

ARROWHEAD CENTER TIS
Traffic Impact Study
Project ID: CEEEn_2017CPST_003



by

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A Capstone Project

Submitted to
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EXECUTIVE SUMMARY

This traffic impact study analyzes potential traffic impacts of proposed single family and apartment complex residential developments for the four land parcels located at the Arrowhead Center in Spanish Fork, Utah. The study considers current conditions (2018), conditions directly after development (2022), and future conditions (2027). Traffic from five intersections and adjacent roadways surrounding the parcels is included in this analysis. Conditions were analyzed in accordance with Access Application Level II from the Traffic Impact Study Guidelines provided by the Utah Department of Transportation (UDOT).

TRAFFIC ANALYSIS

An outline of the traffic analysis performed by GSM Engineers for this project is found below.

Existing (2018) Conditions Analysis

GSM Engineers obtained weekday AM and PM peak traffic counts at the following intersections:

- South Mill Road and SR-164/Arrowhead Trail Road
- SR-164/Arrowhead Trail Road and Calpac Avenue
- SR-164/Arrowhead Trail Road and Del Monte Road
- SR-198/Main Street and SR-164/Arrowhead Trail Road
- SR-198/South State Road and Woodland Hills Drive

These counts were performed on various weekdays between Tuesday-Thursday from 7:00 - 9:00 AM and 4:00 - 6:00 PM to satisfy Spanish Fork City requirements. Greater volumes were counted at the major intersections for the AM peak hour than for the PM peak hour. Traffic volumes were largest from 7:15 AM to 8:15 AM, as shown in traffic count data in Appendix A.

As shown in Table ES-1, three intersections have acceptable delays, and two are failing according to a standard Level of Service (LOS) C, as required by the Spanish Fork Master Plan. Recommendations for failing intersections will be discussed in the body of the report.

Project Conditions Analysis

The proposed development has been identified as multi-family residential for parcels A and B and single-family homes for parcels C and D.

Trip generation for the project was computed using data published in the Institute of Transportation Engineers (ITE), *Trip Generation, 9th Edition, Volume 2*. The projected trip generation for the proposed land use is below:

- Daily: 1862 trips
- Morning Peak Hour: 145 trips
- Evening Peak Hour: 180 trips

Future (2022) Background Conditions Analysis

As shown in Table ES-1, three intersections have an acceptable LOS, and two are failing according to a standard LOS C, as required by the Spanish Fork Master Plan. Mitigations and improvements for failing intersections will be discussed in the body of the report.

Future (2022) Plus Project Conditions Analysis

As shown in Table ES-1, three intersections have acceptable delays, and four are failing according to a standard LOS C, as required by the Spanish Fork Master Plan. Mitigations and improvements for failing intersections will be discussed in the body of the report.

Future (2027) Background Conditions Analysis

As shown in Table ES-1, three intersections have acceptable delays, and two are failing according to a standard LOS C, as required by the Spanish Fork Master Plan. Mitigations and improvements for failing intersections will be discussed in the body of the report.

Future (2027) Plus Project Conditions Analysis

As shown in Table ES-1, three intersections have acceptable delays, and four are failing according to a standard LOS C, as required by the Spanish Fork Master Plan. Mitigations and improvements for failing intersections will be discussed in the body of the report.

RECOMMENDATIONS

The following mitigations and improvements are recommended:

Existing (2018) Conditions Analysis

- South Mill Road and SR-164/Arrowhead Trail Road
 - Convert the westbound segment to one combined through and left turn lane with 2 right turn pockets
 - Increase the minimum initial green time and maximum split time on the same approach
- SR-198/South State Road and Woodland Hills Drive
 - Convert the existing intersection to a signalized intersection

Future (2022) Background Conditions Analysis

- See recommendations for Existing (2018) Conditions

Future (2022) Plus Project Conditions Analysis

- 2 Proposed Intersections along SR-198/Main Street
 - Disallow through and left turn movements
- See recommendations for Existing (2018) Conditions

Future (2027) Background Conditions Analysis

- See recommendations for Existing (2018) Conditions

Future (2027) Plus Project Conditions Analysis

- See recommendations for Existing (2018) Conditions
- See recommendations for Future (2022) Plus Project Conditions

Table ES-1: Summary Peak Hour LOS

Intersection	Existing 2018 Background	Future 2022 Background	Future 2022 Plus Project	Future 2027 Background	Future 2027 Plus Project	Future 2027 Plus Project (Mitigated)
Del Monte Road and SR-164 Arrowhead Trail Road	C	C	C	C	C	-
Calpac Avenue and SR-164 Arrowhead Trail Road	B	B	B	B	B	-
Woodland Hills Drive and SR-198	F	F	F	F	F	C
South Mill Road and Arrowhead Trail Road	F	F	F	F	F	B
SR-164 Arrowhead and Main street	B	B	B	B	B	-
New 3-Way Intersection with SR-198	-	-	D	-	F	C
New 4-Way Intersection with SR-198	-	-	F	-	F	C

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I. INTRODUCTION

A. Purpose

This traffic impact study addresses potential traffic impacts of proposed mixed residential and commercial developments for the four land parcels located at the Arrowhead Center in Spanish Fork, Utah. The study analyzes current conditions (2018), conditions directly after development (2022), and future conditions (2027). Traffic from five intersections and adjacent roadways surrounding the parcels is included in this analysis. Conditions were analyzed in accordance with Access Application Level II from the Traffic Impact Study Guidelines provided by the Utah Department of Transportation (UDOT).

B. Scope

The study area was defined after correspondence with the sponsor. This study was scoped to evaluate the traffic operation impacts of the project on the following intersections:

- South Mill Road and SR-164/Arrowhead Trail Road
 - Signalized Three-Way Intersection
- SR-164/Arrowhead Trail Road and Calpac Avenue
 - Unsignalized Three-Way Intersection with stop control on single minor approach
- SR-164/Arrowhead Trail Road and Del Monte Road
 - Signalized Four-Way Intersection
- SR-198/Main Street and SR-164/Arrowhead Trail Road
 - Unsignalized Four-Way Stop Intersection with stop control on minor approaches
- SR-198/South State Road and Woodland Hills Drive
 - Signalized Four-Way Stop

C. Analysis Methodology

LOS describes the operational performance of an intersection or roadway. LOS is reported on a scale from A to F, with A representing the best performance and F the worst. Table 1 provides a brief description of each LOS letter designation and an accompanying average delay per vehicle for both signalized and unsignalized intersections.

The Highway Capacity Manual 2010 (HCM 2010) methodology was used in this study to be consistent with “state-of-the-practice” professional standards. Signalized and unsignalized intersections are evaluated differently. The LOS for a signalized intersections is determined for the overall intersection, averaging all of the approach delays. The LOS for an unsignalized intersection is determined based on the worst approach.

Table 1: LOS Descriptions

LOS	Description of Traffic Conditions	Average Delay (seconds/vehicle)
Signalized Intersections		Overall Intersection
A	Free Flow	$0 \leq 10.0$
B	Stable Flow (slight delays)	$> 10.0 - 20.0$
C	Stable Flow (acceptable delays)	$> 20.0 - 35.0$
D	Approaching unstable flow (tolerable delay occasionally wait through more than one signal before proceeding)	$> 35.0 - 55.0$
E	Unstable flow (intolerable delay)	$> 55.0 - 80.0$
F	Forced flow (congested and queues fail to clear)	> 80.0
Unsignalized Intersections		Worst Approach
A	Insignificant Delay on Worst Approach	$0 \leq 10.0$
B	Minimum Delay on Worst Approach	$> 10.0 - 15.0$
C	Acceptable Delay on Worst Approach	$> 15.0 - 25.0$
D	Tolerable Delays on Worst Approach	$> 25.0 - 35.0$
E	Significant Delays on Worst Approach	$> 35.0 - 50.0$
F	Excessive delays on Worst Approach	> 50.0
Source: Highway Capacity Manual, 2010 Methodology (Transportation Research Board, 2010)		

D. LOS Standards

For the project purposes, a minimum overall intersection performance for each of the study intersections was set at LOS C. However, if LOS D, E or F for conditions exist, a recommendation for improvement will be provided. A LOS D threshold is consistent with “state-of-the-practice” traffic engineering principles, but in accordance with the Spanish Fork Master Plan, a LOS C threshold is desired.

II. EXISTING (2018) CONDITIONS ANALYSIS

A. Purpose

The purpose of the existing (2018) conditions analysis is to evaluate the current status of selected intersections and roadways during peak hour traffic. Through this analysis, any existing flaws or failures can be identified and corresponding mitigation measures can be suggested. The existing conditions will be used to project traffic volumes to predict future deficiencies that may be caused by the proposed development.

B. Roadway System

The major roadways that may function as access points to the project site are described below:

SR-164/Arrowhead Trail Road is a state-operated roadway with a rural major collector classification. This roadway is currently comprised of a series of two cross sections. Beginning at the intersection of SR-198/Main Street and SR-164/Arrowhead Trail Road, the roadway has a three-lane cross section with one through travel lane in each direction and a center two-way left turn lane (TWLTL). Between Calpac Avenue and Del Monte Road, the roadway tapers to a two-lane cross section with one through travel lane in each direction. Between the intersections with Del Monte Rd and South Mill Rd, there is a small segment with 2 lanes on the eastbound side. The speed limit is 45 mph. According to UDOT qualifications, this roadway is classified as an access category 2 classification. Presently all minimum signal and street spacing requirements are met. The spacing between the intersection of Arrowhead Trail Road with Calpac Avenue and the intersection with Main St appears to be close to the 1000 ft spacing requirement. Driveway requirements for this classification are not met.

SR-198/Main Street is a state-operated roadway rural minor arterial classification. This roadway is currently comprised of a three-lane cross section with one through travel lane in each direction and a center TWLTL. The speed limit is 55 mph. According to UDOT qualifications, this road seems to be a category 2 classification. Presently all minimum signal and street spacing requirements are met. Driveway requirements for this classification are not met.

C. Traffic Volumes

GSM Engineers collected traffic data during AM and PM peak hours between 7:00 - 9:00 AM and 4:00 - 6:00 PM, respectively, at the following intersections:

- South Mill Road and SR-164/Arrowhead Trail Road
- SR-164/Arrowhead Trail Road and Calpac Avenue
- SR-164/Arrowhead Trail Road and Del Monte Road
- SR-198/Main Street and SR-164/Arrowhead Trail Road
- SR-198/South State Road and Woodland Hills Drive

Counts were collected during the appropriate times on various dates. Due to traffic data collection over multiple days, volumes between intersections did not align. Traffic volumes were adjusted based on the volumes at the intersection of Arrowhead Trail Road and Main Street. Original count data is included in Appendix A, while altered volumes can be found in the Synchro LOS analysis results in Appendix B. The peak hour was determined to be in the morning from 7:15 AM to 8:15 AM.

From UDOT data, the percent of heavy traffic was determined to be high for the area, so 4 percent of traffic was assumed to be truck traffic.

D. LOS Analysis

Synchro Software was used to determine the peak hour LOS for each intersection. The results for the background 2018 model serve as a baseline condition for the impact analysis of the Arrowhead Center development during the existing conditions. LOS reports from Synchro are contained in Appendix B of this traffic impact study. As shown in Table 2, three intersections have an acceptable LOS, and two are failing.

Table 2: Existing 2018 Background Level of Service

Intersection	Existing 2018 Background
Del Monte Road and SR-164 Arrowhead Trail Road	C
Calpac Avenue and SR-164 Arrowhead Trail Road	B
Woodland Hills Drive and SR-198	F
South Mill Road and Arrowhead Trail Road	F
SR-164 Arrowhead and Main street	B

E. Mitigation Measures

The intersection of Woodland Hills Drive and SR-198 as well as the intersection of South Mill Road and Arrowhead Trail Road are the only intersections surrounding the property that fall below LOS C in 2018. Both the intersections are LOS F while the others are LOS B or LOS C. No mitigation measures are recommended for the intersections that are LOS C and higher.

The following mitigation measures are recommended at the intersection of Woodland Hills Drive and SR-198:

- Convert the westbound segment to one combined through and left turn lane with 2 right turn pockets
- Increase the minimum initial green time and maximum split time on the same approach

At the intersection of South Mill Road and Arrowhead Trail Road the following mitigation measure is recommended:

- Convert the existing intersection to a signalized intersection

III. PROJECT CONDITIONS

A. Purpose

The purpose of the project conditions is to explain the development plans for the four parcels. These plans are used for trip generation, distribution, and assignment to predict the amount of traffic the new development will add to the project area.

B. Project Description

A summary of the proposed development is found below in Table 3. These proposed developments are addressed in this study to analyze the generated traffic and determine whether any mitigation measures are necessary. The parcels are located around the Arrowhead center.

Table 3: Land Use Description

Parcel	Apartment Buildings	Units per Building	Multi Family Homes	Residential Lots
A	22	3	71	0
B	25	3	70	0
C	0	0	0	50
D	0	0	0	45

C. Trip Generation

Trip generation for the project was calculating using trip generation rates published in the Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition, 2012. The ITE trip generation rates identify gross trips to and from the Arrowhead Center project and do not account for trips already on adjacent roadways. GSM Engineers adjusted the gross trip generation to account for internal trips between residential land uses. No pedestrian or pass-by trip reductions were made.

Table 4: Trip Generation

Time	Trip Generation
AM Peak Hour	145
PM Peak Hour	180
Weekday	1869

Two site plans were submitted. One by Fritzi Realty and one by another Engineering firm. The other Engineering firm proposed land use identified as single housing and commercial. The proposal by the other Engineering firm would have generated 702 AM trips and 19,984 weekday trips which could significantly change the outcome of this study. This study covers the site plan submitted by Fritzi Realty.

D. Trip Distribution and Assignment

Project traffic is assigned based on the type of trip and the distance of the project access points to major roadways, high population densities, and trip attractions. Distribution percentages were determined using existing travel patterns observed during traffic count data collection. The resulting overall distribution of project generated trips is as follows:

To/from the Development

- 7% West on Del Monte Road
- 58% North on SR-198/Main Street
- 18% South on SR-198/State
- 7% South on SR-164/Arrowhead Trail Road
- 10% East on Woodland Hills Drive

Trip generation assignment is shown in Figure 8 of Appendix D.

E. Access Spacing

Two new intersections will be developed along SR-198, one three-way intersection and one four-way intersection. Calpac Avenue and Arrowhead Trail Road will be moved to the west. Currently, the intersection of Calpac Avenue and Arrowhead Trail Road is about 1000 ft from intersection of Arrowhead Trail Road and Main Street. 1000 ft is the minimum spacing between roads for a UDOT category 2 road. The movement of the Calpac Avenue intersection to the west will allow increased access spacing. The distance between 2 new intersections on Main Street may be slightly close together based on a category 2 street, and may require special permissions from the city.

IV. FUTURE (2022) BACKGROUND CONDITIONS

A. Purpose

The purpose of the future (2022) background conditions is to analyze the future traffic conditions around the property parcels at the project location. The analysis of future background conditions will enable GSM Engineers to predict future traffic deficiencies and recommend mitigation measures in order to reduce inefficiency at the intersections surrounding Arrowhead Center.

B. Traffic Volumes

Traffic volumes for the future year 2022 were projected using the altered counts collected by GSM Engineers and an annually compounded traffic growth rate of 3.6%. This growth rate was found using 10 years of historical Annual Average Daily Traffic (AADT) data provided by UDOT.

C. LOS Analysis

Synchro Software was used to determine the peak hour LOS for each intersection. The results for the background 2022 model serve as a baseline condition for the impact analysis of the Arrowhead Center development in 2022. LOS reports from Synchro are contained in Appendix B of this traffic impact study. As shown in Table 5, three intersections have an acceptable LOS, and two are failing.

Table 5: Future 2022 Background Level of Service

Intersection	Future 2022 Background
Del Monte Road and SR-164 Arrowhead Trail Road	C
Calpac Avenue and SR-164 Arrowhead Trail Road	B
Woodland Hills Drive and SR-198	F
South Mill Road and Arrowhead Trail Road	F
SR-164 Arrowhead and Main street	B

D. Mitigation Measures

The intersection of Woodland Hills Drive and SR-198 as well as the intersection of South Mill Road and Arrowhead Trail Road are the only intersections surrounding the property that fall below LOS C in 2022. Both the intersections are LOS F while the others are LOS B or LOS C, as was the case in 2018. Mitigation measure recommendations for the failing intersections are found in part II. Existing (2018) Conditions, section E: Mitigation Measures.

V. FUTURE (2022) PLUS PROJECT CONDITIONS

A. Purpose

The purpose of the future 2022 plus conditions is to examine the traffic impacts of the proposed project at each of the intersections during future 2022 conditions. The trips generated by the project development were combined with the future 2022 background traffic volumes to create the future plus project condition. The plus project conditions detail the important potential impacts of the proposed project on future background traffic conditions.

B. Traffic Volumes

Trips were assigned to the project location intersections based on the trip distribution percentages and permitted intersection turning movements. Base volumes were taken from the Future 2022 Background Conditions.

C. LOS Analysis

Synchro Software was used to determine the peak hour LOS for each intersection. The results for the project conditions 2022 model serve as the condition for the impact analysis of the Arrowhead Center development in 2022 just after the development has been constructed. LOS reports from Synchro are contained in Appendix B of this traffic impact study. As shown in Table 6, the same three intersections have an acceptable LOS, and the other two are failing. The two new intersections along Main Street or SR-198 are failing as soon as they are constructed.

Table 6: Future 2022 Plus Project Level of Service

Intersection	Future 2022 Plus Project
Del Monte Road and SR-164 Arrowhead Trail Road	C
Calpac Avenue and SR-164 Arrowhead Trail Road	B
Woodland Hills Drive and SR-198	F
South Mill Road and Arrowhead Trail Road	F
SR-164 Arrowhead and Main street	B
New 3-Way Intersection with SR-198	D
New 4-Way Intersection with SR-198	F

D. Mitigation Measures

No mitigation measures are recommended for the intersections that are LOS C and higher. See Existing (2018) Conditions Section E: Mitigation Measures for recommendations at the intersection of Woodland Hills Drive and SR-198 and the intersection of South Mill Road and Arrowhead Trail Road.

Synchro analysis reports also showed in the future 2022 plus project conditions, the three-way intersection and four-way intersection along SR-198 will be LOS D and F respectively. To improve these intersections the following mitigation measure is recommended:

- Disallow through and left turn movements

VI. FUTURE (2027) BACKGROUND CONDITIONS

A. Purpose

The purpose of the future 2027 background conditions is to analyze the base future traffic conditions around the parcels at the project location for 2027. The analysis of future background conditions will enable GSM Engineers to predict future traffic deficiencies and recommend mitigation measures in order to reduce inefficiency at the intersections surrounding Arrowhead Center.

B. Traffic Volumes

Traffic volumes for the future year 2027 were predicted using an annually compounded 3.6% growth rate and altered traffic counts collected by GSM Engineers. The growth rate was obtained using 10 years of historical Annual Average Daily Traffic (AADT) data provided by UDOT.

C. Background Geometric Changes

Some background changes were assumed to have occurred along Main Street by the year 2027. According to the City of Spanish Fork's Transportation Master Plan, the number of lanes along Main Street will be increased from two lanes to four lanes.

D. LOS Analysis

Synchro Software was used to find the peak hour LOS for each intersection surrounding the project. The results from Synchro for the background 2027 serve as a baseline condition for the impact analysis of the Arrowhead Center development in 2027. LOS reports from Synchro are contained in Appendix B of this traffic impact study. As shown in Table 7, three intersections have an acceptable LOS and two intersections are failing.

Table 7: Future 2027 Background Level of Service

Intersection	Future 2027 Background
Del Monte Road and SR-164 Arrowhead Trail Road	C
Calpac Avenue and SR-164 Arrowhead Trail Road	B
Woodland Hills Drive and SR-198	F
South Mill Road and Arrowhead Trail Road	F
SR-164 Arrowhead and Main street	B

E. Mitigation Measures

No mitigation measures are recommended for the intersections that are LOS C and higher. Mitigation measure recommendations for the two failing intersections are found in found in part II. Existing (2018) Conditions, section E: Mitigation Measures.

VII. FUTURE (2027) PLUS PROJECT CONDITIONS

A. Purpose

The purpose of the future 2027 plus project conditions is to examine the traffic impacts of the proposed project at each of the intersections during future 2027 conditions. The trips generated by the project development were combined with the future 2027 background traffic volumes to create the future plus project condition. The plus project conditions detail the important potential impacts of the proposed project on future background traffic conditions.

B. Traffic Volumes

Trips were assigned to the project location intersections based on the trip distribution percentages and permitted intersection turning movements. Base volumes were taken from the Future 2027 Background Conditions

C. LOS Analysis

The peak hour LOS for each intersection was found using Synchro Software. LOS reports from Synchro are contained in Appendix B of this traffic impact study. The results for the project conditions 2027 model serve as the condition for the impact analysis of the Arrowhead Center after the development has been existing for several years. As seen in Table 8, the same two intersections are failing and three intersections have an acceptable LOS C or higher. The two new intersections along SR-198 are already failing once constructed.

Table 8: Future 2027 Plus Project Level of Service

Intersection	Future 2027 Plus Project
Del Monte Road and SR-164 Arrowhead Trail Road	C
Calpac Avenue and SR-164 Arrowhead Trail Road	B
Woodland Hills Drive and SR-198	F
South Mill Road and Arrowhead Trail Road	F
SR-164 Arrowhead and Main street	B
New 3-Way Intersection with SR-198	F
New 4-Way Intersection with SR-198	F

D. Mitigation Measures

No mitigation measures are recommended for the intersections that are LOS C and higher. Mitigation measure recommendations for the existing failing intersections are found in found in part II. Existing (2018) Conditions, section E: Mitigation Measures. Recommendations for the two new intersections along SR-198 can be found in found in part V. Future (2022) Plus Project Conditions, section D: Mitigation Measures. A summary of the LOS after mitigation measures are implemented is found in Table 9.

Table 9: Future 2027 Plus Project - Mitigated Level of Service

Intersection	Future 2027 Plus Project
Del Monte Road and SR-164 Arrowhead Trail Road	C
Calpac Avenue and SR-164 Arrowhead Trail Road	B
Woodland Hills Drive and SR-198	C
South Mill Road and Arrowhead Trail Road	B
SR-164 Arrowhead and Main street	B
New 3-Way Intersection with SR-198	C
New 4-Way Intersection with SR-198	C

Appendix A: Turning Movement Counts

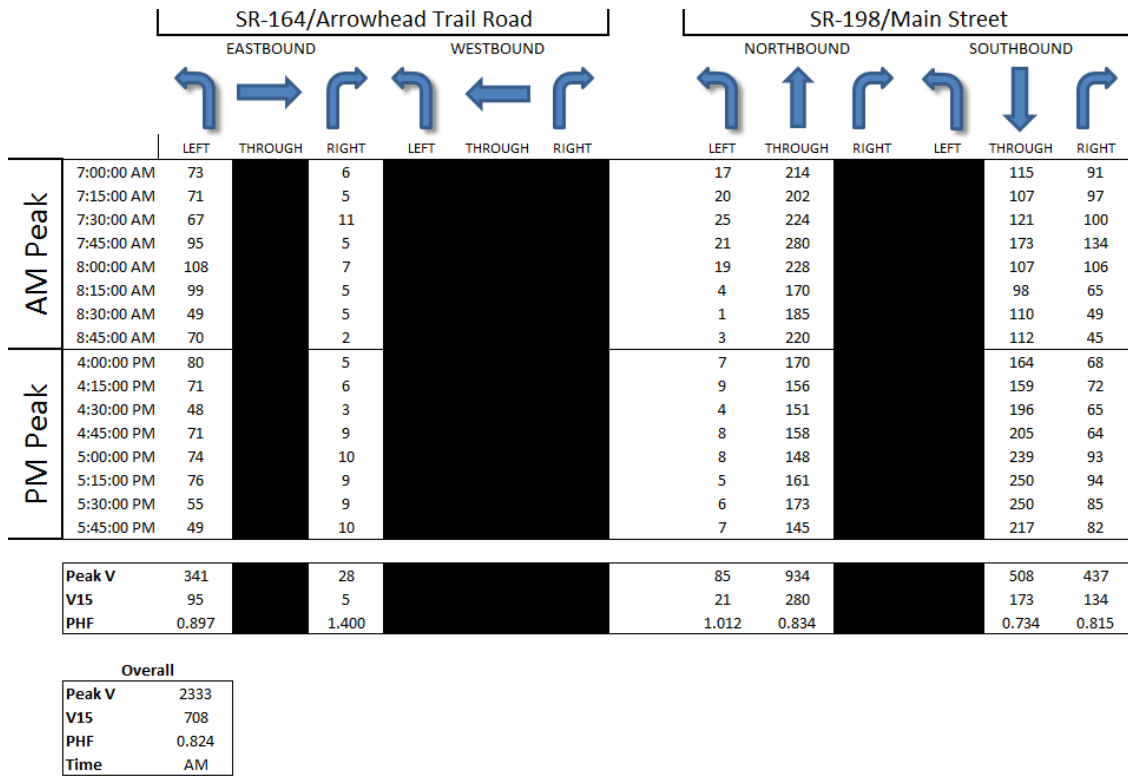


Figure 1: Traffic Counts for SR-198/Main Street and SR-164/Arrowhead Trail Road

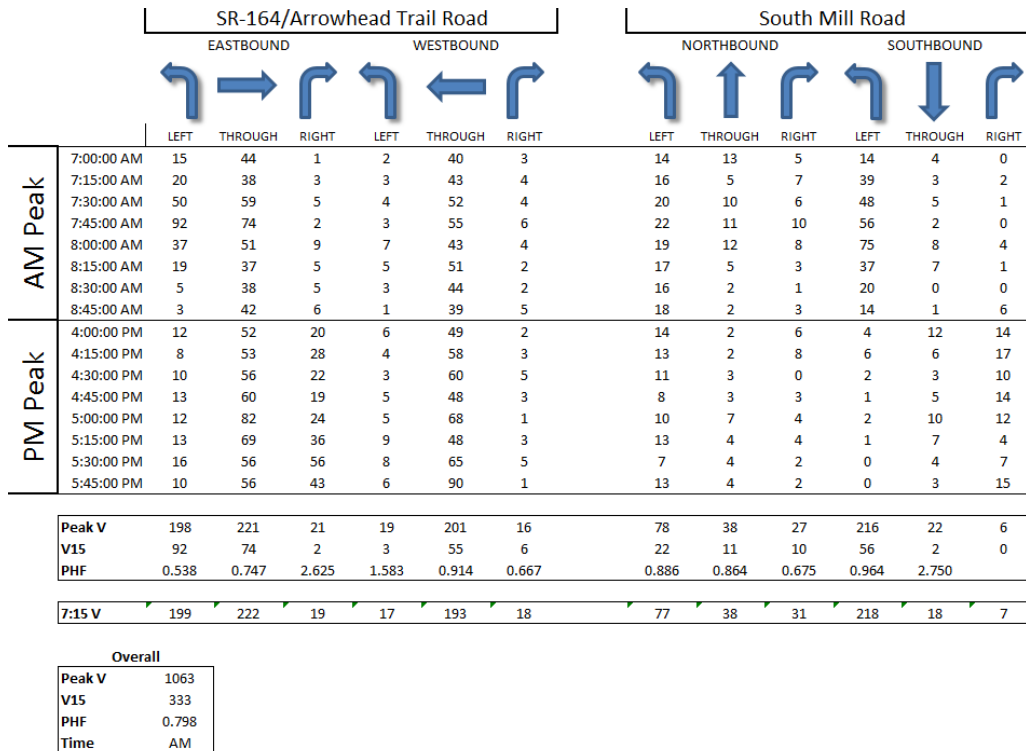


Figure 2: Traffic Counts for South Mill Road and SR-164/Arrowhead Trail Road

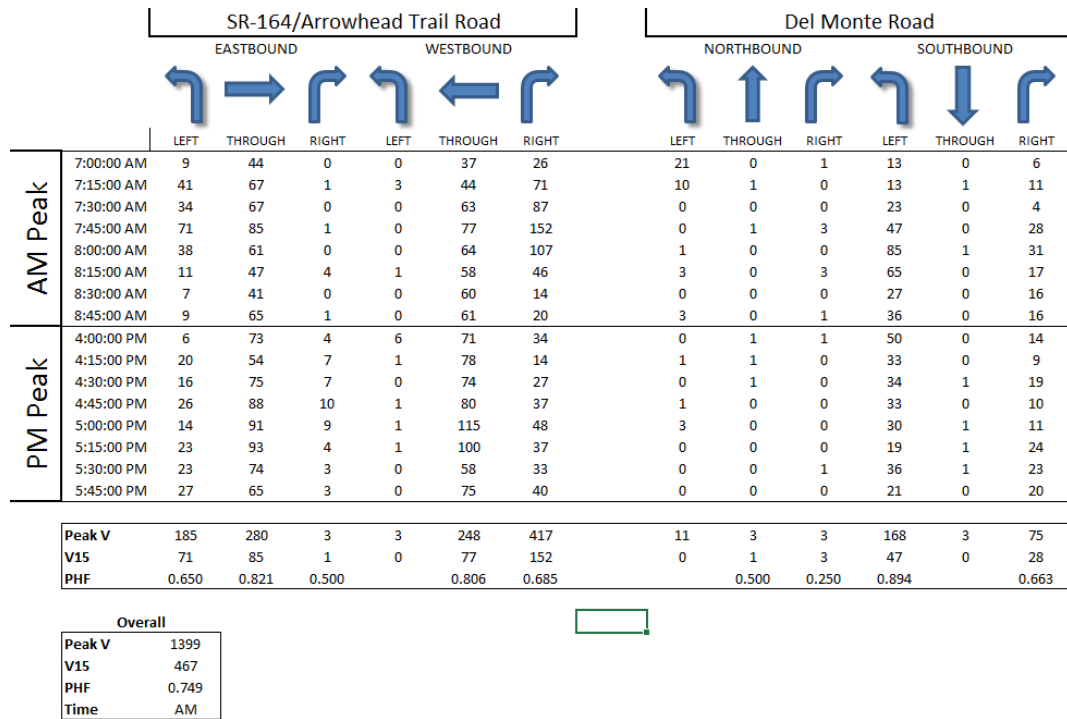


Figure 3: Traffic Counts for SR-164/Arrowhead Trail Road and Del Monte Road

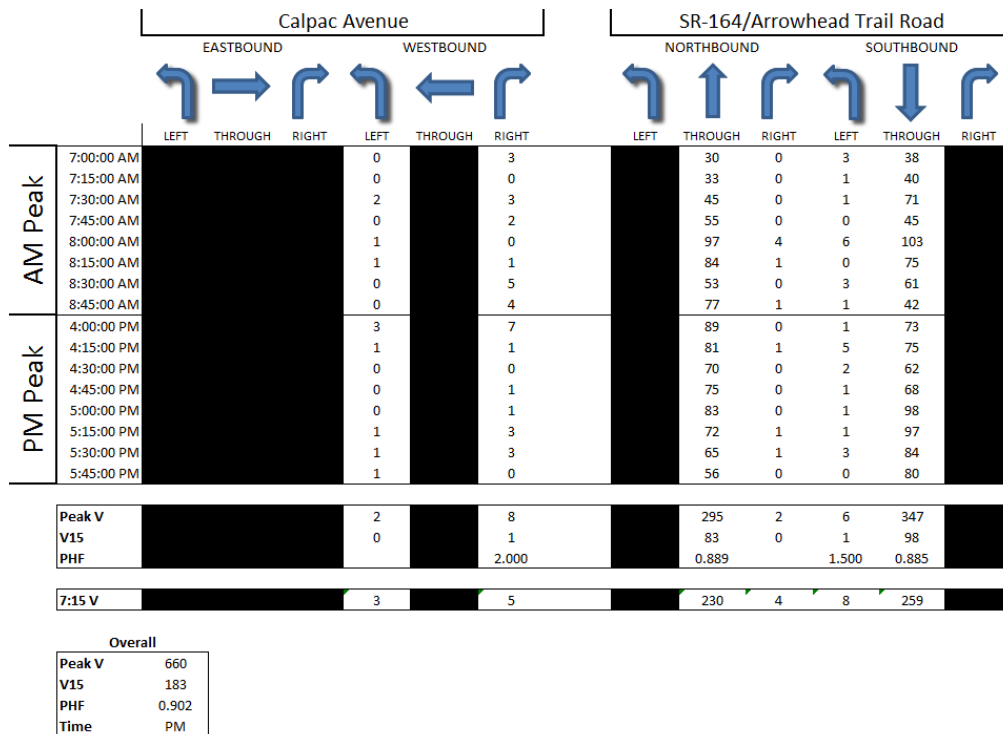


Figure 4: Traffic Counts for SR-164/Arrowhead Trail Road and Calpac Avenue

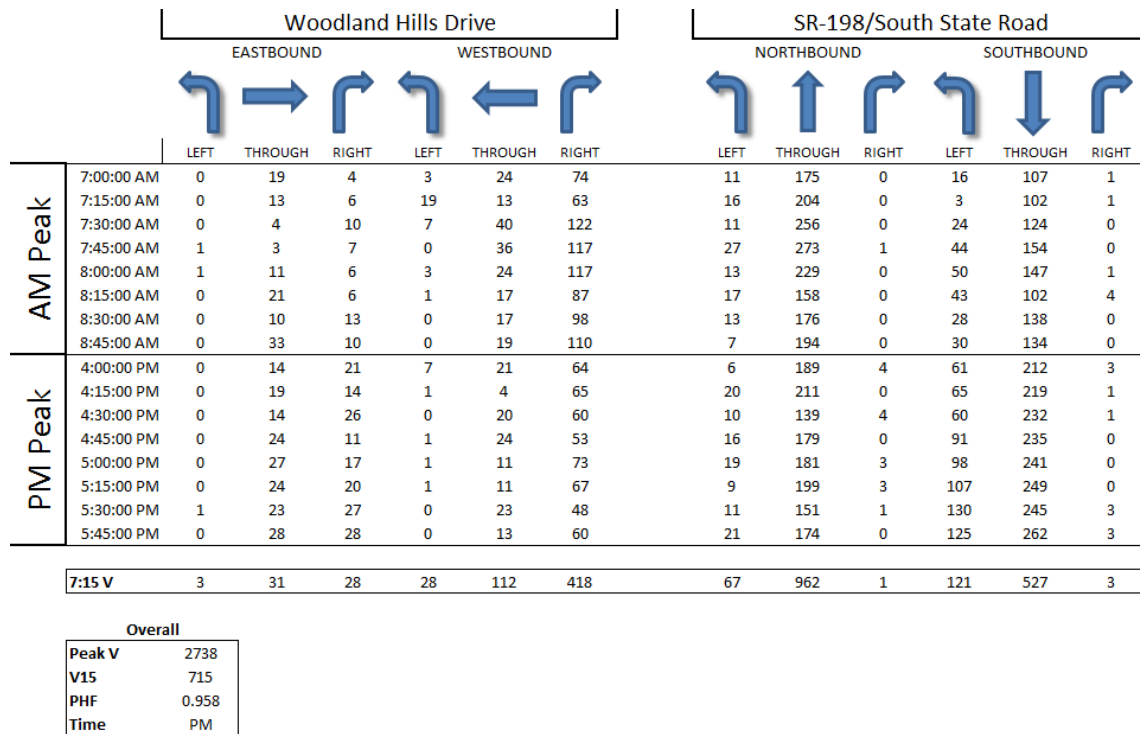


Figure 5: Traffic Counts for SR-198/South State Road and Woodland Hills Drive

Appendix B: LOS Results

2018 Background Report

HCM 2010 Signalized Intersection Summary

3: S Main St/SR-198 & Arrowhead Trail Rd/SR-164

4/5/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	 			 	 			
Traffic Volume (veh/h)	341	28	85	934	508	437		
Future Volume (veh/h)	341	28	85	934	508	437		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827		
Adj Flow Rate, veh/h	401	33	100	1099	598	514		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85		
Percent Heavy Veh, %	4	4	4	4	4	4		
Cap, veh/h	500	230	407	2436	2436	1090		
Arrive On Green	0.15	0.15	0.70	0.70	0.70	0.70		
Sat Flow, veh/h	3375	1553	495	3563	3563	1553		
Grp Volume(v), veh/h	401	33	100	1099	598	514		
Grp Sat Flow(s),veh/h/ln	1688	1553	495	1736	1736	1553		
Q Serve(g_s), s	9.2	1.5	7.3	11.1	5.0	11.8		
Cycle Q Clear(g_c), s	9.2	1.5	12.3	11.1	5.0	11.8		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	500	230	407	2436	2436	1090		
V/C Ratio(X)	0.80	0.14	0.25	0.45	0.25	0.47		
Avail Cap(c_a), veh/h	1013	466	407	2436	2436	1090		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	32.9	29.7	6.5	5.2	4.3	5.3		
Incr Delay (d2), s/veh	1.2	0.1	1.4	0.6	0.2	1.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	4.4	0.6	1.1	5.4	2.4	5.4		
LnGrp Delay(d),s/veh	34.1	29.8	7.9	5.8	4.5	6.8		
LnGrp LOS	C	C	A	A	A	A		
Approach Vol, veh/h	434			1199	1112			
Approach Delay, s/veh	33.8			6.0	5.6			
Approach LOS	C			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		62.1		17.9		62.1		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		44.0		24.0		44.0		
Max Q Clear Time (g_c+I1), s		14.3		11.2		13.8		
Green Ext Time (p_c), s		6.0		0.7		6.1		
Intersection Summary								
HCM 2010 Ctrl Delay			10.2					
HCM 2010 LOS			B					

Educational Use Only

Intersection

Int Delay, s/veh 43.7

Movement	EBL	EBR	SEL	SET	SER	NWL	NWT	NWR	SWL	SWR
Traffic Vol, veh/h	167	17	164	16	6	67	33	23	17	193
Future Vol, veh/h	167	17	164	16	6	67	33	23	17	193
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	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
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	196	20	193	19	7	79	39	27	20	227

Major/Minor	Major1		Minor2			Minor1			Major2	
Conflicting Flow All	248	0	927	904	238	907	904	206	216	0
Stage 1	-	-	278	278	-	616	616	-	-	-
Stage 2	-	-	649	626	-	291	288	-	-	-
Critical Hdwy	4.14	-	7.14	6.54	6.24	7.14	6.54	6.24	4.14	-
Critical Hdwy Stg 1	-	-	6.14	5.54	-	6.14	5.54	-	-	-
Critical Hdwy Stg 2	-	-	6.14	5.54	-	6.14	5.54	-	-	-
Follow-up Hdwy	2.236	-	3.536	4.036	3.336	3.536	4.036	3.336	2.236	-
Pot Cap-1 Maneuver	1306	-	247	275	796	255	275	829	1342	-
Stage 1	-	-	724	677	-	475	479	-	-	-
Stage 2	-	-	455	474	-	713	670	-	-	-
Platoon blocked, %		-								-
Mov Cap-1 Maneuver	1306	-	~ 177	222	796	202	222	829	1342	-
Mov Cap-2 Maneuver	-	-	~ 177	222	-	202	222	-	-	-
Stage 1	-	-	594	665	-	390	393	-	-	-
Stage 2	-	-	326	389	-	675	659	-	-	-

Approach	EB		SE			NW			SW
HCM Control Delay, s	4		175.4			39.8			0.6
HCM LOS			F			E			

Minor Lane/Major Mvmt	NWLn1	EBL2	EBL	EBR	SELn1	SWL	SWR	SWR2
Capacity (veh/h)	242	1306	-	-	185	1342	-	-
HCM Lane V/C Ratio	0.598	0.157	-	-	1.183	0.015	-	-
HCM Control Delay (s)	39.8	8.3	0	-	175.4	7.7	0	-
HCM Lane LOS	E	A	A	-	F	A	A	-
HCM 95th %tile Q(veh)	3.5	0.6	-	-	11.4	0	-	-

Notes

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

Educational Use Only

HCM 2010 Signalized Intersection Summary

7: S State Rd/SR-198/S Main St/S State Rd/SR-198 & Woodland Hills Dr

4/5/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	24	21	21	85	301	50	691	1	95	414	2
Future Volume (veh/h)	2	24	21	21	85	301	50	691	1	95	414	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1900	1827	1827	1900	1827	1827	1827	1827	1827	1900
Adj Flow Rate, veh/h	2	28	25	25	100	354	59	813	1	112	487	2
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	0
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	65	154	137	258	61	216	492	880	748	308	1289	5
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.48	0.48	0.48	0.18	0.71	0.71
Sat Flow, veh/h	915	891	796	1320	354	1252	886	1827	1553	1740	1818	7
Grp Volume(v), veh/h	2	0	53	25	0	454	59	813	1	112	0	489
Grp Sat Flow(s),veh/h/ln	915	0	1687	1320	0	1606	886	1827	1553	1740	0	1826
Q Serve(g_s), s	0.0	0.0	3.0	1.8	0.0	19.0	4.1	45.7	0.0	6.2	0.0	11.7
Cycle Q Clear(g_c), s	19.0	0.0	3.0	4.8	0.0	19.0	4.1	45.7	0.0	6.2	0.0	11.7
Prop In Lane	1.00		0.47	1.00		0.78	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	65	0	291	258	0	277	492	880	748	308	0	1295
V/C Ratio(X)	0.03	0.00	0.18	0.10	0.00	1.64	0.12	0.92	0.00	0.36	0.00	0.38
Avail Cap(c_a), veh/h	65	0	291	258	0	277	492	880	748	308	0	1295
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	55.0	0.0	38.9	40.9	0.0	45.5	15.8	26.6	14.8	39.8	0.0	6.4
Incr Delay (d2), s/veh	0.1	0.0	0.1	0.1	0.0	302.3	0.5	16.7	0.0	3.3	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(50%),veh/ln	0.1	0.0	1.4	0.7	0.0	31.7	1.1	26.9	0.0	3.3	0.0	6.1
LnGrp Delay(d),s/veh	55.1	0.0	39.0	41.0	0.0	347.8	16.3	43.3	14.8	43.1	0.0	7.2
LnGrp LOS	E		D	D		F	B	D	B	D		A
Approach Vol, veh/h	55			479			873			601		
Approach Delay, s/veh	39.6			331.8			41.4			13.9		
Approach LOS	D			F			D			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		6		8					
Phs Duration (G+Y+Rc), s	25.0	60.0	25.0		85.0		25.0					
Change Period (Y+Rc), s	5.5	7.0	6.0		7.0		6.0					
Max Green Setting (Gmax), s	19.5	53.0	19.0		53.0		19.0					
Max Q Clear Time (g_c+I1), s	8.2	47.7	21.0		13.7		21.0					
Green Ext Time (p_c), s	0.1	1.8	0.0		3.0		0.0					

Intersection Summary

HCM 2010 Ctrl Delay 102.4

HCM 2010 LOS F

Educational Use Only

HCM 2010 Signalized Intersection Summary

10: Arrowhead Trail Rd/SR-164 & Del Monte Rd

4/5/2018

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	118	2	53	8	2	2	130	197	2	2	174	293
Future Volume (veh/h)	118	2	53	8	2	2	130	197	2	2	174	293
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1827	1827	1827	1827	1827	1827	1827
Adj Flow Rate, veh/h	139	2	62	9	2	2	153	232	2	2	205	345
Adj No. of Lanes	1	1	1	0	1	1	1	1	1	1	1	1
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	348	365	311	212	47	229	402	837	711	500	837	711
Arrive On Green	0.20	0.20	0.20	0.15	0.15	0.15	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1740	1827	1553	1436	319	1553	838	1827	1553	1120	1827	1553
Grp Volume(v), veh/h	139	2	62	11	0	2	153	232	2	2	205	345
Grp Sat Flow(s),veh/h/ln	1740	1827	1553	1755	0	1553	838	1827	1553	1120	1827	1553
Q Serve(g_s), s	6.6	0.1	3.2	0.5	0.0	0.1	13.0	7.5	0.1	0.1	6.5	14.7
Cycle Q Clear(g_c), s	6.6	0.1	3.2	0.5	0.0	0.1	19.5	7.5	0.1	7.6	6.5	14.7
Prop In Lane	1.00		1.00	0.82		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	348	365	311	259	0	229	402	837	711	500	837	711
V/C Ratio(X)	0.40	0.01	0.20	0.04	0.00	0.01	0.38	0.28	0.00	0.00	0.25	0.49
Avail Cap(c_a), veh/h	348	365	311	259	0	229	402	837	711	500	837	711
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.0	30.4	31.7	34.7	0.0	34.6	21.7	16.0	14.0	18.3	15.7	17.9
Incr Delay (d2), s/veh	3.4	0.0	1.4	0.3	0.0	0.1	2.7	0.8	0.0	0.0	0.7	2.4
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	3.5	0.0	1.5	0.3	0.0	0.0	3.3	3.9	0.0	0.0	3.4	6.7
LnGrp Delay(d),s/veh	36.4	30.5	33.1	35.1	0.0	34.6	24.4	16.8	14.0	18.4	16.4	20.3
LnGrp LOS	D	C	C	D		C	C	B	B	B	B	C
Approach Vol, veh/h	203			13			387			552		
Approach Delay, s/veh	35.4			35.0			19.8			18.9		
Approach LOS	D			C			B			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	50.0		25.0		50.0		20.0					
Change Period (Y+Rc), s	6.5		6.0		6.5		6.0					
Max Green Setting (Gmax), s	43.5		19.0		43.5		14.0					
Max Q Clear Time (g_c+I1), s	21.5		8.6		16.7		2.5					
Green Ext Time (p_c), s	1.8		0.1		1.8		0.0					
Intersection Summary												
HCM 2010 Ctrl Delay	22.3											
HCM 2010 LOS	C											

Educational Use Only

Intersection

Int Delay, s/veh 0.3

Movement	NWL	NWR	NET	NER	SWL	SWT
Traffic Vol, veh/h	3	7	337	4	15	482
Future Vol, veh/h	3	7	337	4	15	482
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	4	8	396	5	18	567

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1001	399	0
Stage 1	399	-	-
Stage 2	602	-	-
Critical Hdwy	6.44	6.24	4.14
Critical Hdwy Stg 1	5.44	-	-
Critical Hdwy Stg 2	5.44	-	-
Follow-up Hdwy	3.536	3.336	2.236
Pot Cap-1 Maneuver	267	646	1147
Stage 1	673	-	-
Stage 2	543	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	263	646	1147
Mov Cap-2 Maneuver	389	-	-
Stage 1	673	-	-
Stage 2	534	-	-

Approach	NW	NE	SW
HCM Control Delay, s	11.8	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWL	SWL	SWT
Capacity (veh/h)	-	-	539	1147	-
HCM Lane V/C Ratio	-	-	0.022	0.015	-
HCM Control Delay (s)	-	-	11.8	8.2	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Educational Use Only

2022 Background Report

HCM 2010 Signalized Intersection Summary

3: S Main St/SR-198 & Arrowhead Trail Rd/SR-164

4/5/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	341	28	85	934	508	437		
Future Volume (veh/h)	341	28	85	934	508	437		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827		
Adj Flow Rate, veh/h	461	38	115	1264	687	591		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85		
Percent Heavy Veh, %	4	4	4	4	4	4		
Cap, veh/h	562	258	346	2373	2373	1062		
Arrive On Green	0.17	0.17	0.68	0.68	0.68	0.68		
Sat Flow, veh/h	3375	1553	423	3563	3563	1553		
Grp Volume(v), veh/h	461	38	115	1264	687	591		
Grp Sat Flow(s),veh/h/ln	1688	1553	423	1736	1736	1553		
Q Serve(g_s), s	10.5	1.7	11.8	14.5	6.2	15.6		
Cycle Q Clear(g_c), s	10.5	1.7	18.0	14.5	6.2	15.6		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	562	258	346	2373	2373	1062		
V/C Ratio(X)	0.82	0.15	0.33	0.53	0.29	0.56		
Avail Cap(c_a), veh/h	1013	466	346	2373	2373	1062		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	32.2	28.5	8.5	6.3	5.0	6.5		
Incr Delay (d2), s/veh	1.2	0.1	2.6	0.9	0.3	2.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.0	0.7	1.6	7.1	3.1	7.2		
LnGrp Delay(d),s/veh	33.4	28.6	11.1	7.2	5.3	8.6		
LnGrp LOS	C	C	B	A	A	A		
Approach Vol, veh/h	499			1379	1278			
Approach Delay, s/veh	33.0			7.5	6.8			
Approach LOS	C			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		60.7		19.3		60.7		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		44.0		24.0		44.0		
Max Q Clear Time (g_c+I1), s		20.0		12.5		17.6		
Green Ext Time (p_c), s		7.6		0.8		7.7		
Intersection Summary								
HCM 2010 Ctrl Delay			11.2					
HCM 2010 LOS			B					

Educational Use Only

Intersection

Int Delay, s/veh 113.6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Traffic Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
Future Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
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	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	222	22	8	91	45	31	235	226	23	23	261	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1065	1039	273	1042	1039	237	285	0	0	249	0	0
Stage 1	319	319	-	708	708	-	-	-	-	-	-	-
Stage 2	746	720	-	334	331	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	~ 199	229	761	206	229	797	1266	-	-	1305	-	-
Stage 1	688	649	-	422	435	-	-	-	-	-	-	-
Stage 2	402	429	-	676	642	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 127	176	761	152	176	797	1266	-	-	1305	-	-
Mov Cap-2 Maneuver	~ 127	176	-	152	176	-	-	-	-	-	-	-
Stage 1	539	635	-	331	341	-	-	-	-	-	-	-
Stage 2	263	336	-	632	629	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	\$ 477.9	90.7	4.1	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1266	-	-	187	134	1305	-
HCM Lane V/C Ratio	0.186	-	-	0.89	1.878	0.018	-
HCM Control Delay (s)	8.5	0	-	90.7	\$ 477.9	7.8	0
HCM Lane LOS	A	A	-	F	F	A	A
HCM 95th %tile Q(veh)	0.7	-	-	6.7	19.5	0.1	-

Notes

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

Educational Use Only

HCM 2010 Signalized Intersection Summary

7: S State Rd/SR-198/S Main St/S State Rd/SR-198 & Woodland Hills Dr

4/5/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	24	21	21	85	301	50	691	1	95	414	2
Future Volume (veh/h)	2	24	21	21	85	301	50	691	1	95	414	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1900	1827	1827	1900	1827	1827	1827	1827	1827	1900
Adj Flow Rate, veh/h	3	32	28	28	115	407	68	935	1	129	560	3
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	0
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	65	155	136	252	61	216	464	880	748	308	1287	7
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.48	0.48	0.48	0.18	0.71	0.71
Sat Flow, veh/h	860	900	788	1312	354	1252	828	1827	1553	1740	1815	10
Grp Volume(v), veh/h	3	0	60	28	0	522	68	935	1	129	0	563
Grp Sat Flow(s),veh/h/ln	860	0	1688	1312	0	1606	828	1827	1553	1740	0	1825
Q Serve(g_s), s	0.0	0.0	3.4	2.1	0.0	19.0	5.1	53.0	0.0	7.2	0.0	14.3
Cycle Q Clear(g_c), s	19.0	0.0	3.4	5.4	0.0	19.0	5.1	53.0	0.0	7.2	0.0	14.3
Prop In Lane	1.00		0.47	1.00		0.78	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	65	0	292	252	0	277	464	880	748	308	0	1294
V/C Ratio(X)	0.05	0.00	0.21	0.11	0.00	1.88	0.15	1.06	0.00	0.42	0.00	0.44
Avail Cap(c_a), veh/h	65	0	292	252	0	277	464	880	748	308	0	1294
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	55.0	0.0	39.0	41.3	0.0	45.5	16.1	28.5	14.8	40.2	0.0	6.7
Incr Delay (d2), s/veh	0.1	0.0	0.1	0.1	0.0	410.2	0.7	48.2	0.0	4.1	0.0	1.1
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	0.1	0.0	1.6	0.8	0.0	40.0	1.3	38.4	0.0	3.8	0.0	7.4
LnGrp Delay(d),s/veh	55.1	0.0	39.2	41.4	0.0	455.7	16.8	76.7	14.8	44.3	0.0	7.8
LnGrp LOS	E		D	D		F	B	F	B	D		A
Approach Vol, veh/h		63			550			1004			692	
Approach Delay, s/veh		39.9			434.6			72.6			14.6	
Approach LOS		D			F			E			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	25.0	60.0		25.0		85.0		25.0				
Change Period (Y+Rc), s	5.5	7.0		6.0		7.0		6.0				
Max Green Setting (Gmax), s	19.5	53.0		19.0		53.0		19.0				
Max Q Clear Time (g_c+I1), s	9.2	55.0		21.0		16.3		21.0				
Green Ext Time (p_c), s	0.2	0.0		0.0		3.8		0.0				

Intersection Summary

HCM 2010 Ctrl Delay 140.6

HCM 2010 LOS F

Educational Use Only

HCM 2010 Signalized Intersection Summary

10: Arrowhead Trail Rd/SR-164 & Del Monte Rd

4/5/2018

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	118	2	53	8	2	2	130	197	2	2	174	293
Future Volume (veh/h)	118	2	53	8	2	2	130	197	2	2	174	293
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1827	1827	1827	1827	1827	1827	1827
Adj Flow Rate, veh/h	160	3	72	11	3	3	176	267	3	3	235	396
Adj No. of Lanes	1	1	1	0	1	1	1	1	1	1	1	1
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	348	365	311	204	56	229	369	837	711	471	837	711
Arrive On Green	0.20	0.20	0.20	0.15	0.15	0.15	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1740	1827	1553	1381	377	1553	777	1827	1553	1084	1827	1553
Grp Volume(v), veh/h	160	3	72	14	0	3	176	267	3	3	235	396
Grp Sat Flow(s),veh/h/ln	1740	1827	1553	1758	0	1553	777	1827	1553	1084	1827	1553
Q Serve(g_s), s	7.7	0.1	3.7	0.7	0.0	0.2	17.3	8.8	0.1	0.2	7.6	17.6
Cycle Q Clear(g_c), s	7.7	0.1	3.7	0.7	0.0	0.2	24.9	8.8	0.1	9.0	7.6	17.6
Prop In Lane	1.00		1.00	0.79		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	348	365	311	259	0	229	369	837	711	471	837	711
V/C Ratio(X)	0.46	0.01	0.23	0.05	0.00	0.01	0.48	0.32	0.00	0.01	0.28	0.56
Avail Cap(c_a), veh/h	348	365	311	259	0	229	369	837	711	471	837	711
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	30.5	31.9	34.8	0.0	34.6	23.8	16.3	14.0	19.2	16.0	18.7
Incr Delay (d2), s/veh	4.3	0.0	1.7	0.4	0.0	0.1	4.4	1.0	0.0	0.0	0.8	3.1
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	4.1	0.1	1.7	0.3	0.0	0.1	4.2	4.7	0.0	0.1	4.0	8.1
LnGrp Delay(d),s/veh	37.8	30.5	33.6	35.2	0.0	34.7	28.1	17.4	14.0	19.2	16.9	21.9
LnGrp LOS	D	C	C	D		C	C	B	B	B	B	C
Approach Vol, veh/h		235			17			446			634	
Approach Delay, s/veh		36.4			35.1			21.6			20.0	
Approach LOS		D			D			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		50.0		25.0		50.0		20.0				
Change Period (Y+Rc), s		6.5		6.0		6.5		6.0				
Max Green Setting (Gmax), s		43.5		19.0		43.5		14.0				
Max Q Clear Time (g_c+I1), s		26.9		9.7		19.6		2.7				
Green Ext Time (p_c), s		2.1		0.2		2.2		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			23.6									
HCM 2010 LOS			C									

Educational Use Only

Intersection

Int Delay, s/veh 0.3

Movement	NWL	NWR	NET	NER	SWL	SWT
Traffic Vol, veh/h	3	7	337	4	15	482
Future Vol, veh/h	3	7	337	4	15	482
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	4	9	456	5	20	652

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1152	459	0
Stage 1	459	-	-
Stage 2	693	-	-
Critical Hdwy	6.44	6.24	4.14
Critical Hdwy Stg 1	5.44	-	-
Critical Hdwy Stg 2	5.44	-	-
Follow-up Hdwy	3.536	3.336	2.236
Pot Cap-1 Maneuver	217	598	1090
Stage 1	632	-	-
Stage 2	493	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	213	598	1090
Mov Cap-2 Maneuver	345	-	-
Stage 1	632	-	-
Stage 2	484	-	-

Approach	NW	NE	SW
HCM Control Delay, s	12.6	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	490	1090
HCM Lane V/C Ratio	-	-	0.028	0.019
HCM Control Delay (s)	-	-	12.6	8.4
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Educational Use Only

2022 Plus Project Conditions Report

HCM 2010 Signalized Intersection Summary

3: S Main St/SR-198 & Arrowhead Trail Rd/SR-164

4/5/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	 			 	 			
Traffic Volume (veh/h)	424	28	85	1106	594	513		
Future Volume (veh/h)	424	28	85	1106	594	513		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827		
Adj Flow Rate, veh/h	499	38	115	1301	699	604		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85		
Percent Heavy Veh, %	4	4	4	4	4	4		
Cap, veh/h	600	276	333	2333	2333	1044		
Arrive On Green	0.18	0.18	0.67	0.67	0.67	0.67		
Sat Flow, veh/h	3375	1553	413	3563	3563	1553		
Grp Volume(v), veh/h	499	38	115	1301	699	604		
Grp Sat Flow(s),veh/h/ln	1688	1553	413	1736	1736	1553		
Q Serve(g_s), s	11.4	1.7	12.7	15.7	6.6	16.7		
Cycle Q Clear(g_c), s	11.4	1.7	19.3	15.7	6.6	16.7		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	600	276	333	2333	2333	1044		
V/C Ratio(X)	0.83	0.14	0.34	0.56	0.30	0.58		
Avail Cap(c_a), veh/h	1013	466	333	2333	2333	1044		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	31.7	27.7	9.3	6.9	5.4	7.0		
Incr Delay (d2), s/veh	1.2	0.1	2.8	1.0	0.3	2.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.4	0.7	1.7	7.7	3.2	7.7		
LnGrp Delay(d),s/veh	32.9	27.8	12.2	7.8	5.7	9.4		
LnGrp LOS	C	C	B	A	A	A		
Approach Vol, veh/h	537			1416	1303			
Approach Delay, s/veh	32.5			8.2	7.4			
Approach LOS	C			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		59.8		20.2		59.8		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		44.0		24.0		44.0		
Max Q Clear Time (g_c+I1), s		21.3		13.4		18.7		
Green Ext Time (p_c), s		7.8		0.8		8.0		
Intersection Summary								
HCM 2010 Ctrl Delay			11.9					
HCM 2010 LOS			B					

Educational Use Only

Intersection

Int Delay, s/veh 113.6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Traffic Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
Future Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
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	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	222	22	8	91	45	31	235	226	23	23	261	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1065	1039	273	1042	1039	237	285	0	0	249	0	0
Stage 1	319	319	-	708	708	-	-	-	-	-	-	-
Stage 2	746	720	-	334	331	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	~ 199	229	761	206	229	797	1266	-	-	1305	-	-
Stage 1	688	649	-	422	435	-	-	-	-	-	-	-
Stage 2	402	429	-	676	642	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 127	176	761	152	176	797	1266	-	-	1305	-	-
Mov Cap-2 Maneuver	~ 127	176	-	152	176	-	-	-	-	-	-	-
Stage 1	539	635	-	331	341	-	-	-	-	-	-	-
Stage 2	263	336	-	632	629	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	\$ 477.9	90.7	4.1	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1266	-	-	187	134	1305	-
HCM Lane V/C Ratio	0.186	-	-	0.89	1.878	0.018	-
HCM Control Delay (s)	8.5	0	-	90.7	\$ 477.9	7.8	0
HCM Lane LOS	A	A	-	F	F	A	A
HCM 95th %tile Q(veh)	0.7	-	-	6.7	19.5	0.1	-

Notes

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

Educational Use Only

HCM 2010 Signalized Intersection Summary

7: S State Rd/SR-198/S Main St/S State Rd/SR-198 & Woodland Hills Dr

4/5/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	24	21	21	85	349	50	800	1	119	495	2
Future Volume (veh/h)	2	24	21	21	85	349	50	800	1	119	495	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1900	1827	1827	1900	1827	1827	1827	1827	1827	1900
Adj Flow Rate, veh/h	3	32	28	28	115	411	68	941	1	140	582	3
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	0
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	65	155	136	252	61	217	456	880	748	308	1288	7
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.48	0.48	0.48	0.18	0.71	0.71
Sat Flow, veh/h	856	900	788	1312	351	1255	811	1827	1553	1740	1816	9
Grp Volume(v), veh/h	3	0	60	28	0	526	68	941	1	140	0	585
Grp Sat Flow(s),veh/h/ln	856	0	1688	1312	0	1606	811	1827	1553	1740	0	1825
Q Serve(g_s), s	0.0	0.0	3.4	2.1	0.0	19.0	5.2	53.0	0.0	7.9	0.0	15.1
Cycle Q Clear(g_c), s	19.0	0.0	3.4	5.4	0.0	19.0	5.2	53.0	0.0	7.9	0.0	15.1
Prop In Lane	1.00		0.47	1.00		0.78	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	65	0	292	252	0	277	456	880	748	308	0	1294
V/C Ratio(X)	0.05	0.00	0.21	0.11	0.00	1.90	0.15	1.07	0.00	0.45	0.00	0.45
Avail Cap(c_a), veh/h	65	0	292	252	0	277	456	880	748	308	0	1294
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	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	55.0	0.0	39.0	41.3	0.0	45.5	16.1	28.5	14.8	40.5	0.0	6.8
Incr Delay (d2), s/veh	0.1	0.0	0.1	0.1	0.0	416.8	0.7	50.5	0.0	4.8	0.0	1.1
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	0.1	0.0	1.6	0.8	0.0	40.5	1.3	39.0	0.0	4.2	0.0	7.9
LnGrp Delay(d),s/veh	55.1	0.0	39.2	41.4	0.0	462.3	16.8	79.0	14.8	45.2	0.0	8.0
LnGrp LOS	E		D	D		F	B	F	B	D		A
Approach Vol, veh/h	63			554			1010			725		
Approach Delay, s/veh	39.9			441.0			74.8			15.2		
Approach LOS	D			F			E			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	25.0	60.0		25.0		85.0		25.0				
Change Period (Y+Rc), s	5.5	7.0		6.0		7.0		6.0				
Max Green Setting (Gmax), s	19.5	53.0		19.0		53.0		19.0				
Max Q Clear Time (g_c+I1), s	9.9	55.0		21.0		17.1		21.0				
Green Ext Time (p_c), s	0.2	0.0		0.0		3.9		0.0				

Intersection Summary

HCM 2010 Ctrl Delay 141.7

HCM 2010 LOS F

Educational Use Only

HCM 2010 Signalized Intersection Summary

10: Arrowhead Trail Rd/SR-164 & Del Monte Rd

4/5/2018

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	118	4	53	17	9	11	130	197	4	5	174	293
Future Volume (veh/h)	118	4	53	17	9	11	130	197	4	5	174	293
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1827	1827	1827	1827	1827	1827	1827
Adj Flow Rate, veh/h	160	5	72	20	11	13	176	267	5	6	235	396
Adj No. of Lanes	1	1	1	0	1	1	1	1	1	1	1	1
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	348	365	311	168	93	229	369	837	711	471	837	711
Arrive On Green	0.20	0.20	0.20	0.15	0.15	0.15	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1740	1827	1553	1142	628	1553	777	1827	1553	1082	1827	1553
Grp Volume(v), veh/h	160	5	72	31	0	13	176	267	5	6	235	396
Grp Sat Flow(s),veh/h/ln	1740	1827	1553	1770	0	1553	777	1827	1553	1082	1827	1553
Q Serve(g_s), s	7.7	0.2	3.7	1.4	0.0	0.7	17.3	8.8	0.2	0.3	7.6	17.6
Cycle Q Clear(g_c), s	7.7	0.2	3.7	1.4	0.0	0.7	24.9	8.8	0.2	9.2	7.6	17.6
Prop In Lane	1.00		1.00	0.65		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	348	365	311	261	0	229	369	837	711	471	837	711
V/C Ratio(X)	0.46	0.01	0.23	0.12	0.00	0.06	0.48	0.32	0.01	0.01	0.28	0.56
Avail Cap(c_a), veh/h	348	365	311	261	0	229	369	837	711	471	837	711
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	30.5	31.9	35.1	0.0	34.8	23.8	16.3	14.0	19.3	16.0	18.7
Incr Delay (d2), s/veh	4.3	0.1	1.7	0.9	0.0	0.5	4.4	1.0	0.0	0.0	0.8	3.1
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	4.1	0.1	1.7	0.8	0.0	0.3	4.2	4.7	0.1	0.1	4.0	8.1
LnGrp Delay(d),s/veh	37.8	30.6	33.6	36.1	0.0	35.3	28.1	17.4	14.0	19.3	16.9	21.9
LnGrp LOS	D	C	C	D		D	C	B	B	B	B	C
Approach Vol, veh/h	237			44			448			637		
Approach Delay, s/veh	36.4			35.8			21.5			20.0		
Approach LOS	D			D			C			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	50.0		25.0		50.0		20.0					
Change Period (Y+Rc), s	6.5		6.0		6.5		6.0					
Max Green Setting (Gmax), s	43.5		19.0		43.5		14.0					
Max Q Clear Time (g_c+I1), s	26.9		9.7		19.6		3.4					
Green Ext Time (p_c), s	2.2		0.2		2.2		0.0					
Intersection Summary												
HCM 2010 Ctrl Delay	23.9											
HCM 2010 LOS	C											

Educational Use Only

Intersection

Int Delay, s/veh 0.6

Movement	NWL	NWR	NET	NER	SWL	SWT
Traffic Vol, veh/h	3	31	397	4	24	557
Future Vol, veh/h	3	31	397	4	24	557
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	4	36	467	5	28	655

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1182	470	0
Stage 1	470	-	-
Stage 2	712	-	-
Critical Hdwy	6.44	6.24	4.14
Critical Hdwy Stg 1	5.44	-	-
Critical Hdwy Stg 2	5.44	-	-
Follow-up Hdwy	3.536	3.336	2.236
Pot Cap-1 Maneuver	208	589	1079
Stage 1	625	-	-
Stage 2	483	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	203	589	1079
Mov Cap-2 Maneuver	335	-	-
Stage 1	625	-	-
Stage 2	470	-	-

Approach	NW	NE	SW
HCM Control Delay, s	12.1	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	547	1079
HCM Lane V/C Ratio	-	-	0.074	0.026
HCM Control Delay (s)	-	-	12.1	8.4
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1

Educational Use Only

Intersection

Int Delay, s/veh 0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	8	8	1167	2	3	613
Future Vol, veh/h	8	8	1167	2	3	613
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	9	9	1373	2	4	721

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2102	1374	0
Stage 1	1374	-	-
Stage 2	728	-	-
Critical Hdwy	6.44	6.24	4.14
Critical Hdwy Stg 1	5.44	-	-
Critical Hdwy Stg 2	5.44	-	-
Follow-up Hdwy	3.536	3.336	2.236
Pot Cap-1 Maneuver	56	176	493
Stage 1	233	-	-
Stage 2	474	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	55	176	493
Mov Cap-2 Maneuver	164	-	-
Stage 1	233	-	-
Stage 2	467	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.8	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	170	493
HCM Lane V/C Ratio	-	-	0.111	0.007
HCM Control Delay (s)	-	-	28.8	12.4
HCM Lane LOS	-	-	D	B
HCM 95th %tile Q(veh)	-	-	0.4	0

Educational Use Only

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	15	0	13	8	0	9	4	1145	2	2	614	5
Future Vol, veh/h	15	0	13	8	0	9	4	1145	2	2	614	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	-	-	-	-	-	-	100	-	-	100	-	-
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	18	0	15	9	0	11	5	1347	2	2	722	6
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2093	2089	725	2096	2091	1348	728	0	0	1349	0	0
Stage 1	730	730	-	1358	1358	-	-	-	-	-	-	-
Stage 2	1363	1359	-	738	733	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	38	52	422	38	52	183	866	-	-	504	-	-
Stage 1	411	425	-	182	215	-	-	-	-	-	-	-
Stage 2	181	215	-	407	423	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	36	51	422	36	51	183	866	-	-	504	-	-
Mov Cap-2 Maneuver	36	51	-	36	51	-	-	-	-	-	-	-
Stage 1	409	423	-	181	214	-	-	-	-	-	-	-
Stage 2	170	214	-	391	421	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	112.8			86.8			0			0		
HCM LOS	F			F								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	866	-	-	63	63	504	-	-				
HCM Lane V/C Ratio	0.005	-	-	0.523	0.317	0.005	-	-				
HCM Control Delay (s)	9.2	-	-	112.8	86.8	12.2	-	-				
HCM Lane LOS	A	-	-	F	F	B	-	-				
HCM 95th %tile Q(veh)	0	-	-	2.1	1.2	0	-	-				

Educational Use Only

2027 Background Report

HCM 2010 Signalized Intersection Summary

3: S Main St/S State Rd/SR-198/S Main St/SR-198 & Arrowhead Trail Rd/SR-164

4/5/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	341	28	85	934	508	437		
Future Volume (veh/h)	341	28	85	934	508	437		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827		
Adj Flow Rate, veh/h	550	45	137	1505	819	704		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85		
Percent Heavy Veh, %	4	4	4	4	4	4		
Cap, veh/h	652	300	274	2280	2280	1020		
Arrive On Green	0.19	0.19	0.66	0.66	0.66	0.66		
Sat Flow, veh/h	3375	1553	334	3563	3563	1553		
Grp Volume(v), veh/h	550	45	137	1505	819	704		
Grp Sat Flow(s),veh/h/ln	1688	1553	334	1736	1736	1553		
Q Serve(g_s), s	12.6	1.9	24.9	21.0	8.5	22.8		
Cycle Q Clear(g_c), s	12.6	1.9	33.4	21.0	8.5	22.8		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	652	300	274	2280	2280	1020		
V/C Ratio(X)	0.84	0.15	0.50	0.66	0.36	0.69		
Avail Cap(c_a), veh/h	1013	466	274	2280	2280	1020		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.70	0.70	1.00	1.00		
Uniform Delay (d), s/veh	31.1	26.8	13.7	8.3	6.2	8.6		
Incr Delay (d2), s/veh	2.3	0.1	4.5	1.1	0.4	3.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.0	0.8	2.6	10.2	4.1	10.7		
LnGrp Delay(d),s/veh	33.4	26.9	18.1	9.4	6.6	12.4		
LnGrp LOS	C	C	B	A	A	B		
Approach Vol, veh/h	595			1642	1523			
Approach Delay, s/veh	32.9			10.1	9.3			
Approach LOS	C			B	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		58.6		21.4		58.6		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		44.0		24.0		44.0		
Max Q Clear Time (g_c+l1), s		35.4		14.6		24.8		
Green Ext Time (p_c), s		5.8		0.9		9.7		

Intersection Summary

HCM 2010 Ctrl Delay 13.4

HCM 2010 LOS B

Educational Use Only

Intersection

Int Delay, s/veh 351.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Traffic Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
Future Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
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	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	264	26	10	108	53	37	280	269	27	27	311	29

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1269	1237	326	1242	1239	283	340	0	0	297	0	0
Stage 1	380	380	-	844	844	-	-	-	-	-	-	-
Stage 2	889	857	-	398	395	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	~ 144	174	711	150	174	751	1208	-	-	1253	-	-
Stage 1	638	610	-	355	376	-	-	-	-	-	-	-
Stage 2	335	371	-	624	601	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 71	122	711	~ 96	122	751	1208	-	-	1253	-	-
Mov Cap-2 Maneuver	~ 71	122	-	~ 96	122	-	-	-	-	-	-	-
Stage 1	460	594	-	256	271	-	-	-	-	-	-	-
Stage 2	~ 185	267	-	573	585	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	\$ 1438.1	\$ 372.4	4.3	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1208	-	-	123	76	1253	-
HCM Lane V/C Ratio	0.232	-	-	1.612	3.945	0.022	-
HCM Control Delay (s)	8.9	0	\$ 372.4	\$ 1438.1	7.9	0	-
HCM Lane LOS	A	A	-	F	F	A	A
HCM 95th %tile Q(veh)	0.9	-	-	14.5	31.5	0.1	-

Notes

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

Educational Use Only

HCM 2010 Signalized Intersection Summary

7: S State Rd/SR-198/S Main St/S State Rd/SR-198 & Woodland Hills Dr

4/5/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	24	21	21	85	301	50	691	1	95	414	2
Future Volume (veh/h)	2	24	21	21	85	301	50	691	1	95	414	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1900	1827	1827	1900	1827	1827	1827	1827	1827	1900
Adj Flow Rate, veh/h	3	39	34	34	137	485	81	1114	2	153	667	3
Adj No. of Lanes	1	1	0	1	1	0	1	2	1	1	2	0
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	65	156	136	241	61	216	427	1672	748	308	2513	11
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.48	0.48	0.48	0.18	0.71	0.71
Sat Flow, veh/h	784	902	786	1296	354	1252	749	3471	1553	1740	3544	16
Grp Volume(v), veh/h	3	0	73	34	0	622	81	1114	2	153	327	343
Grp Sat Flow(s),veh/h/ln	784	0	1688	1296	0	1606	749	1736	1553	1740	1736	1824
Q Serve(g_s), s	0.0	0.0	4.1	2.6	0.0	19.0	6.9	26.9	0.1	8.7	7.4	7.4
Cycle Q Clear(g_c), s	19.0	0.0	4.1	6.7	0.0	19.0	6.9	26.9	0.1	8.7	7.4	7.4
Prop In Lane	1.00		0.47	1.00		0.78	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	65	0	292	241	0	277	427	1672	748	308	1231	1293
V/C Ratio(X)	0.05	0.00	0.25	0.14	0.00	2.24	0.19	0.67	0.00	0.50	0.27	0.27
Avail Cap(c_a), veh/h	65	0	292	241	0	277	427	1672	748	308	1231	1293
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	1.00	1.00	1.00	1.00	0.94	0.94	0.94
Uniform Delay (d), s/veh	55.0	0.0	39.3	42.2	0.0	45.5	16.6	21.7	14.8	40.8	5.7	5.7
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.1	0.0	570.5	1.0	2.1	0.0	5.3	0.5	0.5
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	0.1	0.0	1.9	0.9	0.0	52.4	1.5	13.3	0.0	4.7	3.7	3.9
LnGrp Delay(d),s/veh	55.1	0.0	39.5	42.3	0.0	616.0	17.5	23.9	14.8	46.1	6.2	6.2
LnGrp LOS	E		D	D		F	B	C	B	D	A	A
Approach Vol, veh/h		76			656			1197			823	
Approach Delay, s/veh		40.1			586.3			23.4			13.6	
Approach LOS		D			F			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	25.0	60.0		25.0		85.0		25.0				
Change Period (Y+Rc), s	5.5	7.0		6.0		7.0		6.0				
Max Green Setting (Gmax), s	19.5	53.0		19.0		53.0		19.0				
Max Q Clear Time (g_c+I1), s	10.7	28.9		21.0		9.4		21.0				
Green Ext Time (p_c), s	0.2	4.8		0.0		5.0		0.0				

Intersection Summary

HCM 2010 Ctrl Delay 155.1

HCM 2010 LOS F

Educational Use Only

HCM 2010 Signalized Intersection Summary 10: Arrowhead Trail Rd/SR-164 & Del Monte Rd

4/5/2018

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	118	2	53	8	2	2	130	197	2	2	174	293
Future Volume (veh/h)	118	2	53	8	2	2	130	197	2	2	174	293
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1827	1827	1827	1827	1827	1827	1827
Adj Flow Rate, veh/h	190	3	85	13	3	3	210	318	3	3	280	472
Adj No. of Lanes	1	1	1	0	1	1	1	1	1	1	1	1
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	348	365	311	210	49	229	326	837	711	431	837	711
Arrive On Green	0.20	0.20	0.20	0.15	0.15	0.15	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1740	1827	1553	1426	329	1553	694	1827	1553	1034	1827	1553
Grp Volume(v), veh/h	190	3	85	16	0	3	210	318	3	3	280	472
Grp Sat Flow(s),veh/h/ln	1740	1827	1553	1756	0	1553	694	1827	1553	1034	1827	1553
Q Serve(g_s), s	9.3	0.1	4.4	0.7	0.0	0.2	26.4	10.9	0.1	0.2	9.3	22.5
Cycle Q Clear(g_c), s	9.3	0.1	4.4	0.7	0.0	0.2	35.7	10.9	0.1	11.0	9.3	22.5
Prop In Lane	1.00		1.00	0.81		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	348	365	311	259	0	229	326	837	711	431	837	711
V/C Ratio(X)	0.55	0.01	0.27	0.06	0.00	0.01	0.64	0.38	0.00	0.01	0.33	0.66
Avail Cap(c_a), veh/h	348	365	311	259	0	229	326	837	711	431	837	711
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	30.5	32.2	34.8	0.0	34.6	27.9	16.9	14.0	20.5	16.5	20.1
Incr Delay (d2), s/veh	6.0	0.0	2.2	0.5	0.0	0.1	9.5	1.3	0.0	0.0	1.1	4.8
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(50%),veh/ln	5.1	0.1	2.1	0.4	0.0	0.1	5.9	5.8	0.0	0.1	4.9	10.5
LnGrp Delay(d),s/veh	40.2	30.5	34.3	35.3	0.0	34.7	37.4	18.2	14.0	20.6	17.6	24.9
LnGrp LOS	D	C	C	D		C	D	B	B	C	B	C
Approach Vol, veh/h	278			19			531			755		
Approach Delay, s/veh	38.3			35.2			25.8			22.2		
Approach LOS	D			D			C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	50.0		25.0		50.0		20.0					
Change Period (Y+Rc), s	6.5		6.0		6.5		6.0					
Max Green Setting (Gmax), s	43.5		19.0		43.5		14.0					
Max Q Clear Time (g_c+I1), s	37.7		11.3		24.5		2.7					
Green Ext Time (p_c), s	1.9		0.2		2.9		0.0					

Intersection Summary

HCM 2010 Ctrl Delay 26.4

HCM 2010 LOS C

Educational Use Only

Intersection

Int Delay, s/veh 0.3

Movement	NWL	NWR	NET	NER	SWL	SWT
Traffic Vol, veh/h	3	7	337	4	15	482
Future Vol, veh/h	3	7	337	4	15	482
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	5	11	543	6	24	777

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1371	546	0
Stage 1	546	-	-
Stage 2	825	-	-
Critical Hdwy	6.44	6.24	4.14
Critical Hdwy Stg 1	5.44	-	-
Critical Hdwy Stg 2	5.44	-	-
Follow-up Hdwy	3.536	3.336	2.236
Pot Cap-1 Maneuver	159	534	1010
Stage 1	576	-	-
Stage 2	427	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	155	534	1010
Mov Cap-2 Maneuver	289	-	-
Stage 1	576	-	-
Stage 2	417	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.8	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	426	1010
HCM Lane V/C Ratio	-	-	0.038	0.024
HCM Control Delay (s)	-	-	13.8	8.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Educational Use Only

2027 Plus Project Conditions Report

HCM 2010 Signalized Intersection Summary

3: S Main St/SR-198 & Arrowhead Trail Rd/SR-164

4/5/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	 			 	 			
Traffic Volume (veh/h)	499	28	85	1312	706	609		
Future Volume (veh/h)	499	28	85	1312	706	609		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827		
Adj Flow Rate, veh/h	587	45	137	1544	831	716		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85		
Percent Heavy Veh, %	4	4	4	4	4	4		
Cap, veh/h	688	317	265	2243	2243	1003		
Arrive On Green	0.20	0.20	0.65	0.65	0.65	0.65		
Sat Flow, veh/h	3375	1553	327	3563	3563	1553		
Grp Volume(v), veh/h	587	45	137	1544	831	716		
Grp Sat Flow(s),veh/h/ln	1688	1553	327	1736	1736	1553		
Q Serve(g_s), s	13.4	1.9	26.9	22.7	8.9	24.2		
Cycle Q Clear(g_c), s	13.4	1.9	35.8	22.7	8.9	24.2		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	688	317	265	2243	2243	1003		
V/C Ratio(X)	0.85	0.14	0.52	0.69	0.37	0.71		
Avail Cap(c_a), veh/h	1013	466	265	2243	2243	1003		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	30.7	26.1	14.9	9.0	6.6	9.3		
Incr Delay (d2), s/veh	3.3	0.1	7.1	1.8	0.5	4.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.5	0.8	2.9	11.3	4.4	11.3		
LnGrp Delay(d),s/veh	34.0	26.2	22.0	10.8	7.1	13.6		
LnGrp LOS	C	C	C	B	A	B		
Approach Vol, veh/h	632			1681	1547			
Approach Delay, s/veh	33.4			11.7	10.1			
Approach LOS	C			B	B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		57.7		22.3		57.7		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		44.0		24.0		44.0		
Max Q Clear Time (g_c+l1), s		37.8		15.4		26.2		
Green Ext Time (p_c), s		4.6		0.9		9.6		
Intersection Summary								
HCM 2010 Ctrl Delay	14.6							
HCM 2010 LOS	B							

Educational Use Only

Intersection

Int Delay, s/veh 351.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Traffic Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
Future Vol, veh/h	164	16	6	67	33	23	174	167	17	17	193	18
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	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	264	26	10	108	53	37	280	269	27	27	311	29

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1269	1237	326	1242	1239	283	340	0	0	297	0	0
Stage 1	380	380	-	844	844	-	-	-	-	-	-	-
Stage 2	889	857	-	398	395	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	~ 144	174	711	150	174	751	1208	-	-	1253	-	-
Stage 1	638	610	-	355	376	-	-	-	-	-	-	-
Stage 2	335	371	-	624	601	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 71	122	711	~ 96	122	751	1208	-	-	1253	-	-
Mov Cap-2 Maneuver	~ 71	122	-	~ 96	122	-	-	-	-	-	-	-
Stage 1	460	594	-	256	271	-	-	-	-	-	-	-
Stage 2	~ 185	267	-	573	585	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	\$ 1438.1	\$ 372.4	4.3	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NERNWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	1208	-	-	123	76	1253	-
HCM Lane V/C Ratio	0.232	-	-	1.612	3.945	0.022	-
HCM Control Delay (s)	8.9	0	\$ 372.4	\$ 1438.1	7.9	0	-
HCM Lane LOS	A	A	-	F	F	A	A
HCM 95th %tile Q(veh)	0.9	-	-	14.5	31.5	0.1	-

Notes

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

Educational Use Only

HCM 2010 Signalized Intersection Summary

7: S State Rd/SR-198/S Main St/S State Rd/SR-198 & Woodland Hills Dr

4/5/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	24	21	21	85	415	50	952	1	140	586	2
Future Volume (veh/h)	2	24	21	21	85	415	50	952	1	140	586	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1900	1827	1827	1900	1827	1827	1827	1827	1827	1900
Adj Flow Rate, veh/h	3	39	34	34	137	488	81	1120	2	165	689	3
Adj No. of Lanes	1	1	0	1	1	0	1	2	1	1	2	0
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	65	156	136	241	61	217	419	1672	748	308	2513	11
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.48	0.48	0.48	0.18	0.71	0.71
Sat Flow, veh/h	781	902	786	1296	352	1254	734	3471	1553	1740	3544	15
Grp Volume(v), veh/h	3	0	73	34	0	625	81	1120	2	165	337	355
Grp Sat Flow(s),veh/h/ln	781	0	1688	1296	0	1606	734	1736	1553	1740	1736	1824
Q Serve(g_s), s	0.0	0.0	4.1	2.6	0.0	19.0	7.1	27.2	0.1	9.5	7.7	7.7
Cycle Q Clear(g_c), s	19.0	0.0	4.1	6.7	0.0	19.0	7.1	27.2	0.1	9.5	7.7	7.7
Prop In Lane	1.00		0.47	1.00		0.78	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	65	0	292	241	0	277	419	1672	748	308	1231	1294
V/C Ratio(X)	0.05	0.00	0.25	0.14	0.00	2.25	0.19	0.67	0.00	0.53	0.27	0.27
Avail Cap(c_a), veh/h	65	0	292	241	0	277	419	1672	748	308	1231	1294
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.0	0.0	39.3	42.2	0.0	45.5	16.6	21.8	14.8	41.1	5.8	5.8
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.1	0.0	575.5	1.0	2.2	0.0	6.5	0.6	0.5
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	0.1	0.0	1.9	0.9	0.0	52.7	1.5	13.4	0.0	5.1	3.8	4.0
LnGrp Delay(d),s/veh	55.1	0.0	39.5	42.3	0.0	621.0	17.6	24.0	14.8	47.6	6.3	6.3
LnGrp LOS	E		D	D		F	B	C	B	D	A	A
Approach Vol, veh/h		76			659			1203			857	
Approach Delay, s/veh		40.1			591.2			23.5			14.3	
Approach LOS		D			F			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	25.0	60.0		25.0		85.0		25.0				
Change Period (Y+Rc), s	5.5	7.0		6.0		7.0		6.0				
Max Green Setting (Gmax), s	19.5	53.0		19.0		53.0		19.0				
Max Q Clear Time (g_c+l1), s	11.5	29.2		21.0		9.7		21.0				
Green Ext Time (p_c), s	0.2	4.9		0.0		5.1		0.0				

Intersection Summary

HCM 2010 Ctrl Delay 155.0

HCM 2010 LOS F

Educational Use Only

HCM 2010 Signalized Intersection Summary

10: Arrowhead Trail Rd/SR-164 & Del Monte Rd

4/5/2018

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	118	5	53	19	10	12	130	197	5	6	174	293
Future Volume (veh/h)	118	5	53	19	10	12	130	197	5	6	174	293
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1827	1827	1827	1827	1827	1827	1827
Adj Flow Rate, veh/h	190	6	85	22	12	14	210	318	6	7	280	472
Adj No. of Lanes	1	1	1	0	1	1	1	1	1	1	1	1
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	348	365	311	169	92	229	326	837	711	430	837	711
Arrive On Green	0.20	0.20	0.20	0.15	0.15	0.15	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1740	1827	1553	1145	625	1553	694	1827	1553	1031	1827	1553
Grp Volume(v), veh/h	190	6	85	34	0	14	210	318	6	7	280	472
Grp Sat Flow(s),veh/h/ln	1740	1827	1553	1770	0	1553	694	1827	1553	1031	1827	1553
Q Serve(g_s), s	9.3	0.3	4.4	1.6	0.0	0.7	26.4	10.9	0.2	0.4	9.3	22.5
Cycle Q Clear(g_c), s	9.3	0.3	4.4	1.6	0.0	0.7	35.7	10.9	0.2	11.3	9.3	22.5
Prop In Lane	1.00		1.00	0.65		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	348	365	311	261	0	229	326	837	711	430	837	711
V/C Ratio(X)	0.55	0.02	0.27	0.13	0.00	0.06	0.64	0.38	0.01	0.02	0.33	0.66
Avail Cap(c_a), veh/h	348	365	311	261	0	229	326	837	711	430	837	711
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	30.5	32.2	35.2	0.0	34.8	27.9	16.9	14.0	20.6	16.5	20.1
Incr Delay (d2), s/veh	6.0	0.1	2.2	1.0	0.0	0.5	9.5	1.3	0.0	0.1	1.1	4.8
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(50%),veh/ln	5.1	0.1	2.1	0.8	0.0	0.3	5.9	5.8	0.1	0.1	4.9	10.5
LnGrp Delay(d),s/veh	40.2	30.6	34.3	36.2	0.0	35.4	37.4	18.2	14.0	20.7	17.6	24.9
LnGrp LOS	D	C	C	D		D	D	B	B	C	B	C
Approach Vol, veh/h	281			48			534			759		
Approach Delay, s/veh	38.2			36.0			25.7			22.2		
Approach LOS	D			D			C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	50.0		25.0		50.0		20.0					
Change Period (Y+Rc), s	6.5		6.0		6.5		6.0					
Max Green Setting (Gmax), s	43.5		19.0		43.5		14.0					
Max Q Clear Time (g_c+I1), s	37.7		11.3		24.5		3.6					
Green Ext Time (p_c), s	1.9		0.2		2.9		0.0					
Intersection Summary												
HCM 2010 Ctrl Delay	26.5											
HCM 2010 LOS	C											

Educational Use Only

Intersection

Int Delay, s/veh 0.6

Movement	NWL	NWR	NET	NER	SWL	SWT
Traffic Vol, veh/h	3	33	471	4	28	663
Future Vol, veh/h	3	33	471	4	28	663
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	5	39	554	6	33	780

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1403	557	0
Stage 1	557	-	-
Stage 2	846	-	-
Critical Hdwy	6.44	6.24	4.14
Critical Hdwy Stg 1	5.44	-	-
Critical Hdwy Stg 2	5.44	-	-
Follow-up Hdwy	3.536	3.336	2.236
Pot Cap-1 Maneuver	152	526	1000
Stage 1	570	-	-
Stage 2	417	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	147	526	1000
Mov Cap-2 Maneuver	280	-	-
Stage 1	570	-	-
Stage 2	403	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.3	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	479	1000
HCM Lane V/C Ratio	-	-	0.091	0.033
HCM Control Delay (s)	-	-	13.3	8.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1

Educational Use Only

Intersection

Int Delay, s/veh 0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	8	8	1406	2	3	741
Future Vol, veh/h	8	8	1406	2	3	741
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	9	9	1654	2	4	872

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2098	828	0
Stage 1	1655	-	-
Stage 2	443	-	-
Critical Hdwy	6.88	6.98	4.18
Critical Hdwy Stg 1	5.88	-	-
Critical Hdwy Stg 2	5.88	-	-
Follow-up Hdwy	3.54	3.34	2.24
Pot Cap-1 Maneuver	44	310	376
Stage 1	138	-	-
Stage 2	608	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	43	310	376
Mov Cap-2 Maneuver	43	-	-
Stage 1	138	-	-
Stage 2	595	-	-

Approach	WB	NB	SB
HCM Control Delay, s	67.3	0	0.3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 76	376	-
HCM Lane V/C Ratio	-	- 0.248	0.009	-
HCM Control Delay (s)	-	- 67.3	14.7	0.2
HCM Lane LOS	-	- F	B	A
HCM 95th %tile Q(veh)	-	- 0.9	0	-

Educational Use Only

Intersection

Int Delay, s/veh 1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	15	0	13	8	0	9	4	1384	2	2	742	5
Future Vol, veh/h	15	0	13	8	0	9	4	1384	2	2	742	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	-	-	-	-	-	-	-	-	-	-	-	-
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	18	0	15	9	0	11	5	1628	2	2	873	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1705	2521	439	2080	2523	815	879	0	0	1631	0	0
Stage 1	881	881	-	1639	1639	-	-	-	-	-	-	-
Stage 2	824	1640	-	441	884	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.58	6.98	7.58	6.58	6.98	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.58	5.58	-	6.58	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.58	-	6.58	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4.04	3.34	3.54	4.04	3.34	2.24	-	-	2.24	-	-
Pot Cap-1 Maneuver	58	27	560	30	27	316	752	-	-	385	-	-
Stage 1	304	358	-	102	154	-	-	-	-	-	-	-
Stage 2	329	153	-	560	357	-	-	-	-	-	-	-
Platoon blocked, %							-	-	-	-	-	-
Mov Cap-1 Maneuver	53	25	560	27	25	316	752	-	-	385	-	-
Mov Cap-2 Maneuver	53	25	-	27	25	-	-	-	-	-	-	-
Stage 1	282	354	-	95	143	-	-	-	-	-	-	-
Stage 2	295	142	-	539	353	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	65.5	112.3	0.3	0.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	752	-	-	91	52	385	-	-
HCM Lane V/C Ratio	0.006	-	-	0.362	0.385	0.006	-	-
HCM Control Delay (s)	9.8	0.3	-	65.5	112.3	14.4	0.1	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	1.4	1.4	0	-	-

Educational Use Only

2027 Plus Project Conditions -Mitigated Report

HCM 2010 Signalized Intersection Summary

3: S Main St/SR-198 & Arrowhead Trail Rd/SR-164

4/6/2018

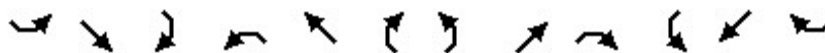
								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	499	28	85	1312	706	609		
Future Volume (veh/h)	499	28	85	1312	706	609		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1827	1827		
Adj Flow Rate, veh/h	587	45	137	1544	831	716		
Adj No. of Lanes	2	1	1	2	2	1		
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85		
Percent Heavy Veh, %	4	4	4	4	4	4		
Cap, veh/h	688	317	265	2243	2243	1003		
Arrive On Green	0.20	0.20	0.65	0.65	0.65	0.65		
Sat Flow, veh/h	3375	1553	327	3563	3563	1553		
Grp Volume(v), veh/h	587	45	137	1544	831	716		
Grp Sat Flow(s),veh/h/ln	1688	1553	327	1736	1736	1553		
Q Serve(g_s), s	13.4	1.9	26.9	22.7	8.9	24.2		
Cycle Q Clear(g_c), s	13.4	1.9	35.8	22.7	8.9	24.2		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	688	317	265	2243	2243	1003		
V/C Ratio(X)	0.85	0.14	0.52	0.69	0.37	0.71		
Avail Cap(c_a), veh/h	1013	466	265	2243	2243	1003		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	30.7	26.1	14.9	9.0	6.6	9.3		
Incr Delay (d2), s/veh	3.3	0.1	7.1	1.8	0.5	4.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.5	0.8	2.9	11.3	4.4	11.3		
LnGrp Delay(d),s/veh	34.0	26.2	22.0	10.8	7.1	13.6		
LnGrp LOS	C	C	C	B	A	B		
Approach Vol, veh/h	632			1681	1547			
Approach Delay, s/veh	33.4			11.7	10.1			
Approach LOS	C			B	B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		57.7		22.3		57.7		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		44.0		24.0		44.0		
Max Q Clear Time (g_c+I1), s		37.8		15.4		26.2		
Green Ext Time (p_c), s		4.6		0.9		9.6		
Intersection Summary								
HCM 2010 Ctrl Delay			14.6					
HCM 2010 LOS			B					

Educational Use Only

HCM 2010 Signalized Intersection Summary

6: Arrowhead Trail Rd/SR-164 & Woodland Hills Dr/S Mill Rd

4/6/2018



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	164	16	6	67	33	23	174	167	17	17	193	18
Future Volume (veh/h)	164	16	6	67	33	23	174	167	17	17	193	18
Number	1	6	16	5	2	12	7	4	14	3	8	18
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
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1827	1900	1900	1827	1900
Adj Flow Rate, veh/h	264	26	10	108	53	37	280	269	27	27	311	29
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	634	58	19	434	205	118	368	267	25	110	631	56
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	1209	146	47	775	513	296	622	666	63	60	1577	140
Grp Volume(v), veh/h	300	0	0	198	0	0	576	0	0	367	0	0
Grp Sat Flow(s),veh/h/ln	1401	0	0	1584	0	0	1352	0	0	1777	0	0
Q Serve(g_s), s	3.1	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.5	0.0	0.0	3.4	0.0	0.0	18.0	0.0	0.0	6.9	0.0	0.0
Prop In Lane	0.88		0.03	0.55		0.19	0.49		0.05	0.07		0.08
Lane Grp Cap(c), veh/h	711	0	0	757	0	0	660	0	0	797	0	0
V/C Ratio(X)	0.42	0.00	0.00	0.26	0.00	0.00	0.87	0.00	0.00	0.46	0.00	0.00
Avail Cap(c_a), veh/h	711	0	0	757	0	0	660	0	0	797	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	0.83	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.9	0.0	0.0	9.1	0.0	0.0	13.8	0.0	0.0	10.2	0.0	0.0
Incr Delay (d2), s/veh	1.8	0.0	0.0	0.7	0.0	0.0	12.4	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	3.1	0.0	0.0	1.8	0.0	0.0	9.3	0.0	0.0	3.5	0.0	0.0
LnGrp Delay(d),s/veh	11.7	0.0	0.0	9.8	0.0	0.0	26.2	0.0	0.0	10.6	0.0	0.0
LnGrp LOS	B			A			C			B		
Approach Vol, veh/h	300			198			576			367		
Approach Delay, s/veh	11.7			9.8			26.2			10.6		
Approach LOS	B			A			C			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		5.4		20.0		8.5		8.9				
Green Ext Time (p_c), s		2.5		0.0		2.2		4.0				

Intersection Summary

HCM 2010 Ctrl Delay 17.0

HCM 2010 LOS B

Educational Use Only

HCM 2010 Signalized Intersection Summary

7: S State Rd/SR-198/S Main St/S State Rd/SR-198 & Woodland Hills Dr

4/6/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	24	21	21	85	415	50	952	1	140	586	2
Future Volume (veh/h)	2	24	21	21	85	415	50	952	1	140	586	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1900	1900	1827	1827	1827	1827	1827	1827	1827	1900
Adj Flow Rate, veh/h	3	39	34	34	137	488	81	1120	2	165	689	3
Adj No. of Lanes	1	1	0	0	1	2	1	2	1	1	2	0
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	131	156	136	80	258	472	419	1672	748	308	2513	11
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.48	0.48	0.48	0.18	0.71	0.71
Sat Flow, veh/h	781	902	786	236	1495	2733	734	3471	1553	1740	3544	15
Grp Volume(v), veh/h	3	0	73	171	0	488	81	1120	2	165	337	355
Grp Sat Flow(s),veh/h/ln	781	0	1688	1730	0	1367	734	1736	1553	1740	1736	1824
Q Serve(g_s), s	0.4	0.0	4.1	4.1	0.0	19.0	7.1	27.2	0.1	9.5	7.7	7.7
Cycle Q Clear(g_c), s	10.1	0.0	4.1	9.7	0.0	19.0	7.1	27.2	0.1	9.5	7.7	7.7
Prop In Lane	1.00		0.47	0.20		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	131	0	292	338	0	472	419	1672	748	308	1231	1294
V/C Ratio(X)	0.02	0.00	0.25	0.51	0.00	1.03	0.19	0.67	0.00	0.53	0.27	0.27
Avail Cap(c_a), veh/h	131	0	292	338	0	472	419	1672	748	308	1231	1294
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)	0.76	0.00	0.76	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.3	0.0	39.3	41.6	0.0	45.5	16.6	21.8	14.8	41.1	5.8	5.8
Incr Delay (d2), s/veh	0.0	0.0	0.1	0.5	0.0	50.4	1.0	2.2	0.0	6.5	0.6	0.5
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	0.1	0.0	1.9	4.8	0.0	10.5	1.5	13.4	0.0	5.1	3.8	4.0
LnGrp Delay(d),s/veh	46.3	0.0	39.5	42.1	0.0	95.9	17.6	24.0	14.8	47.6	6.3	6.3
LnGrp LOS	D		D	D		F	B	C	B	D	A	A
Approach Vol, veh/h	76			659			1203			857		
Approach Delay, s/veh	39.7			81.9			23.5			14.3		
Approach LOS	D			F			C			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	25.0	60.0		25.0		85.0		25.0				
Change Period (Y+Rc), s	5.5	7.0		6.0		7.0		6.0				
Max Green Setting (Gmax), s	19.5	53.0		19.0		53.0		19.0				
Max Q Clear Time (g_c+I1), s	29.2	29.2		12.1		9.7		21.0				
Green Ext Time (p_c), s	0.2	4.9		1.3		5.1		0.0				

Intersection Summary

HCM 2010 Ctrl Delay 34.9

HCM 2010 LOS C

Educational Use Only

HCM 2010 Signalized Intersection Summary

10: Arrowhead Trail Rd/SR-164 & Del Monte Rd

4/6/2018

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	118	5	53	19	10	12	130	197	5	6	174	293
Future Volume (veh/h)	118	5	53	19	10	12	130	197	5	6	174	293
Number	7	4	14	3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1827	1827	1827	1827	1827	1827	1827
Adj Flow Rate, veh/h	190	6	85	22	12	14	210	318	6	7	280	472
Adj No. of Lanes	1	1	1	0	1	1	1	1	1	1	1	1
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, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	348	365	311	169	92	229	326	837	711	430	837	711
Arrive On Green	0.20	0.20	0.20	0.15	0.15	0.15	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1740	1827	1553	1145	625	1553	694	1827	1553	1031	1827	1553
Grp Volume(v), veh/h	190	6	85	34	0	14	210	318	6	7	280	472
Grp Sat Flow(s),veh/h/ln	1740	1827	1553	1770	0	1553	694	1827	1553	1031	1827	1553
Q Serve(g_s), s	9.3	0.3	4.4	1.6	0.0	0.7	26.4	10.9	0.2	0.4	9.3	22.5
Cycle Q Clear(g_c), s	9.3	0.3	4.4	1.6	0.0	0.7	35.7	10.9	0.2	11.3	9.3	22.5
Prop In Lane	1.00		1.00	0.65		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	348	365	311	261	0	229	326	837	711	430	837	711
V/C Ratio(X)	0.55	0.02	0.27	0.13	0.00	0.06	0.64	0.38	0.01	0.02	0.33	0.66
Avail Cap(c_a), veh/h	348	365	311	261	0	229	326	837	711	430	837	711
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	30.5	32.2	35.2	0.0	34.8	27.9	16.9	14.0	20.6	16.5	20.1
Incr Delay (d2), s/veh	6.0	0.1	2.2	1.0	0.0	0.5	9.5	1.3	0.0	0.1	1.1	4.8
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(50%),veh/ln	5.1	0.1	2.1	0.8	0.0	0.3	5.9	5.8	0.1	0.1	4.9	10.5
LnGrp Delay(d),s/veh	40.2	30.6	34.3	36.2	0.0	35.4	37.4	18.2	14.0	20.7	17.6	24.9
LnGrp LOS	D	C	C	D		D	D	B	B	C	B	C
Approach Vol, veh/h	281			48			534			759		
Approach Delay, s/veh	38.2			36.0			25.7			22.2		
Approach LOS	D			D			C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	50.0		25.0		50.0		20.0					
Change Period (Y+Rc), s	6.5		6.0		6.5		6.0					
Max Green Setting (Gmax), s	43.5		19.0		43.5		14.0					
Max Q Clear Time (g_c+I1), s	37.7		11.3		24.5		3.6					
Green Ext Time (p_c), s	1.9		0.2		2.9		0.0					

Intersection Summary

HCM 2010 Ctrl Delay 26.5

HCM 2010 LOS C

Educational Use Only

Intersection

Int Delay, s/veh 0.6

Movement	NWL	NWR	NET	NER	SWL	SWT
Traffic Vol, veh/h	3	33	471	4	28	663
Future Vol, veh/h	3	33	471	4	28	663
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	5	39	554	6	33	780

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1403	557	0
Stage 1	557	-	-
Stage 2	846	-	-
Critical Hdwy	6.44	6.24	4.14
Critical Hdwy Stg 1	5.44	-	-
Critical Hdwy Stg 2	5.44	-	-
Follow-up Hdwy	3.536	3.336	2.236
Pot Cap-1 Maneuver	152	526	1000
Stage 1	570	-	-
Stage 2	417	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	147	526	1000
Mov Cap-2 Maneuver	280	-	-
Stage 1	570	-	-
Stage 2	403	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.3	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NERNWLn1	SWL	SWT
Capacity (veh/h)	-	-	479	1000
HCM Lane V/C Ratio	-	-	0.091	0.033
HCM Control Delay (s)	-	-	13.3	8.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1

Educational Use Only

Intersection

Int Delay, s/veh 0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	0	16	1406	2	3	741
Future Vol, veh/h	0	16	1406	2	3	741
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	0	19	1654	2	4	872

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2098	828	0
Stage 1	1655	-	-
Stage 2	443	-	-
Critical Hdwy	6.88	6.98	4.18
Critical Hdwy Stg 1	5.88	-	-
Critical Hdwy Stg 2	5.88	-	-
Follow-up Hdwy	3.54	3.34	2.24
Pot Cap-1 Maneuver	44	310	376
Stage 1	138	-	-
Stage 2	608	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	43	310	376
Mov Cap-2 Maneuver	43	-	-
Stage 1	138	-	-
Stage 2	595	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.4	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	310	376
HCM Lane V/C Ratio	-	-	0.061	0.009
HCM Control Delay (s)	-	-	17.4	14.7
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.2	0

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Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	0	28	0	0	17	4	1384	2	2	742	5
Future Vol, veh/h	0	0	28	0	0	17	4	1384	2	2	742	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, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	0	0	33	0	0	20	5	1628	2	2	873	6
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1705	2521	439	2080	2523	815	879	0	0	1631	0	0
Stage 1	881	881	-	1639	1639	-	-	-	-	-	-	-
Stage 2	824	1640	-	441	884	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.58	6.98	7.58	6.58	6.98	4.18	-	-	4.18	-	-
Critical Hdwy Stg 1	6.58	5.58	-	6.58	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.58	-	6.58	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4.04	3.34	3.54	4.04	3.34	2.24	-	-	2.24	-	-
Pot Cap-1 Maneuver	58	27	560	30	27	316	752	-	-	385	-	-
Stage 1	304	358	-	102	154	-	-	-	-	-	-	-
Stage 2	329	153	-	560	357	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	51	25	560	27	25	316	752	-	-	385	-	-
Mov Cap-2 Maneuver	51	25	-	27	25	-	-	-	-	-	-	-
Stage 1	282	354	-	95	143	-	-	-	-	-	-	-
Stage 2	286	142	-	522	353	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	11.8			17.2			0.3			0.1		
HCM LOS	B			C								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	752	-	-	560	316	385	-	-				
HCM Lane V/C Ratio	0.006	-	-	0.059	0.063	0.006	-	-				
HCM Control Delay (s)	9.8	0.3	-	11.8	17.2	14.4	0.1	-				
HCM Lane LOS	A	A	-	B	C	B	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-				

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Appendix C: Project Site Plan

FRITZI SUBDIVISION

PRELIMINARY PLAN

SPANISH FORK, UTAH



Figure 6: Fritzi Subdivision

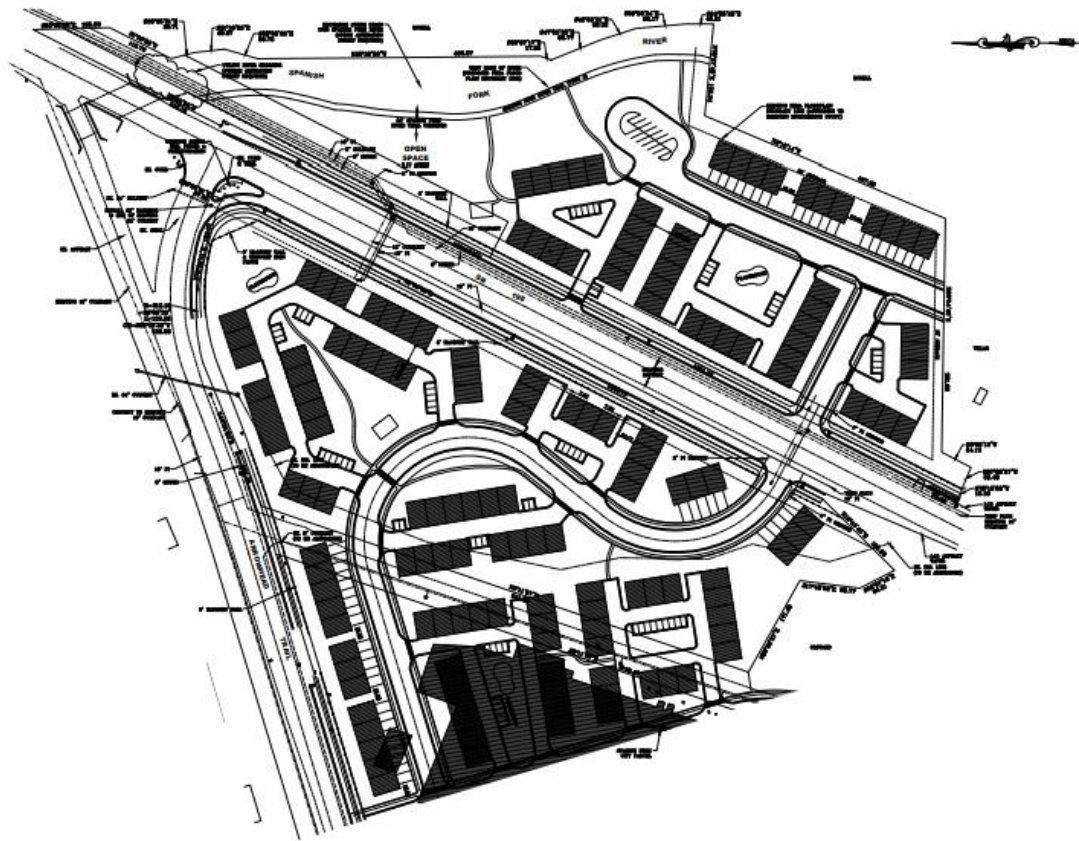


Figure 7: Fritzzi Subdivision 2

Appendix D: Figures

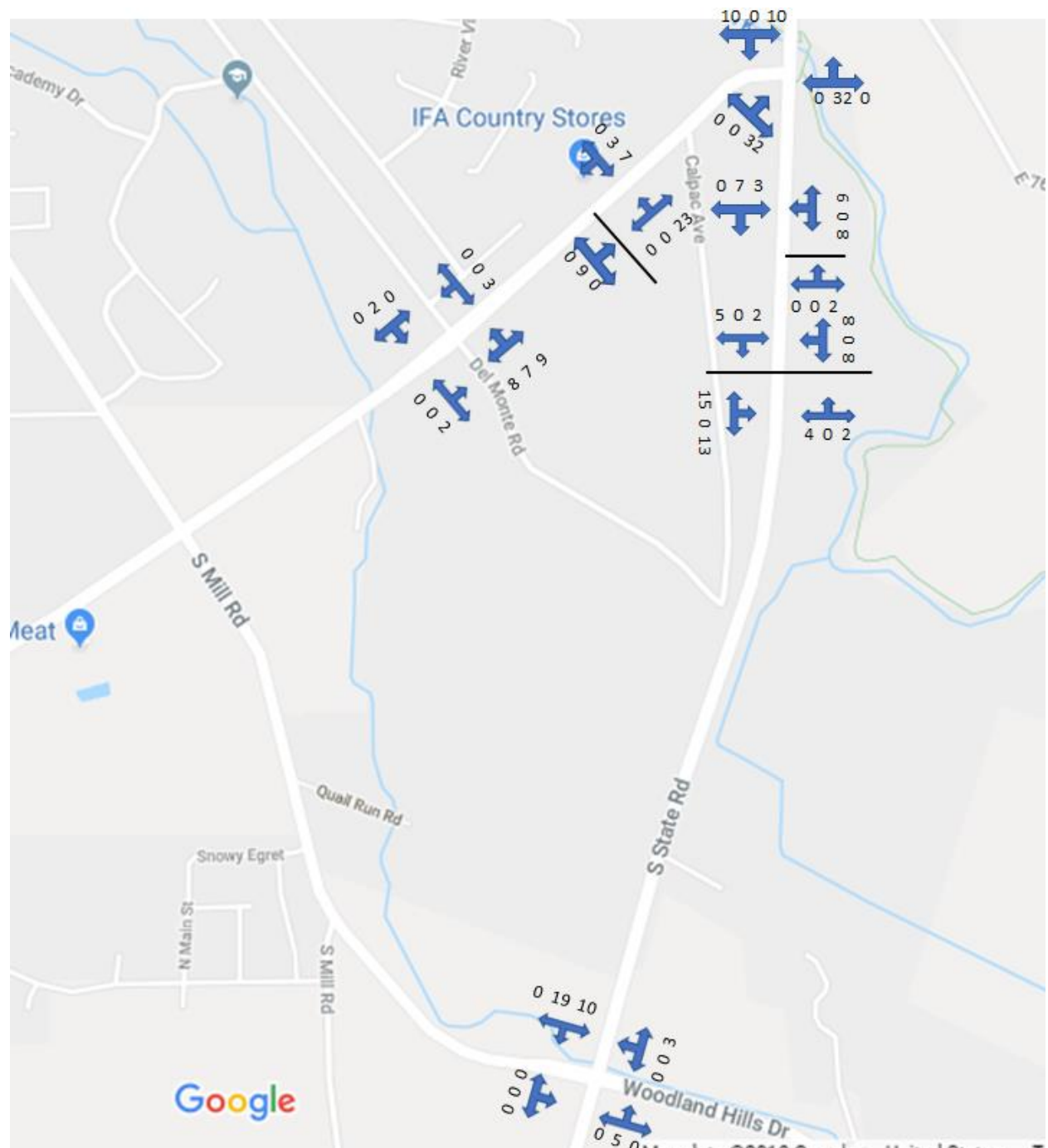




Figure 9: 2018 Background Model



Figure 10: 2022 Background Model



Figure 11: 2022 Plus Project Model



Figure 12: 2027 Background Model



Figure 13: 2027 Plus Project Model