LEGEND

- XXX(XXX) = AM(PM) Peak Hour Traffic Volumes
- X/X = AM/PM Peak Hour Intersection Level of Service
- = Stop Sign
- = Study Intersection

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Vol, veh/h	20	80	90	10	55	75
Future Vol, veh/h	20	80	90	10	55	75
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	94	106	12	65	88
Number of Lanes	1	1	1	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	7.7	9.2	8.3
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	100%	0%
Vol Thru, %	0%	0%	100%	0%	0%	100%
Vol Right, %	0%	100%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	55	75	20	80	90	10
LT Vol	55	0	0	0	90	0
Through Vol	0	0	20	0	0	10
RT Vol	0	75	0	80	0	0
Lane Flow Rate	65	88	24	94	106	12
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.101	0.108	0.033	0.113	0.162	0.016
Departure Headway (Hd)	5.615	4.411	5.033	4.329	5.514	5.011
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	641	814	713	829	652	716
Service Time	3.331	2.127	2.753	2.05	3.234	2.732
HCM Lane V/C Ratio	0.101	0.108	0.034	0.113	0.163	0.017
HCM Control Delay	9	7.7	7.9	7.6	9.3	7.8
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.3	0.4	0.1	0.4	0.6	0

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Vol, veh/h	5	95	80	30	85	80
Future Vol, veh/h	5	95	80	30	85	80
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	104	88	33	93	88
Number of Lanes	1	1	1	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	2
HCM Control Delay	7.8	8.9	8.5
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2
Vol Left, %	100%	0%	0%	0%	100%	0%
Vol Thru, %	0%	0%	100%	0%	0%	100%
Vol Right, %	0%	100%	0%	100%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	85	80	5	95	80	30
LT Vol	85	0	0	0	80	0
Through Vol	0	0	5	0	0	30
RT Vol	0	80	0	95	0	0
Lane Flow Rate	93	88	5	104	88	33
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.145	0.107	0.008	0.128	0.137	0.047
Departure Headway (Hd)	5.597	4.394	5.122	4.418	5.59	5.087
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	642	816	700	813	643	705
Service Time	3.322	2.119	2.842	2.138	3.31	2.807
HCM Lane V/C Ratio	0.145	0.108	0.007	0.128	0.137	0.047
HCM Control Delay	9.3	7.6	7.9	7.8	9.2	8.1
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.5	0.4	0	0.4	0.5	0.1

APPENDIX B. IMPROVEMENT COSTS

Intersection Lane Improvement Preliminary Cost Opinion

ITEM No.	Description	Unit	Quantity (per Mile)		Unit Cost (2021, CDOT)	Per Mile Cost
1	Clearing and Grubbing	AC	0.27	\$	5,200	\$ 1,404
2	Earthwork (Excavation or Embankment) CIP	CY	11,733	\$	55	\$ 645,315
3	Aggregate Base Course (CL 6)	CY	1,950	\$	27	\$ 52,709
4	Concrete Curb & Gutter	LF	5,280	\$	50	\$ 264,000
5	Hot Mix Asphalt	TN	2,351	\$	125	\$ 293,875
6	Subtotal Construction Bid Items					\$ 1,257,303
7	Landscaping				2%	\$ 25,146
8	Drainage				4%	\$ 50,292
9	Erosion Control				3%	\$ 37,719
10	Construction Traffic Control				10%	\$ 125,730
11	Signing and Striping				5%	\$ 62,865
12	Mobilization				10%	\$ 125,730
13	Allowance for Unlisted Items				10%	\$ 125,730
14	Subtotal of Percentage Items					\$ 553,213
15	Subtotal Construction Items					\$ 1,810,516
16	Construction and Design Engineering				23%	\$ 416,419
17	Subtotal Construction and Engineering					\$ 2,226,934
18	Contingency for Misc. & Unforeseen Items				20%	\$ 445,387
	2021 CDOT Cost Data			USE		\$ 2,672,321

ROW Cost (if required) Not Included

Cost per Lineal Foot of Lane

\$506.12

Quantity Calculations

Aggregate Depth: 10 in
 Pavement Depth: 6 in
 Excavation/Embankment (Av. Depth) 3 ft

Single Lane Asphalt Pavement Roundabout

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

May 13, 2019

Item Description	Unit	Quantity	Unit Cost	Cost	Comments
Removal of Asphalt Mat	SY	3500	\$8.00	\$28,000	asphalt pavement
Earthwork - Excavation/Embankment	CY	8800	\$60.00	\$528,000	3 foot depth over the impacted area
Aggregate Base Course	TON	2100	\$35.00	\$73,500	10 inches under HMA and 6 inches under PCCP
Hot Mix Asphalt (HMA)	TON	1600	\$125.00	\$200,000	6 inch depth
Concrete Pavement (PCCP)	SY	700	\$85.00	\$59,500	9 inch depth (truck apron)
Concrete Curb Ramp	SY	150	\$175.00	\$26,250	at each leg and through islands
Curb and Gutter	LF	3000	\$50.00	\$150,000	various types to be used
Median Cover Material	SF	500	\$25.00	\$12,500	patterned concrete in islands (6 inch depth)
Subtotal of Quantified Items				\$1,077,750	
Drainage	LS	1	\$107,775.00	\$107,775	10% of quantified items
Sediment and Erosion Control	LS	1	\$32,332.50	\$32,333	3% of quantified items
Lighting	LS	1	\$32,332.50	\$32,333	3% of quantified items
Utilities	LS	1	\$43,110.00	\$43,110	4% of quantified items
Landscaping	LS	1	\$21,555.00	\$21,555	2% of quantified items (minimum)
Construction Traffic Control	LS	1	\$107,775.00	\$107,775	10% of quantified items (assumes no detour)
Signing and Striping	LS	1	\$53,887.50	\$53,888	5% of quantified items (smaller signs for single lane)
Mobilization	LS	1	\$107,775.00	\$107,775	10% of quantified items
Allowance for Unlisted Items	LS	1	\$107,775.00	\$107,775	10% of quantified items
Construction Sub-Total				\$1,692,068	
Miscellaneous Items and Contingency				\$338,414	20% of construction sub-total
Construction Total				\$2,030,481	
Construction Engineering				\$467,011	23% of construction total
Right-of-Way				-----	right-of-way cost (if required) not included in cost of roundabout
Total				\$2,498,000	

Unit Costs per CDOT 2021 Cost Data

Improvement Share Calculations

Improvement Location	Description	2027 Total Cost	Devel. Allocation	Percent Attributed
				to New Development
1	Market St/I-76 Interchange Roundabouts	\$ 5,306,000	\$ 5,306,000	1.00
2	Woodward Ave/CR 59 Signal	\$ 400,000	\$ 180,000	0.45
3	1st Ave/Market Street Signal	\$ 400,000	\$ 400,000	1.00
4	Market Street 1st Ave to I-76 Lane improvements	\$ 280,500	\$ 185,130	0.66
5	Market Street/ CR 398	\$ 400,000	\$ 400,000	1.00
6	CR 16/Elm St/Woodward Ave Signal, lane improvements	\$ 757,000	\$ 514,760	0.68
7	Market St/CR 18 intersection improvements	\$ 816,000	\$ 816,000	1.00
8	Market St, I-76 to CR 18	\$ 510,000	\$ 510,000	1.00
Total Cost to 2027		\$ 8,869,500	\$ 8,311,890	
Total New Trips		16,580		
Cost Per Trip		\$ 501.32		

5-Year Impact Fee Calculation

Land Use	Unit	Daily Trip Rate	Impact Fee
Single Family Residential	Lot	9.43	\$ 4,727
Multifamily Residential	Dwelling Unit	6.74	\$ 3,379
Commercial/Retail	1,000 SF	18.6	\$ 9,325
Office	1,000 SF	10.84	\$ 5,434
Warehouse	1,000 SF	1.71	\$ 857
Industrial	1,000 SF	4.87	\$ 2,441
Institutional	1,000 SF	10.77	\$ 5,399