TRAFFIC STUDY

MULTI-FAMILY RESIDENTIAL DEVELOPMENT LOCATED SOUTH OF EL MONTE WAY AND NORTH OF SURABIAN WAY ON THE WEST SIDE OF ALTA AVENUE

DINUBA, CA

Prepared for: CRAWFORD & BOWEN PLANNING, INC.

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INTRODUCTION

The purpose of this study is to evaluate the potential traffic impacts of a proposed residential development located south of El Monte Way, north of Surabian Way, on the west side of Alta Avenue in Dinuba, CA.

The proposed project consists of 126 multi-family dwelling units. A vicinity map and location map are presented in Figures 1 and 2, respectively.

A. Land Use, Site and Study Area Boundaries

The existing zoning is M-1 (Light Industrial) and the existing land use is Light Industrial and Commercial.

A total of four intersections are included in the study: three signalized and one stop controlled. The scope is based on a threshold of 50 project trips as defined in the Caltrans *Guide for the Preparation of Traffic Impact Studies*. Additionally, intersections were studied that were directly related to or adjacent to the project.

B. Existing Site Uses and Site Access

The site is currently vacant land. As currently planned, access to the proposed residential development would be provided along Surabian Way. A conceptual site plan is shown in Figure 3.

C. Existing Uses in Vicinity of the Site

Commercial land uses exist to the east, west, and north of the project. Vacant land exists immediately south of the project, with commercial land uses located generally south of the project. The project is bounded by Surabian Drive to the south.











D. Roadway Descriptions

<u>Alta Avenue</u> is a north-south arterial that extends throughout the City of Dinuba. In the vicinity of the project, it exists as a four-lane roadway and provides access to residential, commercial, and agricultural land uses.

<u>El Monte Way</u> is an east-west arterial that extends west from Road 72 through the City of Orosi. In the vicinity of the project, it exists as a four-lane roadway with curb and gutter. El Monte Way provides access to commercial, residential, and agricultural land uses.

<u>Monte Vista Dr</u> is a north-south collector that extends from El Monte Way to Sierra Way in the City of Dinuba. In the vicinity of the project, it exists as a two-lane roadway and provides access to commercial and industrial land uses.

<u>Surabian Drive</u> is an east-west local roadway that extends from Alta Avenue to Monte Vista Drive in the City of Dinuba. In the vicinity of the project, it exists as a two-lane roadway and provides access to commercial land uses.



PROJECT TRIP GENERATION AND DESIGN HOUR VOLUMES

The trip generation and design hour volumes for the residential development were calculated using the Institute of Transportation Engineers (ITE) <u>Trip Generation</u>, 11th Edition. The ADT, AM and PM peak hour rate equations, and peak hour directional splits for the ITE Land Use Code 220 (Multi-Family Housing) were used to estimate the project traffic.

Table 1
Project Trip Generation

General Information		Daily Trips		AM Peak Hour Trips			PM Peak Hour Trips			
ITE Code	Development Type	Variable	ADT RATE	ADT	Rate	In % Split/ Trips	Out % Split/ Trips	Rate	In % Split/ Trips	Out % Split/ Trips
220	Multifamily	126	eq	883	eq	24%	76%	eq	63%	37%
	Housing (Low Rise)	Dwelling Units				15	47		47	28

TRIP DISTRIBUTION AND ASSIGNMENT

The project trip distribution in Table 2 represents the most likely travel routes for traffic accessing the project. Project traffic distribution was estimated based on a review of the potential draw from population centers within the region and the types of land uses involved.

Direction	Percent
North	35
East	25
South	25
West	15

Table 2Project Trip Distribution



EXISTING AND FUTURE TRAFFIC

Weekday peak hour turning movements were counted at the following intersections in May 2024 (see Appendix for count data).

Traffic counts were conducted between the hours 6:00 to 8:00 AM and 4:00 to 6:00 PM and are shown in Figure 5. Existing + Project peak hour volumes are shown in Figure 6.

Annual growth rates ranging between 1.77% and 4.79% were applied to existing traffic volumes to estimate future traffic volumes for the year 2044. These growth rates were estimated based on a review of existing and approved future developments in the vicinity of the project and TCAG traffic model data. Future peak hour volumes are shown in Figures 7 and 8.



PROJECT PEAK HOUR TRAFFIC FIGURE 4		A GTIA
Multi-Family Residential Dinuba CA	8	RUETTGERS ESCHULER

Traffic Study		524-43
	AM Handler	ANTERIA NOR SOLUTION SO
2024 PEAK HOUR TRAFFIC FIGURE 5	MA EIIMOTEIWAY	Surbian Surplice

Multi-Family Residential Dinuba CA

Traffic Study 524	<u>4-43</u>
2034+PROJECT PEAK HOUR TRAFFIC	

Multi-Family Residential Dinuba CA

Traffic Study		524-43
	AM 1999 19	
EAK HOUR TRAFFIC FIGURE 7		Birnsparton Brich
2044 PE	AM 610 131 131 131 131 131 131 131 1	Surabian Way
		Monte Vista Dr

Multi-Family Residential Dinuba CA

2044-PROJECT PEAK HOUR TRAFFIC FIGURE 8		Surabian Way
Multi-Family Residential Dinuba CA	12	RUETTGERS SCHULER CIVIL ENGINEERS

INTERSECTION ANALYSIS

A capacity analysis of the study intersections was conducted using Synchro software from Trafficware. This software utilizes the capacity analysis methodology in the Transportation Research Board's <u>Highway Capacity Manual 2010</u> (HCM 2010). The analysis was performed for each of the following traffic scenarios.

- Existing (2024)
- Existing (2024) + Project
- Future (2044)
- Future (2044) + Project

Level of service (LOS) criteria for unsignalized and signalized intersections, as defined in HCM 2010, are presented in the tables below.

Average Control Delay (sec/veh)	Level of Service	Expected Delay to Minor Street Traffic
≤ 10	А	Little or no delay
$> 10 \text{ and } \le 15$	В	Short traffic delays
$> 15 \text{ and } \le 25$	С	Average traffic delays
$> 25 \text{ and } \le 35$	D	Long traffic delays
$> 35 \text{ and } \le 50$	Е	Very long traffic delays
> 50	F	Extreme delays

LEVEL OF SERVICE CRITERIA UNSIGNALIZED INTERSECTION

LEVEL OF SERVICE CRITERIA SIGNALIZED INTERSECTIONS

Volume/Capacity	Control Delay (sec/veh)	Level of Service
< 0.60	≤ 10	А
0.61 - 0.70	$> 10 \text{ and } \le 20$	В
0.71 - 0.80	$> 20 \text{ and } \le 35$	С
0.81 - 0.90	$>$ 35 and \leq 55	D
0.91 - 1.00	> 55 and ≤ 80	Е
> 1.0	> 80	F



Peak hour level of service for the study intersections is presented in Tables 3a and 3b. The City of Dinuba Circulation Element states that the peak hour level of service for intersections shall be LOS C or better for urban areas. It should be noted that LOS D is allowed if the intersection is currently operating at an LOS D prior to the addition of the project traffic in the existing scenario.

#	Intersection	Control Type	2024	2024+ Project	2044	2044+ Project
1	Monte Vista Dr & El Monte Way	Signal	В	В	С	С
2	Alta Ave & El Monte Way	Signal	В	В	С	С
3	Monte Vista Dr & Surabian Dr	WB	А	В	В	В
4	Alta Ave & Surabian Dr/Uruapan Way	Signal	С	С	С	С

Table 3aPM Intersection Level of Service

Table	3b
AM Intersection L	evel of Service

#	Intersection	Control Type	2024	2024+ Project	2044	2044+ Project
1	Monte Vista Dr & El Monte Way	Signal	В	В	В	В
2	Alta Ave & El Monte Way	Signal	В	В	С	С
3	Monte Vista Dr & Surabian Dr	WB	А	А	В	В
4	Alta Ave & Surabian Dr/Uruapan Way	Signal	С	С	С	С



TRAFFIC SIGNAL WARRANT ANALYSIS

Peak hour signal warrants were evaluated for the unsignalized intersection within the study based on the 2014 <u>California Manual on Uniform Traffic Control Devices</u> (2014 CA MUTCD). Peak hour signal warrants assess delay to traffic on minor street approaches when entering or crossing a major street. Signal warrant analysis results are shown in Tables 4a and 4b.

Table 4a Traffic Signal Warrants Weekday PM Peak Hour

			2024		20)24+Project	t		2044		20	44+Project	t
		Major	Minor		Major	Minor		Major	Minor		Major	Minor	
		Street	Street		Street	Street		Street	Street		Street	Street	
		Total	High		Total	High		Total	High		Total	High	
		Approach	Approach	Warrant	Approach	Approach	Warrant	Approach	Approach	Warrant	Approach	Approach	Warrant
#	Intersection	Vol	Vol	Met	Vol	Vol	Met	Vol	Vol	Met	Vol	Vol	Met
3	Monte Vista Dr at Surabian Dr	382	108	NO	393	115	NO	761	159	NO	772	166	NO

Table 4b Traffic Signal Warrants Weekday AM Peak Hour

	2024				2024+Project				2044		2044+Project		
		Major	Minor		Major	Minor		Major	Minor		Major	Minor	
		Street	Street		Street	Street		Street	Street		Street	Street	
		Total	High		Total	High		Total	High		Total	High	
		Approach	Approach	Warrant	Approach	Approach	Warrant	Approach	Approach	Warrant	Approach	Approach	Warrant
#	Intersection	Vol	Vol	Met	Vol	Vol	Met	Vol	Vol	Met	Vol	Vol	Met
3	Monte Vista Dr at Surabian Dr	212	84	NO	215	96	NO	417	123	NO	420	135	NO

It is important to note that a signal warrant defines the minimum condition under which signalization of an intersection might be warranted. Meeting this threshold does not suggest traffic signals are required, but rather, that other traffic factors and conditions be considered in order to determine whether signals are truly justified.

It is also noted that signal warrants do not necessarily correlate with level of service. An intersection may satisfy a signal warrant condition and operate at or above an acceptable level of service or operate below an acceptable level of service and not meet signal warrant criteria.



ROADWAY ANALYSIS

A capacity analysis of the study roadways was conducted using Table 4 in the State of Florida Department of Transportation *Quality/Level of Service Handbook* dated June 2020 (see Appendix). The City of Dinuba Circulation Element states that the peak hour level of service for roadways shall be no lower than LOS C for urban areas. It should be noted that LOS D is allowed if a roadway segment is currently operating at an LOS D prior to the addition of the project traffic in the existing scenario. The analysis was performed for the following AM and PM traffic scenarios:

- Existing (2024)
- Existing (2024) + Project
- Future (2044)
- Future (2044) + Project

2044+Project 2024 2024+Project 2044 **Roadway Segment Two-Way LOS** Two-Way LOS **Two-Way LOS** Two-Way LOS VOL LOS VOL LOS VOL LOS VOL LOS 1770 С 1790 С 2714 С С El Monte Way: Monte Vista Dr - Alta Ave 2734 С С С Alte Ave: El Monte Way - Surabian Way 932 970 С 1658 1696 337 С 394 С 619 С С Surabian Way: Monte Vista Dr - Alta Ave 676 Monte Vista Dr: El Monte Way - Surabian Way 646 С 664 С 1030 С 1048 С

Table 5aPM ROADWAY LEVEL OF SERVICE

Table 5b AM ROADWAY LEVEL OF SERVICE

Roadway Segment	20 Two-W	24 /ay LOS	2024+ Two-W	Project ay LOS	20 Two-W	44 ay LOS	2044+Project Two-Way LOS		
	VOL	LOS	VOL	LOS	VOL	LOS	VOL	LOS	
El Monte Way: Monte Vista Dr - Alta Ave	1294	С	1312	С	2004	С	2022	С	
Alta Ave: El Monte Way - Surabian Way	854	С	886	С	1566	С	1598	С	
Surabian Way: Monte Vista Dr - Alta Ave	208	С	256	С	375	С	423	С	
Monte Vista Dr: El Monte Way - Surabian Way	355	С	370	С	570	С	585	С	



VMT ANALYSIS

An evaluation of vehicle miles traveled (VMT) for project traffic was conducted in accordance with California Environmental Quality Act (CEQA) requirements. The City of Dinuba has adopted the "County of Tulare SB 743 Guidelines", dated June 8, 2020, which contains recommendations regarding VMT assessment, significance thresholds and mitigation measures.

Analysis

Baseline VMT was determined utilizing data from the California Statewide Travel Demand Model (CSTDM). The proposed residential project is located in Traffic Analysis Zone (TAZ) 2777, which has an average VMT/capita of 10.70 miles. The proposed residential project is considered a typical project within the TAZ and therefore the project would be expected to have the same VMT per capita. There are no special considerations with the project to assume the project would produce a VMT/capita lower than the average for the TAZ. The threshold of significance for residential project VMT/capita is if the project VMT is below the average in the TAZ where the project is located. Since VMT/capita is assumed to be equal to the average for the aforementioned zone, it is anticipated that the proposed project will have a significant transportation impact prior to mitigation.

Mitigation

The Tulare County guidelines include detailed instructions for mitigation if a project has significant impacts. The guidelines state "The preferred method of VMT mitigation in Tulare County is for project applicants to provide transportation improvements that facilitate travel by walking, bicycling, or transit." In accordance with these guidelines, a survey was conducted within a half mile of the project to determine any pedestrian, bicycle or transit facilities deficiencies exist. After review, sidewalks and ADA compliant wheelchair ramps are proposed to be constructed. The identified improvements include the following and are shown in Figure 9:

- 110 feet of sidewalk between Dickey Avenue & Smith Avenue on the north side of El Monte Way.
- 180 feet of sidewalk on the east side of Dickey Avenue on the north side of El Monte Way.
- Two (2) ADA compliant curb ramps at Smith Avenue and El Monte Way.

The guidelines include a minimum cost for mitigation of 20 per daily trip generated by the project or 0.5% of the total construction cost of the project (not including land acquisition). As shown in Table 1, the project is anticipated to generate 883 daily trips, which equates to a target value of improvements of

\$17,660. The total mitigation cost, for the identified improvements, is estimated at approximately \$18,162 with a 20% contingency.

Pursuant to the guidelines, if a project provides mitigation which meets the minimum target listed above, the project can presume a 1% reduction in VMT. The assumed VMT/capita reduction is 1% of 10.70 or 0.107. The resulting VMT/capita after mitigation is 10.59 which is below the average VMT/capita in the TAZ which the project is located. After mitigation, the project will have a less than significant transportation impact.







The purpose of this study is to evaluate the potential traffic impacts of a proposed residential development located south of El Monte Way, north of Surabian Way, on the west side of Alta Avenue in Dinuba, CA. The study included both level of service (LOS) and vehicle miles traveled (VMT) analyses.

All four study intersections currently operate above LOS D during peak hours with and without project traffic in 2024. All intersections are anticipated to continue to operate above LOS D in 2044 prior to, and with the addition of project traffic. Therefore, no improvements are recommended.

All roadway segments within the scope of the study currently operate above LOS C during peak hours prior to, and with the addition of project traffic in 2024. All roadway segments are anticipated to continue to operate at LOS C in 2044 prior to, and with the addition of project traffic. Therefore, no improvements are recommended.

Project VMT analysis showed a VMT which was equal to the existing local VMT in the area, which indicates a transportation impact under CEQA. With implementation of the mitigation measures identified above for reduction of VMT, the project will have a less than significant transportation impact.



REFERENCES

- 1. Highway Capacity Manual, Special Report 209, Transportation Research Board
- 2. California <u>Manual on Uniform Traffic Control Devices for Streets and Highways</u>, 2012 Edition, Federal Highway Administration (FHA)
- 3. Caltrans Guide for the Preparation of Traffic Impact Studies, June 2001
- 4. <u>City of Dinuba General Plan Policies Statement</u>, September 23, 2008
- 5. County of Tulare SB 743 Guidelines, June 8, 2020
- 6. <u>Technical Advisory on Evaluating Impacts in CEQA</u>, Governor's Office of Planning and Research, December 2018
- 7. <u>Trip Generation</u>, 11th Edition, Institute of Transportation Engineers (ITE)

APPENDIX



Lanes, Volumes, Timings 1: Monte Vista Dr/Alice Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	2	^	۲	2	≜ 16		2	•	*		4	
Traffic Volume (vph)	4	601	148	70	464	29	251	44	102	67	31	8
Future Volume (vph)	4	601	148	70	464	29	251	44	102	67	31	8
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95		180	105		0	100		100	0		0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97		1.00				0.98		1.00	
Frt			0.850		0.991				0.850		0.990	
Flt Protected	0.950			0.950			0.950				0.969	
Satd. Flow (prot)	1630	3539	1458	1630	3499	0	1630	1863	1458	0	1784	0
Flt Permitted	0.950			0.950			0.950				0.783	
Satd. Flow (perm)	1630	3539	1413	1630	3499	0	1630	1863	1431	0	1442	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			161		6				111		3	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	653	161	76	504	32	273	48	111	73	34	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	653	161	76	536	0	273	48	111	0	116	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12	Ŭ		12	Ŭ		12	Ŭ		12	Ŭ
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	Cl+Ex	CI+Ex	Cl+Ex	Cl+Ex	CI+Ex		CI+Ex	CI+Ex	Cl+Ex	Cl+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases			4						2	6		
Detector Phase	7	4	4	3	8		5	2	2	6	6	
Switch Phase				-				_	_	-		

Scenario 1 Baseline

Synchro 12 Report

Lanes, Volumes, Timings 1: Monte Vista Dr/Alice Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	9.7	40.7	40.7	12.9	43.9		29.1	66.4	66.4	37.3	37.3	
Total Split (%)	8.1%	33.9%	33.9%	10.8%	36.6%		24.3%	55.3%	55.3%	31.1%	31.1%	
Maximum Green (s)	4.0	35.0	35.0	7.2	38.2		24.2	61.5	61.5	32.4	32.4	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lag			Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)	6.3	24.2	24.2	9.5	32.4		20.7	40.4	40.4		15.3	
Actuated g/C Ratio	0.08	0.29	0.29	0.11	0.39		0.25	0.49	0.49		0.18	
v/c Ratio	0.03	0.63	0.31	0.41	0.39		0.67	0.05	0.15		0.43	
Control Delay (s/veh)	48.5	30.8	6.6	50.2	20.8		41.8	13.3	3.4		38.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)	48.5	30.8	6.6	50.2	20.8		41.8	13.3	3.4		38.2	
LOS	D	С	А	D	С		D	В	А		D	
Approach Delay (s/veh)		26.1			24.4			28.8			38.2	
Approach LOS		С			С			С			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 83												
Natural Cycle: 110												
Control Type: Actuated-Unc	oordinated											
Maximum v/c Ratio: 0.67												
Intersection Signal Delay (s/	/veh): 26.9			lr	ntersection	n LOS: C						
Intersection Capacity Utilization	tion 54.8%			10	CU Level	of Service	eΑ					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way

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66.4 s		12.9 s	40.7 s
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37.3 s	29.1 s	9.7 s 43	3.9 s

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	* *	1	3	≜t a		3	•	1		4	
Traffic Volume (veh/h)	4	601	148	70	464	29	251	44	102	67	31	8
Future Volume (veh/h)	4	601	148	70	464	29	251	44	102	67	31	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	4	653	161	76	504	32	273	48	111	73	34	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap. veh/h	51	1055	420	136	1182	75	349	808	620	212	87	17
Arrive On Green	0.03	0.30	0.30	0.08	0.35	0.32	0.21	0.43	0.43	0.16	0.16	0.14
Sat Flow, veh/h	1641	3554	1415	1641	3386	214	1641	1870	1436	768	556	111
Grn Volume(v) veh/h	4	653	161	76	264	272	273	48	111	116	0	0
Grp Sat Flow(s) veh/h/ln	1641	1777	1415	1641	1777	1824	1641	1870	1436	1436	0	0
O Serve(a, s) s	0.2	10.1	2.6	2.8	72	7.3	10.0	10	3.0	3.3	0.0	0.0
Cycle O Clear(q, c) s	0.2	10.1	2.0	2.8	7.2	7.3	10.0	1.0	3.0	4.5	0.0	0.0
Pron In Lane	1 00	10.1	1 00	1 00	1.2	0.12	1 00	1.0	1 00	0.63	0.0	0.08
Lane Grn Can(c) veh/h	51	1055	420	136	620	637	349	808	620	317	0	0.00
V/C Ratio(X)	0.08	0.62	0.38	0.56	0 43	0 43	0 78	0.06	0.18	0.37	0.00	0.00
Avail Cap(c, a) veh/h	147	2044	814	229	1111	1141	645	1829	1404	822	0.00	0.00
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d) s/veh	30.0	19.3	3.5	28.1	15.9	16.0	23.7	10.6	11.2	24.5	0.0	0.0
Incr Delay (d2) s/veh	0.7	0.6	0.6	3.5	0.5	0.5	3.9	0.0	0.1	0.7	0.0	0.0
Initial Q Delay(d3) s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%) veh/ln	0.0	3.5	1.5	11	24	2.5	3.6	0.3	0.8	14	0.0	0.0
Unsig Movement Delay s/ve	h	0.0	1.0			2.0	0.0	0.0	0.0		0.0	0.0
LnGrp Delav(d), s/veh	30.7	19.9	4.1	31.6	16.3	16.4	27.6	10.6	11.3	25.2	0.0	0.0
LnGrp LOS	С	В	A	С	В	В	С	В	В	С		
Approach Vol. veh/h	-	818		-	612		-	432		-	116	
Approach Delay, s/yeh		16.9			18.3			21.5			25.2	
Approach LOS		В			В			С			С	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		31.6	9.3	22.9	17.6	14.0	6.0	26.3				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		61.5	7.2	35.0	24.2	32.4	4.0	38.2				
Max Q Clear Time (g_c+l1), s	;	5.0	4.8	12.1	12.0	6.5	2.2	9.3				
Green Ext Time (p_c), s		0.6	0.0	3.5	0.7	0.4	0.0	1.9				
Intersection Summary												
HCM 7th Control Delay, s/veh	1		18.8									
HCM 7th LOS			В									

Lanes, Volumes, Timings 2: Alta Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	**	1	55	**	1	N N	≜t ⊾		3	**	1
Traffic Volume (vph)	207	642	124	57	442	111	196	267	53	137	235	159
Future Volume (vph)	207	642	124	57	442	111	196	267	53	137	235	159
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	200		195	110		115	190		0	80		80
Storage Lanes	2		1	2		1	2		0	1		1
Taper Length (ft)	25		•	25		•	25		· ·	25		
Lane Util Factor	0.97	0.95	1 00	0.97	0.95	1 00	0.97	0.95	0.95	1 00	0.95	1 00
Ped Bike Factor		0.00	0.98	0.01	0.00	0.98		1.00	0.00		0.00	0.98
Frt			0.850			0.850		0.975				0.850
Fit Protected	0 950		0.000	0 950		0.000	0 950	0.010		0 950		0.000
Satd Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3440	0	1630	3539	1458
Flt Permitted	0.950	0000	1100	0.950	0000	1100	0.950	0110	v	0.950	0000	1100
Satd Flow (perm)	3162	3539	1431	3162	3539	1432	3162	3440	0	1630	3539	1432
Right Turn on Red	0102	0000	Yes	0102	0000	Yes	0102	0110	Yes	1000	0000	Yes
Satd Flow (RTOR)			135			119		21	100			173
Link Speed (mph)		55	100		55	115		55			55	170
Link Distance (ft)		1012			2084			1629			1012	
Travel Time (s)		12 5			25.8			20.2			12.5	
Confl Peds (#/br)		12.5	5		20.0	5		20.2	5		12.5	5
Confl Bikes (#/br)			2			2			2			2
Peak Hour Factor	0 92	0 92	0 02	0 92	0 92	0 92	0 92	0 92	0 02	0.92	0 92	0 92
Adi Elow (vph)	225	608	135	62	/80	121	213	200	58	1/0	255	173
Shared Lane Traffic (%)	225	030	100	02	400	121	215	250	50	143	200	175
Lane Group Flow (yph)	225	608	135	62	/80	121	213	3/18	0	1/10	255	173
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Loft	Loft	Right	Loft	Loft	Right	Loft	Loft	Right			Right
Median Width(ft)	Len	24	Right	Len	2/	Right	Leit	2/	rught	Len	2/	rtight
Link Offset(ft)		2 4 0			2 4 0			24			2 4 0	
Crosswalk Width(ft)		16			16			16			16	
		10			10			10			10	
Headway Eactor	1 1 1	1 00	1 1 1	1 1 1	1 00	1 1 1	1 1 1	1 00	1 1 1	1 1 1	1 00	1 11
Turning Speed (mph)	1.11	1.00	0	1.11	1.00	0	1.11	1.00	0	1.11	1.00	0
Number of Detectors	1	1	1	1	1	1	1	1	9	1	1	1
Number of Detectors	I	1	1	I	1	I	1	I		1	1	1
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type												
Detector 1 Channel							OITEX	OITEX				
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
	0.0 Drot	0.0	Dorm	0.0 Drot		0.0	0.0 Drot	0.0		Drot	0.0	Dorm
Protocted Phases	7101		Fellil	r10(Feilii	FIUL			1		Feim
Pormitted Phases	1	4		3	0		5	2			0	
			Λ			0						C
Detector Phase	7	Λ	4	2	0	8	E	0		1	6	6

Scenario 1 Baseline

Synchro 12 Report

Lanes, Volumes, Timings 2: Alta Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	15.4	48.3	48.3	9.9	42.8	42.8	17.8	42.9		18.9	44.0	44.0
Total Split (%)	12.8%	40.3%	40.3%	8.3%	35.7%	35.7%	14.8%	35.8%		15.8%	36.7%	36.7%
Maximum Green (s)	9.7	42.6	42.6	4.2	37.1	37.1	12.9	38.0		14.0	39.1	39.1
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	11.7	28.1	28.1	6.3	20.0	20.0	11.6	16.7		13.4	18.4	18.4
Actuated g/C Ratio	0.15	0.36	0.36	0.08	0.25	0.25	0.15	0.21		0.17	0.23	0.23
v/c Ratio	0.48	0.55	0.23	0.25	0.54	0.27	0.46	0.47		0.54	0.31	0.37
Control Delay (s/veh)	39.2	24.1	5.4	43.7	28.3	7.2	38.0	27.8		42.7	26.4	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	39.2	24.1	5.4	43.7	28.3	7.2	38.0	27.8		42.7	26.4	6.9
LOS	D	С	А	D	С	А	D	С		D	С	A
Approach Delay (s/veh)		24.9			25.9			31.7			24.7	
Approach LOS		С			С			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 78	.7											
Natural Cycle: 105												
Control Type: Actuated-Un	coordinated											
Maximum v/c Ratio: 0.55												
Intersection Signal Delay (s/veh): 26.4			Ir	ntersectio	n LOS: C						
Intersection Capacity Utiliz	ation 56.8%			10	CU Level	of Service	эB					
Analysis Period (min) 15												
Splits and Phases: 2: Al	ta Ave & El	Monte Wa	ау									

Ч _{Ø1}	1 ø2		
18,9 s	42,9 s	9,9 <mark>s 48.3 s</mark>	
1 Ø5	↓ <i>∅</i> 6	€ Ø8	ر هر
17.8 s	44 s	42.8 s	15.4 s

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	* *	7	33	* *	1	1	≜1 ₀		3	44	1
Traffic Volume (veh/h)	207	642	124	57	442	111	196	267	53	137	235	159
Future Volume (veh/h)	207	642	124	57	442	111	196	267	53	137	235	159
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adi.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adi(A pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adi	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	225	698	135	62	480	121	213	290	58	149	255	173
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap veh/h	425	1134	457	233	919	370	375	591	116	213	755	304
Arrive On Green	0.13	0.32	0.32	0.07	0.26	0.26	0.12	0.20	0.18	0.13	0.21	0.21
Sat Flow, yeh/h	3183	3554	1434	3183	3554	1432	3183	2947	580	1641	3554	1429
	225	698	135	62	/80	121	213	173	175	1/10	255	173
Grp Sat Flow(s) yeb/b/ln	1501	1777	1/3/	1501	1777	1/132	1501	1777	1750	16/1	1777	1/20
O Serve(a, s) s	3.8	96	/ 1	11	67	22	36	5.0	5 1	5.0	35	3.8
Q Serve(Q_s), s	3.0	9.0	4.1	1.1	6.7	2.2	3.0	5.0	J.1 5.1	5.0	3.5	3.0
$\frac{1}{2} \frac{1}{2} \frac{1}$	1.00	9.0	1.00	1.1	0.7	1.00	1.00	5.0	0.33	1.00	5.5	1.00
Lang Grn Can(a) yoh/h	1.00	112/	1.00	1.00	010	370	375	356	251	212	755	304
V/C Patio(X)	425	0.62	437	233	0.52	033	0.57	0.40	0.50	0.70	0.34	0.57
V/C Rall $O(\Lambda)$	0.00	0.02	1102	0.27	0.02	0.00	760	1100	1101	424	0.04	0.07
HCM Distance Datio	1.00	1 00	1 00	1 00	2092	904	1 00	1 00	1 00	424	2400	992
HCW FIGUON Rallo	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	14.0	1.00	10.0	1.00	1.00	20.4	1.00	1.00	10.2	1.00
Uniform Delay (d), s/ven	23.3	10.0	14.0	25.5	10.3	5.4 0.5	24.0	20.4	20.0	24.0	19.5	1.1
Incr Delay (d2), s/ven	1.0	0.5	0.4	0.0	0.5	0.5	1.4	1.0	1.1	4.1	0.3	1.7
Initial Q Delay(03), s/ven	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%),ven/In	1.3	3.1	1.1	0.4	Z.Z	1.0	1.Z	1.8	1.8	1.9	1.2	1.7
Unsig. Movement Delay, s/ven	04.0	47.0	45.4	05.0	40.0	5.0	05.4	04.4	04.7	00.0	40.5	0.4
LnGrp Delay(d), s/ven	24.3	17.2	15.1	25.9	18.8	5.9	25.4	21.4	21.7	28.2	19.5	9.4
LnGrp LUS	C	В	В	C	В	A	C	C	C	C	В	A
Approach Vol, veh/h		1058			663			561			577	
Approach Delay, s/veh		18.4			17.1			23.0			18.7	
Approach LOS		В			В			С			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.5	15.6	8.2	22.4	10.8	16.2	11.7	18.9				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	14.0	38.0	4.2	42.6	12.9	39.1	9.7	37.1				
Max Q Clear Time (g c+l1), s	7.0	7.1	3.1	11.6	5.6	5.8	5.8	8.7				
Green Ext Time (p_c), s	0.2	1.2	0.0	3.7	0.4	1.7	0.3	2.5				
Intersection Summary												
HCM 7th Control Delay. s/veh			19.1									
HCM 7th LOS			В									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	7	*	≜ ti-		*	1	
Traffic Volume (vph)	26	82	158	15	61	148	
Future Volume (vph)	26	82	158	15	61	148	
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900	
Storage Length (ft)	0	100		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00	
Frt		0.850	0.987				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1630	1458	3493	0	1630	1863	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1630	1458	3493	0	1630	1863	
Link Speed (mph)	55		55			55	
Link Distance (ft)	522		452			482	
Travel Time (s)	6.5		5.6			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	28	89	172	16	66	161	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	28	89	188	0	66	161	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Right	Left	Left	
Median Width(ft)	12		12			12	
Link Offset(ft)	0		0			0	
Crosswalk Width(ft)	16		16			16	
Two way Left Turn Lane							
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00	
Turning Speed (mph)	15	9		9	15		
Sign Control	Stop		Free			Free	
Intersection Summary							
Area Type: (Other						
Control Type: Unsignalized							
Intersection Capacity Utilizat	ion 21.8%			IC	CU Level	of Service A	А
Analysis Period (min) 15							

Intersection

Int Delay, s/veh	3.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	۳	1	_ ≜ ⊅		٦	1
Traffic Vol, veh/h	26	82	158	15	61	148
Future Vol, veh/h	26	82	158	15	61	148
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	100	-	-	150	-
Veh in Median Storage	,# 0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	89	172	16	66	161

Major/Minor	Minor1	Ν	/lajor1	N	lajor2	
Conflicting Flow All	473	94	0	0	188	0
Stage 1	180	-	-	-	-	-
Stage 2	293	-	-	-	-	-
Critical Hdwy	6.63	6.93	-	-	4.13	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	- 3	2.219	-
Pot Cap-1 Maneuver	534	945	-	-	1385	-
Stage 1	834	-	-	-	-	-
Stage 2	756	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	509	945	-	-	1385	-
Mov Cap-2 Maneuver	509	-	-	-	-	-
Stage 1	834	-	-	-	-	-
Stage 2	720	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s/v	10	0	2.26
HCMLOS	Α		

Minor Lane/Major Mvmt	NBT	NBRW	VBLn1V	VBLn2	SBL	SBT	
Capacity (veh/h)	-	-	509	945	1385	-	
HCM Lane V/C Ratio	-	-	0.056	0.094	0.048	-	
HCM Control Delay (s/veh)	-	-	12.5	9.2	7.7	-	
HCM Lane LOS	-	-	В	А	А	-	
HCM 95th %tile Q(veh)	-	-	0.2	0.3	0.2	-	

Lanes, Volumes, Timings 4: Alta Ave & Surabian Dr/Uruapan Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		3	•	1		≜t ₀			≜1 6	
Traffic Volume (vph)	43	83	43	7	96	35	57	186	13	52	185	15
Future Volume (vph)	43	83	43	7	96	35	57	186	13	52	185	15
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.949				0.850		0.990			0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1768	0	1630	1863	1458	1630	3504	0	1630	3500	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1768	0	1630	1863	1458	1630	3504	0	1630	3500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31				255		8			9	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	90	47	8	104	38	62	202	14	57	201	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	47	137	0	8	104	38	62	216	0	57	217	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	CI+Ex	CI+Ex		Cl+Ex	Cl+Ex	Cl+Ex	CI+Ex	CI+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						

Scenario 1 Baseline

Lanes, Volumes, Timings 4: Alta Ave & Surabian Dr/Uruapan Way

PM 2024 06/06/2024

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	10.0	34.5		10.0	34.5	34.5	15.0	35.5		10.0	30.5	
Total Split (%)	11.1%	38.3%		11.1%	38.3%	38.3%	16.7%	39.4%		11.1%	33.9%	
Maximum Green (s)	4.0	28.5		4.0	28.5	28.5	9.0	29.5		4.0	24.5	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	4.2	15.3		4.2	11.6	11.6	7.7	36.3		4.2	36.1	
Actuated g/C Ratio	0.06	0.22		0.06	0.17	0.17	0.11	0.53		0.06	0.53	
v/c Ratio	0.48	0.33		0.08	0.33	0.08	0.34	0.12		0.58	0.12	
Control Delay (s/veh)	54.7	19.5		38.9	28.6	0.3	37.7	14.4		61.9	16.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	54.7	19.5		38.9	28.6	0.3	37.7	14.4		61.9	16.2	
LOS	D	В		D	С	А	D	В		E	В	
Approach Delay (s/veh)		28.4			22.0			19.6			25.7	
Approach LOS		С			С			В			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 68.	5											
Natural Cycle: 95												
Control Type: Actuated-Une	coordinated	1										
Maximum v/c Ratio: 0.58												
Intersection Signal Delay (s	s/veh): 23.7			Ir	ntersectio	n LOS: C						
Intersection Capacity Utilization	ation 33.3%)		IC	CU Level	of Service	eΑ					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		3	•	1		≜t a			≜ 16	
Traffic Volume (veh/h)	43	83	43	7	96	35	57	186	13	52	185	15
Future Volume (veh/h)	43	83	43	7	96	35	57	186	13	52	185	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adi.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adi(A pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	47	90	47	8	104	38	62	202	14	57	201	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap. veh/h	58	132	69	21	172	134	76	1545	106	69	1514	120
Arrive On Green	0.04	0.11	0.11	0.01	0.09	0.09	0.05	0.46	0.46	0.04	0.45	0.45
Sat Flow, veh/h	1641	1157	604	1641	1870	1460	1641	3373	232	1641	3336	263
Grp Volume(v), veh/h	47	0	137	8	104	38	62	106	110	57	106	111
Grp Sat Flow(s),veh/h/ln	1641	0	1762	1641	1870	1460	1641	1777	1829	1641	1777	1823
Q Serve(q s), s	1.8	0.0	4.8	0.3	3.4	1.2	2.4	2.2	2.2	2.2	2.2	2.3
Cycle Q Clear(q c), s	1.8	0.0	4.8	0.3	3.4	1.2	2.4	2.2	2.2	2.2	2.2	2.3
Prop In Lane	1.00		0.34	1.00		1.00	1.00		0.13	1.00		0.14
Lane Grp Cap(c), veh/h	58	0	201	21	172	134	76	814	838	69	806	827
V/C Ratio(X)	0.81	0.00	0.68	0.37	0.60	0.28	0.82	0.13	0.13	0.83	0.13	0.13
Avail Cap(c a), veh/h	102	0	780	102	828	646	229	814	838	102	806	827
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.8	0.0	27.4	31.5	28.1	15.3	30.4	10.1	10.1	30.6	10.2	10.2
Incr Delay (d2), s/veh	22.7	0.0	4.0	10.4	3.4	1.1	18.6	0.3	0.3	28.6	0.3	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	2.0	0.2	1.5	0.5	1.2	0.7	0.7	1.3	0.7	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	53.6	0.0	31.4	41.9	31.5	16.4	49.1	10.4	10.4	59.2	10.6	10.6
LnGrp LOS	D		С	D	С	В	D	В	В	Е	В	В
Approach Vol. veh/h		184			150			278			274	
Approach Delay, s/veh		37.1			28.2			19.0			20.7	
Approach LOS		D			С			В			С	
Timer - Assianed Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.7	35.5	6.8	13.4	9.0	35.2	8.3	11.9				
Change Period (Y+Rc) s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax) s	4.0	29.5	4.0	28.5	9.0	24.5	4.0	28.5				
Max O Clear Time $(q, c+11)$ s	4.0	4.2	2.3	6.8	44	4.3	3.8	5.4				
Green Ext Time (p c). s	0.0	1.0	0.0	0.6	0.0	0.9	0.0	0.5				
Intersection Summary												
HCM 7th Control Delay s/yeb			24.8									
HCM 7th LOS			<u>د</u> بت									
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	44	*	3	≜t i		3	4	1		4	
Traffic Volume (vph)	4	607	155	70	468	29	255	44	102	67	31	8
Future Volume (vph)	4	607	155	70	468	29	255	44	102	67	31	8
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95		180	105		0	100		100	0		0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97		1.00				0.98		1.00	
Frt			0.850		0.991				0.850		0.990	
Flt Protected	0.950			0.950			0.950				0.969	
Satd. Flow (prot)	1630	3539	1458	1630	3499	0	1630	1863	1458	0	1784	0
Flt Permitted	0.950			0.950			0.950				0.783	
Satd. Flow (perm)	1630	3539	1414	1630	3499	0	1630	1863	1431	0	1442	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			168		6				111		3	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	660	168	76	509	32	277	48	111	73	34	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	660	168	76	541	0	277	48	111	0	116	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	Cl+Ex	CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases			4						2	6		
Detector Phase	7	4	4	3	8		5	2	2	6	6	
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	9.7	41.7	41.7	12.0	44.0		29.0	66.3	66.3	37.3	37.3	
Total Split (%)	8.1%	34.8%	34.8%	10.0%	36.7%		24.2%	55.3%	55.3%	31.1%	31.1%	
Maximum Green (s)	4.0	36.0	36.0	6.3	38.3		24.1	61.4	61.4	32.4	32.4	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lag			Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)	6.2	24.7	24.7	8.7	32.3		21.1	40.7	40.7		15.3	
Actuated g/C Ratio	0.07	0.30	0.30	0.10	0.39		0.25	0.49	0.49		0.18	
v/c Ratio	0.03	0.63	0.31	0.45	0.40		0.67	0.05	0.15		0.43	
Control Delay (s/veh)	48.0	30.3	6.4	52.4	21.0		41.1	13.0	3.3		37.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)	48.0	30.3	6.4	52.4	21.0		41.1	13.0	3.3		37.8	
LOS	D	С	A	D	С		D	В	A		D	
Approach Delay (s/veh)		25.6			24.9			28.4			37.8	
Approach LOS		С			С			С			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 83	8.1											
Natural Cycle: 110												
Control Type: Actuated-Ur	ncoordinated											
Maximum v/c Ratio: 0.67												
Intersection Signal Delay (s/veh): 26.7			lr	ntersection	n LOS: C						
Intersection Capacity Utiliz	ation 55.2%			10	CU Level of	of Service	эB					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way

† _{ø2}		f ø3	→ Ø4
66.3 s		12 ş	41.7 s
↓ _{Ø6}	n @5	ノ 。	← Ø8
37.3 5	29 s	9.7 s	44 s

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	* *	7	3	≜t a		1	•	7		4	
Traffic Volume (veh/h)	4	607	155	70	468	29	255	44	102	67	31	8
Future Volume (veh/h)	4	607	155	70	468	29	255	44	102	67	31	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	4	660	168	76	509	32	277	48	111	73	34	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	50	1060	422	136	1188	74	352	809	621	211	87	17
Arrive On Green	0.03	0.30	0.30	0.08	0.35	0.32	0.21	0.43	0.43	0.16	0.16	0.14
Sat Flow, veh/h	1641	3554	1415	1641	3389	213	1641	1870	1436	769	555	111
Grp Volume(v), veh/h	4	660	168	76	266	275	277	48	111	116	0	0
Grp Sat Flow(s),veh/h/ln	1641	1777	1415	1641	1777	1824	1641	1870	1436	1436	0	0
Q Serve(g_s), s	0.2	10.3	2.7	2.9	7.4	7.4	10.3	1.0	3.1	3.4	0.0	0.0
Cycle Q Clear(g_c), s	0.2	10.3	2.7	2.9	7.4	7.4	10.3	1.0	3.1	4.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	0.63		0.08
Lane Grp Cap(c), veh/h	50	1060	422	136	623	640	352	809	621	315	0	0
V/C Ratio(X)	0.08	0.62	0.40	0.56	0.43	0.43	0.79	0.06	0.18	0.37	0.00	0.00
Avail Cap(c_a), veh/h	145	2078	827	204	1102	1132	636	1807	1387	813	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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	30.4	19.5	3.5	28.4	16.0	16.1	23.9	10.6	11.2	24.8	0.0	0.0
Incr Delay (d2), s/veh	0.7	0.6	0.6	3.6	0.5	0.5	3.9	0.0	0.1	0.7	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/In	0.1	3.6	1.5	1.1	2.5	2.6	3.7	0.3	0.8	1.5	0.0	0.0
Unsig. Movement Delay, s/ve	h											
LnGrp Delay(d), s/veh	31.0	20.1	4.1	32.0	16.5	16.5	27.8	10.7	11.4	25.5	0.0	0.0
LnGrp LOS	С	С	А	С	В	В	С	В	В	С		
Approach Vol. veh/h		832			617			436			116	
Approach Delay, s/veh		16.9			18.4			21.8			25.5	
Approach LOS		В			В			С			С	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		31.9	9.3	23.2	17.8	14.1	6.0	26.6				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		61.4	6.3	36.0	24.1	32.4	4.0	38.3				
Max Q Clear Time (g_c+I1), s		5.1	4.9	12.3	12.3	6.6	2.2	9.4				
Green Ext Time (p_c), s		0.6	0.0	3.6	0.7	0.4	0.0	1.9				
Intersection Summary												
HCM 7th Control Delay, s/veh	i –		18.9									
HCM 7th LOS			В									

Lane Group EBL EBT EBR WBL WBT WBR NBL NBT NBR SBL SBT SBR Lane Configurations Image: Additional stress of the str		٦	-	\mathbf{r}	*	+	•	1	†	۲	5	Ļ	~
Lane Configurations M	Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph) 207 642 136 66 442 111 204 269 57 137 238 159 Future Volume (vph) 207 642 136 66 442 111 204 269 57 137 238 159 Ideal Flow (vphpl) 1750 1900 1750 1750 1900 1750 1750 1900 1750	Lane Configurations	**	**	*	**	**	*	¥.¥	≜ 1⊾		*	**	1
Future Volume (vph) 207 642 136 66 442 111 204 269 57 137 238 159 Ideal Flow (vphpl) 1750 1900 1750 1750 1900 1750 1750 1900 1750 1	Traffic Volume (vph)	207	642	136	66	442	111	204	269	57	137	238	159
Ideal Flow (vphpl) 1750 1900 1750 1750 1900 1	Future Volume (vph)	207	642	136	66	442	111	204	269	57	137	238	159
Storage Length (ft) 200 195 110 115 190 0 80 80 Storage Lanes 2 1 2 1 2 0 1 1 Taper Length (ft) 25 25 25 25 25 25 Lane Util. Factor 0.97 0.95 1.00 0.97 0.95 1.00 0.97 Ped Bike Factor 0.850 0.850 0.850 0.974 0.850 Fit 0.950 0.950 0.950 0.950 0.950	Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Lanes 2 1 2 1 2 1 2 0 1 1 Taper Length (ft) 25 25 25 25 25 25 25 25 25 25 1.00 0.950 0.950 </td <td>Storage Length (ft)</td> <td>200</td> <td></td> <td>195</td> <td>110</td> <td></td> <td>115</td> <td>190</td> <td></td> <td>0</td> <td>80</td> <td></td> <td>80</td>	Storage Length (ft)	200		195	110		115	190		0	80		80
Taper Length (ft) 25 25 25 25 25 Lane Util. Factor 0.97 0.95 1.00 0.97 0.95 1.00 0.97 0.95 1.00 0.97 0.95 1.00 0.97 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 1.00 0.95 0.95 1.00 0.95 1.00 0.95 <td>Storage Lanes</td> <td>200</td> <td></td> <td>1</td> <td>2</td> <td></td> <td>1</td> <td>2</td> <td></td> <td>0</td> <td>1</td> <td></td> <td>1</td>	Storage Lanes	200		1	2		1	2		0	1		1
Lane Util. Factor 0.97 0.95 1.00 0.97 0.95 1.00 0.97 0.95 1.00 0.95 <td>Taper Length (ft)</td> <td>25</td> <td></td> <td></td> <td>25</td> <td></td> <td>·</td> <td>25</td> <td></td> <td>· ·</td> <td>25</td> <td></td> <td></td>	Taper Length (ft)	25			25		·	25		· ·	25		
Ped Bike Factor 0.98 0.98 1.00 0.98 Frt 0.850 0.850 0.974 0.850 Elt Protected 0.950 0.950 0.950 0.950	Lane Util Factor	0.97	0.95	1 00	0.97	0.95	1 00	0.97	0.95	0.95	1 00	0.95	1 00
Frt 0.850 0.850 0.974 0.850 Elt Protected 0.950 0.950 0.950 0.950	Ped Bike Factor	0.01	0.00	0.98			0.98	0.01	1.00	0.00		0.00	0.98
Fit Protected 0.950 0.950 0.950 0.950	Frt			0.850			0.850		0.974				0.850
A A A A A A A A A A A A A A A A A A A	Flt Protected	0 950		0.000	0 950		0.000	0 950	0.071		0 950		0.000
Satd Flow (prot) 3162 3539 1458 3162 3539 1458 3162 3436 0 1630 3539 1458	Satd Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3436	0	1630	3539	1458
Elt Permitted 0.950 0.950 0.950 0.950 0.950 0.950	Flt Permitted	0.950		1.00	0.950	0000	1100	0.950	0.00	•	0.950		1100
Satd Flow (nerm) 3162 3539 1431 3162 3539 1432 3162 3436 0 1630 3539 1432	Satd Flow (perm)	3162	3539	1431	3162	3539	1432	3162	3436	0	1630	3539	1432
Right Turn on Red Yes Yes Yes Yes Yes	Right Turn on Red	0102	0000	Yes	0102	0000	Yes	0102	0100	Yes	1000	0000	Yes
Satd Flow (RTOR) 158 158 22 173	Satd Flow (RTOR)			158			158		22	100			173
Link Speed (mph) 55 55 55 55	Link Speed (mph)		55	100		55	100		55			55	170
Link Distance (ft) 1012 2084 1629 1012	Link Distance (ft)		1012			2084			1629			1012	
Travel Time (s) 12 25 258 20 2 12 5	Travel Time (s)		12 5			25.8			20.2			12.5	
Confl Peds (#/hr) 5 5 5 5 5	Confl Peds (#/hr)		12.0	5		20.0	5		20.2	5		12.0	5
Confl Bikes (#/hr) 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Confl Bikes (#/hr)			2			2			2			2
Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92	Peak Hour Factor	0 92	0 92	0.92	0 92	0 92	0.92	0 92	0 92	0.92	0 92	0 92	0 92
Adi Flow (vnh) 225 698 148 72 480 121 222 292 62 149 259 173	Adi Flow (vph)	225	698	148	72	480	121	222	292	62	149	259	173
Shared Lane Traffic (%)	Shared Lane Traffic (%)	220	000	140	12	-00	121		LUL	02	140	200	170
Lane Group Flow (vph) 225 698 148 72 480 121 222 354 0 149 259 173	Lane Group Flow (vph)	225	698	148	72	480	121	222	354	0	149	259	173
Enter Blocked Intersection No	Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment Left Left Right Left Right Left Right Left Right Left Right Left Right	Lane Alignment	l eft	Left	Right	Left	l eft	Right	Left	Left	Right	l eft	Left	Right
Median Width(ft) 24 24 24 24 24	Median Width(ft)	Lon	24	rugite	Lon	24	ragin	Lon	24	ragin	Lon	24	rugin
Link Offset(ft) 0 0 0 0	Link Offset(ft)		0			0			0			0	
Crosswalk Width/ft) 16 16 16 16	Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane			10			10			10			10	
Headway Eactor 111 100 111 111 100 111 110 111 100 111 111 100 111	Headway Eactor	1 11	1 00	1 1 1	1 1 1	1 00	1 11	1 11	1 00	1 1 1	1 1 1	1 00	1 11
Turning Speed (mph) 15 9 15 9 15 9 15 9	Turning Speed (mph)	15	1.00	9	15	1.00	9	1.11	1.00	9	15	1.00	9
Number of Detectors 1 1 1 1 1 1 1 1 1 1	Number of Detectors	1	1	1	1	1	1	1	1	5	1	1	1
Detector Template	Detector Template	•							•		•	•	
Leading Detector (ff) 50 50 50 50 50 50 50 50 50 50	Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft) $0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0$	Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position/ff) 0 0 0 0 0 0 0 0 0 0 0 0 0	Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ff) 50 50 50 50 50 50 50 50 50 50 50 50 50	Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type CI+Ex CI	Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	Cl+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel	Detector 1 Channel												
	Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Turn Type Prot NA Perm Prot NA Perm Prot NA Derm		Prot	ΝΔ	Perm	Prot	0.0 ΝΔ	Perm	Prot	ΝΔ		Prot	0.0 ΝΔ	Perm
Protected Phases $7 4$ $3 8$ $5 2$ $1 6$	Protected Phases	7	1		2	<u>م</u> برا و		5	2		1	AVI A	
Permitted Phases A 8 6	Permitted Phases	1	4	Λ	5	U	8	J	2			U	6
Detector Phase 7 4 4 3 8 8 5 2 1 6 6	Netector Phase	7	1	- 1	2	Q	8	5	2		1	6	6
Switch Phase	Switch Phase	1	т	т	5	0	0	5	2		1	0	0

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	15.4	47.9	47.9	10.3	42.8	42.8	18.2	42.9		18.9	43.6	43.6
Total Split (%)	12.8%	39.9%	39.9%	8.6%	35.7%	35.7%	15.2%	35.8%		15.8%	36.3%	36.3%
Maximum Green (s)	9.7	42.2	42.2	4.6	37.1	37.1	13.3	38.0		14.0	38.7	38.7
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	11.7	27.0	27.0	7.5	20.0	20.0	11.9	16.9		13.4	18.4	18.4
Actuated g/C Ratio	0.15	0.34	0.34	0.09	0.25	0.25	0.15	0.21		0.17	0.23	0.23
v/c Ratio	0.48	0.58	0.25	0.24	0.54	0.25	0.47	0.47		0.54	0.31	0.37
Control Delay (s/veh)	39.4	26.0	5.0	41.0	28.4	3.3	38.0	27.8		42.9	26.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	39.4	26.0	5.0	41.0	28.4	3.3	38.0	27.8		42.9	26.6	6.9
LOS	D	С	А	D	С	А	D	С		D	С	A
Approach Delay (s/veh)		25.9			25.3			31.8			24.9	
Approach LOS		С			С			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 79												
Natural Cycle: 105												
Control Type: Actuated-Un	coordinated	1										
Maximum v/c Ratio: 0.58												
Intersection Signal Delay (s	s/veh): 26.7			ıl	ntersectio	n LOS: C						
Intersection Capacity Utilization	ation 56.9%)		[(CU Level	of Service	эB					
Analysis Period (min) 15												
Splits and Phases: 2: Alt	a Ave & El	Monte W	ay								1	1

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42,9 \$	18.9 s	47.9 ş	10.3 s
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18.2 s 43.6 s		15.4 s 42.8 s	

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	* *	*	77	* *	1	77	≜1 4		3	**	1
Traffic Volume (veh/h)	207	642	136	66	442	111	204	269	57	137	238	159
Future Volume (veh/h)	207	642	136	66	442	111	204	269	57	137	238	159
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adi.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adi(A pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adi	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	225	698	148	72	480	121	222	292	62	149	259	173
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap. veh/h	415	1122	453	239	926	373	381	582	122	232	787	317
Arrive On Green	0.13	0.32	0.32	0.08	0.26	0.26	0.12	0.20	0.18	0.14	0.22	0.22
Sat Flow, veh/h	3183	3554	1434	3183	3554	1432	3183	2913	608	1641	3554	1430
Grn Volume(v) veh/h	225	698	148	72	480	121	222	176	178	149	259	173
Grp Sat Flow(s) veh/h/ln	1591	1777	1434	1591	1777	1432	1591	1777	1744	1641	1777	1430
Q Serve(q , s) s	4 0	10.0	2.6	13	6.9	22	3.9	53	54	51	37	6.4
Cycle Q Clear(q, c) s	4.0	10.0	2.6	1.3	6.9	22	3.9	5.3	54	5.1	37	6.4
Prop In Lane	1 00	10.0	1 00	1 00	0.0	1 00	1 00	0.0	0.35	1 00	0.1	1 00
Lane Grp Cap(c), veh/h	415	1122	453	239	926	373	381	355	349	232	787	317
V/C Ratio(X)	0.54	0.62	0.33	0.30	0.52	0.32	0.58	0.50	0.51	0.64	0.33	0.55
Avail Cap(c a), veh/h	607	2611	1053	336	2308	930	757	1157	1136	409	2356	948
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.3	17.4	4.7	26.1	18.9	5.4	24.9	21.2	21.4	24.2	19.5	20.6
Incr Delay (d2), s/yeh	1.1	0.6	0.4	0.7	0.5	0.5	1.4	1.1	1.2	3.0	0.2	1.5
Initial Q Delav(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%).veh/ln	1.3	3.3	1.2	0.4	2.3	1.1	1.3	1.9	2.0	1.9	1.3	1.9
Unsig. Movement Delay, s/veh	1											-
LnGrp Delay(d), s/veh	25.4	18.0	5.1	26.8	19.3	5.9	26.3	22.3	22.6	27.2	19.8	22.1
LnGrp LOS	С	В	А	С	В	А	С	С	С	С	В	С
Approach Vol. veh/h		1071			673			576			581	
Approach Delay, s/veh		17.8			17.7			23.9			22.3	
Approach LOS		В			В			С			С	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.4	15.9	8.5	22.9	11.2	17.2	11.8	19.6				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	14.0	38.0	4.6	42.2	13.3	38.7	9.7	37.1				
Max Q Clear Time (g c+l1), s	7.1	7.4	3.3	12.0	5.9	8.4	6.0	8.9				
Green Ext Time (p_c), s	0.2	1.2	0.0	3.8	0.5	1.7	0.3	2.5				
Intersection Summary												
HCM 7th Control Delay, s/veh			19.9									
HCM 7th LOS			В									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	7	*	≜ ti-			1
Traffic Volume (vph)	26	89	158	15	72	148
Future Volume (vph)	26	89	158	15	72	148
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900
Storage Length (ft)	0	100		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850	0.987			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1630	1458	3493	0	1630	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1630	1458	3493	0	1630	1863
Link Speed (mph)	55		55			55
Link Distance (ft)	522		452			482
Travel Time (s)	6.5		5.6			6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	97	172	16	78	161
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	97	188	0	78	161
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type: Unsignalized						
Intersection Capacity Utiliza	tion 22.5%			IC	CU Level o	of Service A

Analysis Period (min) 15

Intersection

Int Delay, s/veh	3.4						
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	٦	1	∱ ĵ _e		٦	1	
Traffic Vol, veh/h	26	89	158	15	72	148	
Future Vol, veh/h	26	89	158	15	72	148	
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	100	-	-	150	-	
Veh in Median Storage	, # 0	-	0	-	-	0	
Grade, %	0	-	0	-	-	0	
Peak Hour Factor	92	92	92	92	92	92	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	28	97	172	16	78	161	

Major/Minor	Minor1	Ν	/lajor1	Ν	lajor2		
Conflicting Flow All	497	94	0	0	188	0	
Stage 1	180	-	-	-	-	-	
Stage 2	317	-	-	-	-	-	
Critical Hdwy	6.63	6.93	-	-	4.13	-	
Critical Hdwy Stg 1	5.83	-	-	-	-	-	
Critical Hdwy Stg 2	5.43	-	-	-	-	-	
Follow-up Hdwy	3.519	3.319	-	-	2.219	-	
Pot Cap-1 Maneuver	517	945	-	-	1385	-	
Stage 1	834	-	-	-	-	-	
Stage 2	737	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	488	945	-	-	1385	-	
Mov Cap-2 Maneuver	488	-	-	-	-	-	
Stage 1	834	-	-	-	-	-	
Stage 2	696	-	-	-	-	-	

Approach WB	NB	SB
HCM Control Delay, s/v10.06	0	2.54
HCM LOS B		

Minor Lane/Major Mvmt	NBT	NBRV	VBLn1V	VBLn2	SBL	SBT	
Capacity (veh/h)	-	-	488	945	1385	-	
HCM Lane V/C Ratio	-	-	0.058	0.102	0.057	-	
HCM Control Delay (s/veh)	-	-	12.8	9.2	7.8	-	
HCM Lane LOS	-	-	В	А	А	-	
HCM 95th %tile Q(veh)	-	-	0.2	0.3	0.2	-	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	1		3	•	1	3	≜t i			≜t ₀	
Traffic Volume (vph)	57	83	50	7	96	35	69	186	13	52	185	39
Future Volume (vph)	57	83	50	7	96	35	69	186	13	52	185	39
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.944				0.850		0.990			0.974	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1758	0	1630	1863	1458	1630	3504	0	1630	3447	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1758	0	1630	1863	1458	1630	3504	0	1630	3447	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		27				245		6			21	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adi, Flow (vph)	62	90	54	8	104	38	75	202	14	57	201	42
Shared Lane Traffic (%)				-								
Lane Group Flow (vph)	62	144	0	8	104	38	75	216	0	57	243	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Riaht	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	CI+Ex		Cl+Ex	Cl+Ex	Cl+Ex	CI+Ex	CI+Ex		Cl+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	20.0	45.0		12.0	37.0	37.0	22.0	44.0		19.0	41.0	
Total Split (%)	16.7%	37.5%		10.0%	30.8%	30.8%	18.3%	36.7%		15.8%	34.2%	
Maximum Green (s)	14.0	39.0		6.0	31.0	31.0	16.0	38.0		13.0	35.0	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	9.0	22.6		6.0	12.5	12.5	9.7	41.5		8.7	40.6	
Actuated g/C Ratio	0.10	0.25		0.07	0.14	0.14	0.11	0.46		0.10	0.45	
v/c Ratio	0.38	0.31		0.07	0.40	0.09	0.43	0.13		0.36	0.16	
Control Delay (s/veh)	49.3	23.8		49.0	41.8	0.4	49.5	19.0		49.3	18.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	49.3	23.8		49.0	41.8	0.4	49.5	19.0		49.3	18.8	
LOS	D	С		D	D	А	D	В		D	В	
Approach Delay (s/veh)		31.5			31.7			26.9			24.6	
Approach LOS		С			С			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 90.1	1											
Natural Cycle: 95												
Control Type: Actuated-Unc	oordinated	l										
Maximum v/c Ratio: 0.43												
Intersection Signal Delay (s/	/veh): 27.9			lr	ntersectio	n LOS: C						
Intersection Capacity Utiliza	tion 35.6%			10	CU Level	of Service	eΑ					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way

1	Ø2			🖌 🖌 👩	1	Ç	øз	\rightarrow	Ø 4			
44 s				19 s		12 s		45 s				
5	Ø5	Ļ,	36	-		٢	Ø7		+	Ø8		
22.5	4	41 s				20 s			37 s			

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	ħ		3	•	1	1	≜t è		3	≜ ta	
Traffic Volume (veh/h)	57	83	50	7	96	35	69	186	13	52	185	39
Future Volume (veh/h)	57	83	50	7	96	35	69	186	13	52	185	39
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	62	90	54	8	104	38	75	202	14	57	201	42
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	77	138	83	13	163	127	95	1701	117	70	1438	295
Arrive On Green	0.05	0.13	0.13	0.01	0.09	0.09	0.06	0.50	0.50	0.04	0.49	0.49
Sat Flow, veh/h	1641	1095	657	1641	1870	1460	1641	3373	232	1641	2937	602
Grp Volume(v), veh/h	62	0	144	8	104	38	75	106	110	57	120	123
Grp Sat Flow(s),veh/h/ln	1641	0	1752	1641	1870	1460	1641	1777	1829	1641	1777	1762
Q Serve(g_s), s	2.8	0.0	5.9	0.4	4.0	1.4	3.4	2.4	2.4	2.6	2.8	2.9
Cycle Q Clear(g_c), s	2.8	0.0	5.9	0.4	4.0	1.4	3.4	2.4	2.4	2.6	2.8	2.9
Prop In Lane	1.00		0.38	1.00		1.00	1.00		0.13	1.00		0.34
Lane Grp Cap(c), veh/h	77	0	221	13	163	127	95	896	922	70	870	863
V/C Ratio(X)	0.80	0.00	0.65	0.60	0.64	0.30	0.79	0.12	0.12	0.81	0.14	0.14
Avail Cap(c_a), veh/h	305	0	907	131	770	601	348	896	922	283	870	863
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.6	0.0	31.4	37.2	33.2	19.5	35.1	9.8	9.8	35.7	10.5	10.6
Incr Delay (d2), s/veh	17.2	0.0	3.2	35.7	4.1	1.3	13.7	0.3	0.3	19.1	0.3	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	2.4	0.3	1.8	0.6	1.6	0.8	0.8	1.3	0.9	1.0
Unsig. Movement Delay, s/vel	h											
LnGrp Delay(d), s/veh	52.7	0.0	34.6	72.9	37.4	20.8	48.7	10.1	10.1	54.9	10.9	10.9
LnGrp LOS	D		С	Е	D	С	D	В	В	D	В	В
Approach Vol. veh/h		206			150			291			300	
Approach Delay, s/veh		40.0			35.1			20.1			19.2	
Approach LOS		D			D			С			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.2	44.0	6.6	15.5	10.3	42.9	9.5	12.6				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	13.0	38.0	6.0	39.0	16.0	35.0	14.0	31.0				
Max Q Clear Time (g_c+l1), s	4.6	4.4	2.4	7.9	5.4	4.9	4.8	6.0				
Green Ext Time (p_c), s	0.0	1.0	0.0	0.7	0.1	1.2	0.1	0.5				
Intersection Summary												
HCM 7th Control Delay, s/veh			26.5									
HCM 7th LOS			С									

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	2	^	۲	2	≜ 16		×	1	*		4	
Traffic Volume (vph)	6	891	181	101	668	42	387	104	157	95	62	11
Future Volume (vph)	6	891	181	101	668	42	387	104	157	95	62	11
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95		180	105		0	100		100	0		0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97		1.00				0.98		1.00	
Frt			0.850		0.991				0.850		0.991	
Flt Protected	0.950			0.950			0.950				0.972	
Satd. Flow (prot)	1630	3539	1458	1630	3499	0	1630	1863	1458	0	1791	0
Flt Permitted	0.950			0.950			0.950				0.762	
Satd. Flow (perm)	1630	3539	1414	1630	3499	0	1630	1863	1430	0	1404	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			148		6				171		2	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adi, Flow (vph)	7	968	197	110	726	46	421	113	171	103	67	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	968	197	110	772	0	421	113	171	0	182	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12	Ŭ		12	Ŭ		12	Ŭ		12	Ŭ
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	CI+Ex	Cl+Ex	Cl+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases			4						2	6		
Detector Phase	7	4	4	3	8		5	2	2	6	6	
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	36.0	46.7	46.7	37.3	48.0		25.0	36.0	36.0	11.0	11.0	
Total Split (%)	30.0%	38.9%	38.9%	31.1%	40.0%		20.8%	30.0%	30.0%	9.2%	9.2%	
Maximum Green (s)	30.3	41.0	41.0	31.6	42.3		20.1	31.1	31.1	6.1	6.1	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)	8.0	33.1	33.1	14.1	49.4		21.8	37.0	37.0		11.0	
Actuated g/C Ratio	0.08	0.34	0.34	0.15	0.51		0.23	0.38	0.38		0.11	
v/c Ratio	0.05	0.80	0.34	0.46	0.43		1.15	0.16	0.26		1.12	
Control Delay (s/veh)	51.2	35.8	9.8	47.8	17.3		129.4	22.2	4.6		149.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)	51.2	35.8	9.8	47.8	17.3		129.4	22.2	4.6		149.8	
LOS	D	D	А	D	В		F	С	А		F	
Approach Delay (s/veh)		31.5			21.1			81.9			149.8	
Approach LOS		С			С			F			F	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 96.0	6											
Natural Cycle: 130												
Control Type: Actuated-Unc	coordinated	1										
Maximum v/c Ratio: 1.15												
Intersection Signal Delay (s	/veh): 47.8			Ir	ntersection	n LOS: D						
Intersection Capacity Utiliza	ation 71.3%)		10	CU Level	of Service	ЭC					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way

1 ø2	🗲 ø3	→ Ø4
36 s	37.3 s	46.7 s
↑ ø5 ► ø6	ح _{۵7}	← _{Ø8}
25 s 11 s	36 s	48 s

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	† †	۲	2	≜ 1₀			1	*		4	
Traffic Volume (veh/h)	6	891	181	101	668	42	387	104	157	95	62	11
Future Volume (veh/h)	6	891	181	101	668	42	387	104	157	95	62	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	7	968	197	110	726	46	421	113	171	103	67	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	46	1275	508	173	1478	94	419	729	559	132	41	7
Arrive On Green	0.03	0.36	0.36	0.11	0.44	0.42	0.26	0.39	0.39	0.09	0.09	0.07
Sat Flow, veh/h	1641	3554	1418	1641	3387	214	1641	1870	1435	742	482	86
Grp Volume(v), veh/h	7	968	197	110	381	391	421	113	171	182	0	0
Grp Sat Flow(s),veh/h/ln	1641	1777	1418	1641	1777	1825	1641	1870	1435	1311	0	0
Q Serve(g_s), s	0.3	19.7	8.5	5.3	12.6	12.7	21.0	3.2	6.8	7.0	0.0	0.0
Cycle Q Clear(g_c), s	0.3	19.7	8.5	5.3	12.6	12.7	21.0	3.2	6.8	7.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	0.57		0.07
Lane Grp Cap(c), veh/h	46	1275	508	173	775	796	419	729	559	180	0	0
V/C Ratio(X)	0.15	0.76	0.39	0.63	0.49	0.49	1.00	0.16	0.31	1.01	0.00	0.00
Avail Cap(c_a), veh/h	639	1848	737	665	952	977	419	729	559	180	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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	39.0	23.2	19.6	35.2	16.6	16.7	30.6	16.3	17.4	38.9	0.0	0.0
Incr Delay (d2), s/veh	1.5	1.1	0.5	3.8	0.5	0.5	44.8	0.1	0.3	69.4	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/In	0.1	7.3	2.5	2.1	4.4	4.5	12.5	1.2	2.0	6.9	0.0	0.0
Unsig. Movement Delay, s/ve	h											
LnGrp Delay(d), s/veh	40.5	24.3	20.1	39.0	17.1	17.2	75.4	16.4	17.7	108.4	0.0	0.0
LnGrp LOS	D	С	С	D	В	В	F	В	В	F		
Approach Vol, veh/h		1172			882			705			182	
Approach Delay, s/veh		23.7			19.9			51.9			108.4	
Approach LOS		С			В			D			F	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		36.0	12.7	33.5	25.0	11.0	6.3	39.8				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		31.1	31.6	41.0	20.1	6.1	30.3	42.3				
Max Q Clear Time (g_c+I1), s	;	8.8	7.3	21.7	23.0	9.0	2.3	14.7				
Green Ext Time (p_c), s		1.0	0.3	5.1	0.0	0.0	0.0	2.9				
Intersection Summary												
HCM 7th Control Delay, s/veh	1		34.6									
HCM 7th LOS			С									
Notes												

User approved pedestrian interval to be less than phase max green.

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	**	**	1	55	**	1	**	≜t ⊾		*	**	1
Traffic Volume (vph)	299	926	179	86	798	167	280	542	76	200	495	232
Future Volume (vph)	299	926	179	86	798	167	280	542	76	200	495	232
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	200		195	110		115	190		0	80		80
Storage Lanes	2		1	2		1	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98		1.00				0.98
Frt			0.850			0.850		0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3464	0	1630	3539	1458
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3162	3539	1431	3162	3539	1432	3162	3464	0	1630	3539	1432
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			156			114		14				121
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		1012			2084			1629			1012	
Travel Time (s)		12.5			25.8			20.2			12.5	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	325	1007	195	93	867	182	304	589	83	217	538	252
Shared Lane Traffic (%)												
Lane Group Flow (vph)	325	1007	195	93	867	182	304	672	0	217	538	252
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24	-		24	-		24	-		24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1	1	1	1		1	1	1
Detector Template												
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type	CI+Ex	Cl+Ex	CI+Ex	Cl+Ex	CI+Ex	Cl+Ex	Cl+Ex	Cl+Ex		CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	15.0	49.4	49.4	9.7	44.1	44.1	16.5	42.9		18.0	44.4	44.4
Total Split (%)	12.5%	41.2%	41.2%	8.1%	36.8%	36.8%	13.8%	35.8%		15.0%	37.0%	37.0%
Maximum Green (s)	9.3	43.7	43.7	4.0	38.4	38.4	11.6	38.0		13.1	39.5	39.5
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	11.2	38.9	38.9	6.4	31.8	31.8	12.7	26.3		14.2	27.9	27.9
Actuated g/C Ratio	0.11	0.39	0.39	0.06	0.32	0.32	0.13	0.26		0.14	0.28	0.28
v/c Ratio	0.92	0.73	0.30	0.46	0.77	0.34	0.76	0.73		0.94	0.55	0.52
Control Delay (s/veh)	77.5	31.2	7.6	56.7	36.5	12.8	57.4	38.0		90.3	33.0	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	77.5	31.2	7.6	56.7	36.5	12.8	57.4	38.0		90.3	33.0	19.6
LOS	E	С	А	E	D	В	E	D		F	С	В
Approach Delay (s/veh)		38.0			34.4			44.0			42.0	
Approach LOS		D			С			D			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 99.	.8											
Natural Cycle: 125												
Control Type: Actuated-Un	coordinated	ł										
Maximum v/c Ratio: 0.94												
Intersection Signal Delay (s	s/veh): 39.2	2		Ir	ntersectio	n LOS: D						
Intersection Capacity Utilization	ation 77.7%	Ď		10	CU Level	of Service	e D					
Analysis Period (min) 15												

Splits and Phases: 2: Alta Ave & El Monte Way

ø3 ø1	1 ø2	→ Ø4	F
18 s	42,9 s	49.4 s	9,7 s
1 05	a6	€ Ø8	J _{Ø7}
16.5 s	44.4 s	44.1 s	15 s

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	* *	7	55	**	1	10	≜ 16		3	**	7
Traffic Volume (veh/h)	299	926	179	86	798	167	280	542	76	200	495	232
Future Volume (veh/h)	299	926	179	86	798	167	280	542	76	200	495	232
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	325	1007	195	93	867	182	304	589	83	217	538	252
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap. veh/h	368	1249	504	257	1125	454	395	787	111	241	979	395
Arrive On Green	0.12	0.35	0.35	0.08	0.32	0.32	0.12	0.25	0.24	0.15	0.28	0.28
Sat Flow, veh/h	3183	3554	1434	3183	3554	1434	3183	3119	438	1641	3554	1432
Grp Volume(v), veh/h	325	1007	195	93	867	182	304	335	337	217	538	252
Grp Sat Flow(s), veh/h/ln	1591	1777	1434	1591	1777	1434	1591	1777	1781	1641	1777	1432
Q Serve(q , s), s	9.6	24.4	6.1	2.6	21.0	5.8	8.8	16.5	16.6	12.4	12.3	10.3
Cycle Q Clear(q, c), s	9.6	24.4	6.1	2.6	21.0	5.8	8.8	16.5	16.6	12.4	12.3	10.3
Prop In Lane	1.00		1.00	1.00	•	1.00	1.00		0.25	1.00		1.00
Lane Grp Cap(c), veh/h	368	1249	504	257	1125	454	395	449	450	241	979	395
V/C Ratio(X)	0.88	0.81	0.39	0.36	0.77	0.40	0.77	0.75	0.75	0.90	0.55	0.64
Avail Cap(c a), veh/h	368	1696	685	257	1498	604	418	727	728	241	1509	608
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.4	27.9	9.0	41.4	29.4	9.4	40.3	32.8	32.9	39.9	29.4	14.8
Incr Delay (d2), s/yeh	21.4	2.1	0.5	0.9	1.8	0.6	8.1	2.5	2.5	32.5	0.5	1.7
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	4.6	9.6	2.8	1.0	8.3	2.8	37	6.8	6.9	6.8	49	4.5
Unsig, Movement Delay, s/veh	1	0.0	2.0		0.0	2.0	0.1	0.0	0.0	0.0	1.0	1.0
LnGrp Delav(d), s/veh	. 62.9	30.0	9.5	42.2	31.2	10.0	48.4	35.3	35.4	72.4	29.9	16.5
LnGrp LOS	E	C	A	D	C	В	D	D	D	E	C	B
Approach Vol. veh/h		1527			1142			976			1007	
Approach Delay s/yeh		34.4			28.7			39.4			35.7	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.0	28.0	11.7	37.4	15.8	30.2	15.0	34.1				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	13.1	38.0	4.0	43.7	11.6	39.5	9.3	38.4				
Max Q Clear Time (q c+l1), s	14.4	18.6	4.6	26.4	10.8	14.3	11.6	23.0				
Green Ext Time (p_c), s	0.0	2.3	0.0	5.1	0.1	3.4	0.0	4.2				
Intersection Summary												
HCM 7th Control Delay, s/veh			34.3									
HCM 7th LOS			С									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	۲	7	≜ ta			1	
Traffic Volume (vph)	38	121	280	38	94	349	
Future Volume (vph)	38	121	280	38	94	349	
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900	
Storage Length (ft)	0	100		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00	
Frt		0.850	0.982				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1630	1458	3476	0	1630	1863	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1630	1458	3476	0	1630	1863	
Link Speed (mph)	55		55			55	
Link Distance (ft)	522		452			482	
Travel Time (s)	6.5		5.6			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	41	132	304	41	102	379	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	41	132	345	0	102	379	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Right	Left	Left	
Median Width(ft)	12		12			12	
Link Offset(ft)	0		0			0	
Crosswalk Width(ft)	16		16			16	
Two way Left Turn Lane							
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00	
Turning Speed (mph)	15	9		9	15		
Sign Control	Stop		Free			Free	
Intersection Summary							
Area Type: 0	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizat	ion 28.4%			IC	CU Level o	of Service A	Ą
Analysis Period (min) 15							

Intersection

Int Delay, s/veh	3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	1	7	∱ î,		٦	1
Traffic Vol, veh/h	38	121	280	38	94	349
Future Vol, veh/h	38	121	280	38	94	349
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	100	-	-	150	-
Veh in Median Storage	,# 0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	132	304	41	102	379

Major/Minor	Minor1	Ν	/lajor1	М	ajor2	
Conflicting Flow All	909	173	0	0	346	0
Stage 1	325	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Critical Hdwy	6.63	6.93	-	-	4.13	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	- 2	2.219	-
Pot Cap-1 Maneuver	290	841	-	-	1212	-
Stage 1	705	-	-	-	-	-
Stage 2	557	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	265	841	-	-	1212	-
Mov Cap-2 Maneuver	265	-	-	-	-	-
Stage 1	705	-	-	-	-	-
Stage 2	510	-	-	-	-	-

Minor Lane/Major Mvmt	NBT	NBRV	VBLn1V	VBLn2	SBL	SBT	
Capacity (veh/h)	-	-	265	841	1212	-	
HCM Lane V/C Ratio	-	-	0.156	0.156	0.084	-	
HCM Control Delay (s/veh)	-	-	21.1	10.1	8.2	-	
HCM Lane LOS	-	-	С	В	Α	-	
HCM 95th %tile Q(veh)	-	-	0.5	0.6	0.3	-	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		3	•	1		≜t ₀			≜1 6	
Traffic Volume (vph)	62	178	62	10	206	50	85	407	19	90	376	26
Future Volume (vph)	62	178	62	10	206	50	85	407	19	90	376	26
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.961				0.850		0.993			0.990	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1790	0	1630	1863	1458	1630	3514	0	1630	3504	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1790	0	1630	1863	1458	1630	3514	0	1630	3504	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15				245		4			6	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	193	67	11	224	54	92	442	21	98	409	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	67	260	0	11	224	54	92	463	0	98	437	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	CI+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	18.0	45.0		10.0	37.0	37.0	21.0	43.0		22.0	44.0	
Total Split (%)	15.0%	37.5%		8.3%	30.8%	30.8%	17.5%	35.8%		18.3%	36.7%	
Maximum Green (s)	12.0	39.0		4.0	31.0	31.0	15.0	37.0		16.0	38.0	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	9.3	28.2		4.2	17.9	17.9	10.9	39.3		11.6	40.0	
Actuated g/C Ratio	0.10	0.29		0.04	0.19	0.19	0.11	0.41		0.12	0.42	
v/c Ratio	0.42	0.48		0.15	0.64	0.11	0.50	0.32		0.50	0.30	
Control Delay (s/veh)	54.6	29.9		57.1	47.2	0.5	54.4	24.4		53.0	23.4	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	54.6	29.9		57.1	47.2	0.5	54.4	24.4		53.0	23.4	
LOS	D	С		E	D	А	D	С		D	С	
Approach Delay (s/veh)		35.0			38.8			29.4			28.8	
Approach LOS		С			D			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 95	.7											
Natural Cycle: 95												
Control Type: Actuated-Un	coordinated	1										
Maximum v/c Ratio: 0.64												
Intersection Signal Delay (s/veh): 31.9			Ir	ntersectio	n LOS: C						
Intersection Capacity Utiliz	ation 53.7%)		10	CU Level	of Service	e A					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		3	•	1	3	≜t a		3	≜ 16	
Traffic Volume (veh/h)	62	178	62	10	206	50	85	407	19	90	376	26
Future Volume (veh/h)	62	178	62	10	206	50	85	407	19	90	376	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adi.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adi(A pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adi	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	67	193	67	11	224	54	92	442	21	98	409	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	84	255	89	18	284	222	116	1497	71	135	1502	102
Arrive On Green	0.05	0.19	0 19	0.01	0.15	0.15	0.07	0.43	0 43	0.08	0.45	0.45
Sat Flow, veh/h	1641	1327	461	1641	1870	1460	1641	3454	164	1641	3375	230
Grp Volume(v) veh/h	67	0	260	11	224	54	92	227	236	98	215	222
Grp Sat Flow(s) veh/h/ln	1641	0	1787	1641	1870	1460	1641	1777	1841	1641	1777	1829
O Serve(a, s) s	34	0.0	11 7	0.6	99	21	47	7 1	7 1	5.0	6.5	6.6
$Cycle \cap Clear(q, c) $ s	3.4	0.0	11.7	0.6	9.9	2.1	47	7.1	7.1	5.0	6.5	6.6
Pron In Lane	1 00	0.0	0.26	1 00	0.0	1 00	1 00	7.1	0.09	1 00	0.0	0.13
Lane Grn Can(c) veh/h	84	0	344	18	284	222	116	770	798	135	791	814
V/C Ratio(X)	0.80	0.00	0.76	0.62	0.79	0.24	0.79	0.29	0.30	0.72	0.27	0 27
Avail Cap(c_a) veh/h	231	0.00	816	77	679	530	288	770	798	307	791	814
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
Instream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d) s/veh	40.1	0.00	32.6	42.1	34.9	17.3	39.1	15.7	15.7	38.2	15.0	15.0
Incr Delay (d2) s/veh	15.5	0.0	3.4	30.8	۵4.5 4 ۹	0.6	11 4	10.1	0.9	7 1	0.8	0.8
Initial O Delay(d3), s/veh	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfO(50%) veh/ln	17	0.0	49	0.0	4 5	0.0	2.1	2.7	2.8	2.1	24	2.5
Unsig Movement Delay s/veh	1.7	0.0	7.0	0.4	7.0	0.0	2.1	2.1	2.0	2.1	2.7	2.0
InGrn Delay(d) s/veh	55 5	0.0	36.0	72 9	39.8	17 9	50.4	16 7	16.7	45.3	15.8	15.8
LnGrp LOS	00.0 F	0.0	00.0 D	72.5 F	00.0 D	B	00.4 D	10.7 B	10.7 B	-0.0 D	10.0 B	10.0 B
Approach Vol. veh/h	_	327			289			555			535	
Approach Delay, s/veh		40.0			36.9			22.3			21.2	
Approach LOS		-10.0 D			D			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.0	43.0	6.9	22.4	12.0	44.0	10.4	19.0				
Change Period (Y+Rc) s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax) s	16.0	37.0	4.0	39.0	15.0	38.0	12.0	31.0				
Max Q Clear Time (q. $c+11$) s	7.0	91	2.6	13.7	6.7	8.6	5.4	11.9				
Green Ext Time (p_c), s	0.1	2.3	0.0	1.3	0.1	2.2	0.1	1.1				
Intersection Summary												
HCM 7th Control Delay. s/veh			27.8									
HCM 7th LOS			С									

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	44	*	3	≜t i		3	4	1		4	
Traffic Volume (vph)	6	897	188	101	672	42	391	104	157	95	62	11
Future Volume (vph)	6	897	188	101	672	42	391	104	157	95	62	11
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95		180	105		0	100		100	0		0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97		1.00				0.98		1.00	
Frt			0.850		0.991				0.850		0.991	
Flt Protected	0.950			0.950			0.950				0.972	
Satd. Flow (prot)	1630	3539	1458	1630	3499	0	1630	1863	1458	0	1792	0
Flt Permitted	0.950			0.950			0.950				0.762	
Satd. Flow (perm)	1630	3539	1412	1630	3499	0	1630	1863	1430	0	1404	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			127		5				171		2	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	975	204	110	730	46	425	113	171	103	67	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	975	204	110	776	0	425	113	171	0	182	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	CI+Ex	Cl+Ex	CI+Ex		Cl+Ex	CI+Ex	Cl+Ex	CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases			4						2	6		
Detector Phase	7	4	4	3	8		5	2	2	6	6	
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	32.0	41.4	41.4	35.6	45.0		38.0	53.0	53.0	15.0	15.0	
Total Split (%)	24.6%	31.8%	31.8%	27.4%	34.6%		29.2%	40.8%	40.8%	11.5%	11.5%	
Maximum Green (s)	26.3	35.7	35.7	29.9	39.3		33.1	48.1	48.1	10.1	10.1	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)	7.9	36.8	36.8	15.0	53.7		34.4	53.3	53.3		14.8	
Actuated g/C Ratio	0.07	0.31	0.31	0.13	0.46		0.29	0.45	0.45		0.13	
v/c Ratio	0.06	0.88	0.38	0.53	0.48		0.89	0.13	0.23		1.02	
Control Delay (s/veh)	58.2	49.0	16.1	58.8	25.0		62.6	19.8	3.6		123.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)	58.2	49.0	16.1	58.8	25.0		62.6	19.8	3.6		123.2	
LOS	E	D	В	E	С		E	В	А		F	
Approach Delay (s/veh)		43.4			29.2			41.5			123.2	
Approach LOS		D			С			D			F	
Intersection Summary												
Area Type:	Other											
Cycle Length: 130												
Actuated Cycle Length: 11	7.2											
Natural Cycle: 130												
Control Type: Actuated-Ur	ncoordinated	l										
Maximum v/c Ratio: 1.02												
Intersection Signal Delay (s/veh): 43.6			Ir	ntersection	ו LOS: D						
Intersection Capacity Utiliz	ation 71.7%)		10	CU Level of	of Service	эC					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	* *	7	3	≜t a		3	•	7		4	
Traffic Volume (veh/h)	6	897	188	101	672	42	391	104	157	95	62	11
Future Volume (veh/h)	6	897	188	101	672	42	391	104	157	95	62	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	7	975	204	110	730	46	425	113	171	103	67	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	40	1186	473	166	1391	88	473	827	635	142	55	10
Arrive On Green	0.02	0.33	0.33	0.10	0.41	0.39	0.29	0.44	0.44	0.11	0.11	0.10
Sat Flow, veh/h	1641	3554	1417	1641	3388	213	1641	1870	1436	744	484	87
Grp Volume(v), veh/h	7	975	204	110	383	393	425	113	171	182	0	0
Grp Sat Flow(s),veh/h/ln	1641	1777	1417	1641	1777	1825	1641	1870	1436	1314	0	0
Q Serve(g_s), s	0.4	24.6	10.9	6.3	15.8	15.8	24.3	3.5	7.4	11.0	0.0	0.0
Cycle Q Clear(g_c), s	0.4	24.6	10.9	6.3	15.8	15.8	24.3	3.5	7.4	11.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	0.57		0.07
Lane Grp Cap(c), veh/h	40	1186	473	166	729	749	473	827	635	206	0	0
V/C Ratio(X)	0.17	0.82	0.43	0.66	0.52	0.53	0.90	0.14	0.27	0.88	0.00	0.00
Avail Cap(c_a), veh/h	471	1363	543	532	747	767	572	940	721	206	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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	46.6	29.8	25.3	42.2	21.6	21.7	33.3	16.2	17.2	44.3	0.0	0.0
Incr Delay (d2), s/veh	2.0	3.7	0.6	4.5	0.6	0.6	15.1	0.1	0.2	33.2	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/In	0.2	10.0	3.4	2.6	6.0	6.2	10.7	1.4	2.2	6.1	0.0	0.0
Unsig. Movement Delay, s/veł	า											
LnGrp Delay(d), s/veh	48.6	33.5	25.9	46.7	22.2	22.3	48.5	16.2	17.5	77.5	0.0	0.0
LnGrp LOS	D	С	С	D	С	С	D	В	В	E		
Approach Vol, veh/h		1186			886			709			182	
Approach Delay, s/veh		32.3			25.3			35.9			77.5	
Approach LOS		С			С			D			Е	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		47.1	13.9	36.6	32.1	15.0	6.4	44.0				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		48.1	29.9	35.7	33.1	10.1	26.3	39.3				
Max Q Clear Time (g_c+l1), s		9.4	8.3	26.6	26.3	13.0	2.4	17.8				
Green Ext Time (p_c), s		1.1	0.3	3.7	0.9	0.0	0.0	2.8				
Intersection Summary												
HCM 7th Control Delay, s/veh			33.8									
HCM 7th LOS			С									
Notes												

User approved pedestrian interval to be less than phase max green.

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	33	* *	*	7 7	**	1	7 7	≜t i		3	**	7
Traffic Volume (vph)	299	926	191	95	798	167	288	544	80	200	498	232
Future Volume (vph)	299	926	191	95	798	167	288	544	80	200	498	232
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	200		195	110		115	190		0	80		80
Storage Lanes	2		1	2		1	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98		1.00				0.98
Frt			0.850			0.850		0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd, Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3464	0	1630	3539	1458
Flt Permitted	0.950			0.950			0.950		-	0.950		
Satd, Flow (perm)	3162	3539	1431	3162	3539	1432	3162	3464	0	1630	3539	1432
Right Turn on Red	•••=		Yes	••••		Yes	•••=		Yes			Yes
Satd Flow (RTOR)			167			114		14				121
Link Speed (mph)		55			55			55			55	
Link Distance (ff)		1012			2084			1629			1012	
Travel Time (s)		12.5			25.8			20.2			12.5	
Confl Peds (#/hr)		12.0	5		20.0	5		20.2	5		12.0	5
Confl Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0 92	0 92	0.92	0 92	0 92	0.92	0 92	0.92	0.92	0 92	0 92	0.92
Adi Flow (vph)	325	1007	208	103	867	182	313	591	87	217	541	252
Shared Lane Traffic (%)	020	1001	200	100	001	102	010	001	01		011	202
Lane Group Flow (vph)	325	1007	208	103	867	182	313	678	0	217	541	252
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	Lon	24	rugite	Lon	24	rugin	Lon	24	rugite	Lon	24	rugin
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		10			10			10			10	
Headway Eactor	1 11	1 00	1 1 1	1 11	1 00	1 11	1 11	1 00	1 1 1	1 11	1 00	1 11
Turning Speed (mph)	15	1.00	9	15	1.00	9	15	1.00	9	15	1.00	9
Number of Detectors	1	1	1	1	1	1	1	1	Ū	1	1	1
Detector Template	•	•	•	•	•	•	•			•	•	
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0 0	0 0	0	0	0 0	0 0	0	0		0 0	0 0	0
Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	Cl+Ex	CI+Ex	CI+Ex	CI+Ex	Cl+Ex		CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel		OI' LA	OF	ONEX	OF		OI' LA	OI LA			OF	OFER
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	1100	1.0.1	1 01111	2	0	1 0111	5	2		1	6	1 0111
Demoitte d Disease	7	4			0							
Permitted Phases	7	4	4	ა	0	8	J	2		1	0	6
Permitted Phases	7	4	4	3	8	8	5	2		1	6	6

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	15.0	49.4	49.4	9.7	44.1	44.1	16.9	42.9		18.0	44.0	44.0
Total Split (%)	12.5%	41.2%	41.2%	8.1%	36.8%	36.8%	14.1%	35.8%		15.0%	36.7%	36.7%
Maximum Green (s)	9.3	43.7	43.7	4.0	38.4	38.4	12.0	38.0		13.1	39.1	39.1
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	11.2	36.0	36.0	7.1	31.8	31.8	13.1	26.5		14.3	27.7	27.7
Actuated g/C Ratio	0.11	0.36	0.36	0.07	0.32	0.32	0.13	0.26		0.14	0.28	0.28
v/c Ratio	0.92	0.79	0.33	0.46	0.77	0.34	0.76	0.73		0.94	0.55	0.52
Control Delay (s/veh)	78.1	34.3	7.8	56.3	36.6	12.9	56.9	38.0		90.9	33.4	19.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	78.1	34.3	7.8	56.3	36.6	12.9	56.9	38.0		90.9	33.4	19.8
LOS	E	С	А	E	D	В	E	D		F	С	В
Approach Delay (s/veh)		40.0			34.6			44.0			42.4	
Approach LOS		D			С			D			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 10	0.1											
Natural Cycle: 125												
Control Type: Actuated-Un	coordinated											
Maximum v/c Ratio: 0.94												
Intersection Signal Delay (s/veh): 40.0			lr	ntersectio	n LOS: D						
Intersection Capacity Utiliz	ation 77.8%			10	CU Level	of Service	e D					
Analysis Period (min) 15												

Splits and Phases: 2: Alta Ave & El Monte Way

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18 s	42,9 \$	49.4 s	9,7 s
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16.9 s	44 s	44.1 s	15 s

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	* *	7	ሻሻ	* *	1	77	≜1 6			44	1
Traffic Volume (veh/h)	299	926	191	95	798	167	288	544	80	200	498	232
Future Volume (veh/h)	299	926	191	95	798	167	288	544	80	200	498	232
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	325	1007	208	103	867	182	313	591	87	217	541	252
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	367	1249	504	255	1124	453	404	787	116	241	973	392
Arrive On Green	0.12	0.35	0.35	0.08	0.32	0.32	0.13	0.25	0.24	0.15	0.27	0.27
Sat Flow, veh/h	3183	3554	1434	3183	3554	1434	3183	3099	455	1641	3554	1432
Grp Volume(v), veh/h	325	1007	208	103	867	182	313	338	340	217	541	252
Grp Sat Flow(s),veh/h/ln	1591	1777	1434	1591	1777	1434	1591	1777	1778	1641	1777	1432
Q Serve(g s), s	9.6	24.5	6.5	2.9	21.0	5.8	9.1	16.7	16.8	12.4	12.4	10.4
Cycle Q Clear(g c), s	9.6	24.5	6.5	2.9	21.0	5.8	9.1	16.7	16.8	12.4	12.4	10.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.26	1.00		1.00
Lane Grp Cap(c), veh/h	367	1249	504	255	1124	453	404	451	451	241	973	392
V/C Ratio(X)	0.89	0.81	0.41	0.40	0.77	0.40	0.77	0.75	0.75	0.90	0.56	0.64
Avail Cap(c_a), veh/h	367	1691	683	255	1494	603	430	725	725	241	1490	600
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.6	28.0	9.0	41.7	29.5	9.5	40.3	32.8	32.9	40.0	29.7	15.0
Incr Delay (d2), s/veh	21.9	2.1	0.5	1.0	1.8	0.6	8.1	2.5	2.6	33.1	0.5	1.8
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	4.6	9.6	3.0	1.1	8.4	2.8	3.8	6.9	7.0	6.9	4.9	0.2
Unsig. Movement Delay, s/vel	h											
LnGrp Delay(d), s/veh	63.4	30.1	9.6	42.7	31.3	10.1	48.4	35.3	35.5	73.1	30.2	16.7
LnGrp LOS	E	С	А	D	С	В	D	D	D	Е	С	В
Approach Vol. veh/h		1540			1152			991			1010	
Approach Delay, s/veh		34.4			29.0			39.5			36.0	
Approach LOS		С			С			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.0	28.2	11.6	37.5	16.1	30.1	15.0	34.2				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	13.1	38.0	4.0	43.7	12.0	39.1	9.3	38.4				
Max Q Clear Time (g_c+l1), s	14.4	18.8	4.9	26.5	11.1	14.4	11.6	23.0				
Green Ext Time (p_c), s	0.0	2.4	0.0	5.2	0.1	3.4	0.0	4.2				
Intersection Summary												
HCM 7th Control Delay, s/veh			34.5									
HCM 7th LOS			С									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	×.	7	≜ ti-		*	1
Traffic Volume (vph)	38	128	280	38	105	349
Future Volume (vph)	38	128	280	38	105	349
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900
Storage Length (ft)	0	100		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850	0.982			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1630	1458	3476	0	1630	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1630	1458	3476	0	1630	1863
Link Speed (mph)	55		55			55
Link Distance (ft)	522		452			482
Travel Time (s)	6.5		5.6			6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	139	304	41	114	379
Shared Lane Traffic (%)						
Lane Group Flow (vph)	41	139	345	0	114	379
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type: 0	Other					
Control Type: Unsignalized						
Intersection Capacity Utilizat	tion 28.6%			IC	CU Level of	of Service A
Analysis Period (min) 15						

Intersection

Int Delay, s/veh	3.2								
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations	1	1	_ ≜ ⊅		٦	1			
Traffic Vol, veh/h	38	128	280	38	105	349			
Future Vol, veh/h	38	128	280	38	105	349			
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	100	-	-	150	-			
Veh in Median Storage	e, # 0	-	0	-	-	0			
Grade, %	0	-	0	-	-	0			
Peak Hour Factor	92	92	92	92	92	92			
Heavy Vehicles, %	2	2	2	2	2	2			
Mvmt Flow	41	139	304	41	114	379			

Major/Minor	Minor1	Ν	/lajor1	Μ	lajor2	
Conflicting Flow All	933	173	0	0	346	0
Stage 1	325	-	-	-	-	-
Stage 2	608	-	-	-	-	-
Critical Hdwy	6.63	6.93	-	-	4.13	-
Critical Hdwy Stg 1	5.83	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	- 2	2.219	-
Pot Cap-1 Maneuver	280	841	-	-	1212	-
Stage 1	705	-	-	-	-	-
Stage 2	543	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	254	841	-	-	1212	-
Mov Cap-2 Maneuver	254	-	-	-	-	-
Stage 1	705	-	-	-	-	-
Stage 2	491	-	-	-	-	-

Approach V	B NB	NB S
HCM Control Delay, s/v12.	3 0	0 1.9
HCM LOS	3	

Minor Lane/Major Mvmt	NBT	NBRWBLn1	VBLn2	SBL	SBT	
Capacity (veh/h)	-	- 254	841	1212	-	
HCM Lane V/C Ratio	-	- 0.163	0.165	0.094	-	
HCM Control Delay (s/veh)	-	- 21.9	10.1	8.3	-	
HCM Lane LOS	-	- C	В	А	-	
HCM 95th %tile Q(veh)	-	- 0.6	0.6	0.3	-	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	eî.		7	1	*	2	A1⊅		2	≜ ti-	
Traffic Volume (vph)	76	178	69	10	206	50	97	407	19	90	376	50
Future Volume (vph)	76	178	69	10	206	50	97	407	19	90	376	50
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.958				0.850		0.993			0.983	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1785	0	1630	1863	1458	1630	3514	0	1630	3479	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1785	0	1630	1863	1458	1630	3514	0	1630	3479	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17				191		4			12	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adi, Flow (vph)	83	193	75	11	224	54	105	442	21	98	409	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	268	0	11	224	54	105	463	0	98	463	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	-	1	2	1	1	2	-	1	2	-
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel	•. =	•. =		• =	•. =	0. =/(0 . <u>-</u> ,	• · - <i>n</i>		• =	•. =	
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94		0.0	94	0.0	0.0	94		0.0	94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			CI+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel		OI LA			OFER			OI LA			OI LA	
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases				1.00	1.47.1		1.00	1.0/1		1.00	14/1	
	7	4		3	8		5	2		1	6	

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	19.0	45.0		10.0	36.0	36.0	21.0	45.0		20.0	44.0	
Total Split (%)	15.8%	37.5%		8.3%	30.0%	30.0%	17.5%	37.5%		16.7%	36.7%	
Maximum Green (s)	13.0	39.0		4.0	30.0	30.0	15.0	39.0		14.0	38.0	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	10.2	29.2		4.2	18.2	18.2	11.5	41.1		11.0	40.7	
Actuated g/C Ratio	0.10	0.30		0.04	0.19	0.19	0.12	0.42		0.11	0.42	
v/c Ratio	0.49	0.49		0.16	0.65	0.13	0.55	0.31		0.54	0.32	
Control Delay (s/veh)	56.8	30.1		58.3	48.4	0.6	56.9	24.0		57.3	24.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	56.8	30.1		58.3	48.4	0.6	56.9	24.0		57.3	24.1	
LOS	E	С		E	D	А	E	С		E	С	
Approach Delay (s/veh)		36.4			39.8			30.1			29.9	
Approach LOS		D			D			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 97	.9											
Natural Cycle: 95												
Control Type: Actuated-Ur	coordinated	1										
Maximum v/c Ratio: 0.65												
Intersection Signal Delay (s/veh): 32.9			Ir	ntersectio	n LOS: C						
Intersection Capacity Utiliz	ation 54.7%)		10	CU Level	of Service	эA					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		3	•	1	3	≜t è		3	≜ 1₀	
Traffic Volume (veh/h)	76	178	69	10	206	50	97	407	19	90	376	50
Future Volume (veh/h)	76	178	69	10	206	50	97	407	19	90	376	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	83	193	75	11	224	54	105	442	21	98	409	54
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap. veh/h	105	261	101	18	281	220	132	1520	72	123	1373	180
Arrive On Green	0.06	0.20	0.20	0.01	0.15	0.15	0.08	0.44	0.44	0.08	0.43	0.43
Sat Flow, veh/h	1641	1282	498	1641	1870	1460	1641	3454	164	1641	3158	414
Grp Volume(v), veh/h	83	0	268	11	224	54	105	227	236	98	229	234
Grp Sat Flow(s),veh/h/ln	1641	0	1781	1641	1870	1460	1641	1777	1841	1641	1777	1796
Q Serve(a s), s	4.4	0.0	12.5	0.6	10.2	2.9	5.6	7.3	7.3	5.2	7.4	7.5
Cycle Q Clear(q c), s	4.4	0.0	12.5	0.6	10.2	2.9	5.6	7.3	7.3	5.2	7.4	7.5
Prop In Lane	1.00		0.28	1.00		1.00	1.00		0.09	1.00		0.23
Lane Grp Cap(c), veh/h	105	0	362	18	281	220	132	782	810	123	773	781
V/C Ratio(X)	0.79	0.00	0.74	0.63	0.80	0.25	0.80	0.29	0.29	0.80	0.30	0.30
Avail Cap(c a), veh/h	241	0	784	74	633	494	278	782	810	259	773	781
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.9	0.0	33.1	43.7	36.3	33.2	40.1	15.9	15.9	40.3	16.2	16.3
Incr Delay (d2), s/veh	12.6	0.0	3.0	31.3	5.1	0.6	10.5	0.9	0.9	11.0	1.0	1.0
Initial Q Delav(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	2.0	0.0	5.2	0.4	4.7	1.0	2.5	2.7	2.8	2.3	2.8	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delav(d), s/veh	53.5	0.0	36.1	74.9	41.5	33.8	50.5	16.9	16.9	51.3	17.2	17.3
LnGrp LOS	D		D	E	D	С	D	В	В	D	В	В
Approach Vol. veh/h		351			289			568			561	
Approach Delay, s/veh		40.2			41.3			23.1			23.2	
Approach LOS		D			D			С			С	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.7	45.0	6.9	24.0	13.1	44.5	11.7	19.3				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax) s	14.0	39.0	4 0	39.0	15.0	38.0	13.0	30.0				
Max Q Clear Time (q. c+11) s	7.2	93	2.6	14.5	7.6	9.5	6.4	12.2				
Green Ext Time (p c), s	0.1	2.3	0.0	1.3	0.1	2.3	0.1	1.1				
Intersection Summary												
HCM 7th Control Delay s/veh			29.5									
HCM 7th LOS			 C									
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	*	**	*		≜t ⊾			*	1		4	
Traffic Volume (vph)	0	415	107	50	476	20	108	22	34	91	34	4
Future Volume (vph)	0	415	107	50	476	20	108	22	34	91	34	4
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95	1000	180	105		0	100	1000	100	0	1000	0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25		•	25		•	25			25		•
Lane Util, Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.00	0.97		1.00				0.98		1.00	
Frt			0.850		0.994				0.850		0.996	
Flt Protected				0.950			0.950				0.966	
Satd. Flow (prot)	1716	3539	1458	1630	3513	0	1630	1863	1458	0	1791	0
Flt Permitted				0.950		•	0.950			•	0.778	•
Satd. Flow (perm)	1716	3539	1415	1630	3513	0	1630	1863	1431	0	1443	0
Right Turn on Red			Yes			Yes			Yes	•		Yes
Satd. Flow (RTOR)			124		4				83		1	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5		•	5		0.0	5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adi, Flow (vph)	0	451	116	54	517	22	117	24	37	99	37	4
Shared Lane Traffic (%)	-											
Lane Group Flow (vph)	0	451	116	54	539	0	117	24	37	0	140	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12	J -		12	J •		12	J -		12	J -
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	Cl+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases			4						2	6		
Detector Phase	7	4	4	3	8		5	2	2	6	6	
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	9.7	41.7	41.7	12.0	44.0		19.0	56.3	56.3	37.3	37.3	
Total Split (%)	8.8%	37.9%	37.9%	10.9%	40.0%		17.3%	51.2%	51.2%	33.9%	33.9%	
Maximum Green (s)	4.0	36.0	36.0	6.3	38.3		14.1	51.4	51.4	32.4	32.4	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lag			Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)		19.4	19.4	9.5	25.4		12.3	27.5	27.5		15.6	
Actuated g/C Ratio		0.31	0.31	0.15	0.40		0.20	0.44	0.44		0.25	
v/c Ratio		0.41	0.22	0.22	0.38		0.37	0.03	0.05		0.39	
Control Delay (s/veh)		21.9	5.6	37.6	15.0		34.4	12.6	0.1		28.0	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)		21.9	5.6	37.6	15.0		34.4	12.6	0.1		28.0	
LOS		С	А	D	В		С	В	А		С	
Approach Delay (s/veh)		18.5			17.0			24.4			28.0	
Approach LOS		В			В			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 62.	.8											
Natural Cycle: 100												
Control Type: Actuated-Une	coordinated	l										
Maximum v/c Ratio: 0.41												
Intersection Signal Delay (s	s/veh): 19.5			Ir	ntersection	n LOS: B						
Intersection Capacity Utiliza	ation 43.3%			10	CU Level	of Service	A					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way

† _{ø2}		£	Ø3	→ ø4
56.3 s		12 ş 👘		41.7 s
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37.3 s	19 s	9.7 s	4	4 s

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		* *	1	3	¢τ		3	•	*		4	
Traffic Volume (veh/h)	0	415	107	50	476	20	108	22	34	91	34	4
Future Volume (veh/h)	0	415	107	50	476	20	108	22	34	91	34	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adi.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adi(A pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.98
Parking Bus, Adi	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	0	451	116	54	517	22	117	24	37	99	37	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap. veh/h	4	969	386	132	1526	65	180	722	554	309	98	8
Arrive On Green	0.00	0.27	0.27	0.08	0.44	0.40	0.11	0.39	0.39	0.19	0.19	0.17
Sat Flow, veh/h	1641	3554	1414	1641	3468	147	1641	1870	1435	927	517	42
Grp Volume(v), veh/h	0	451	116	54	264	275	117	24	37	140	0	0
Grp Sat Flow(s) veh/h/ln	1641	1777	1414	1641	1777	1839	1641	1870	1435	1487	0	0
Q Serve(q_s), s	0.0	4.9	1.5	1.4	4.5	4.5	3.1	0.4	0.7	2.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.9	1.5	1.4	4.5	4.5	3.1	0.4	0.7	3.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.08	1.00	•••	1.00	0.71		0.03
Lane Grp Cap(c), veh/h	4	969	386	132	782	809	180	722	554	416	0	0
V/C Ratio(X)	0.00	0.47	0.30	0.41	0.34	0.34	0.65	0.03	0.07	0.34	0.00	0.00
Avail Cap(c a), veh/h	203	2912	1158	285	1545	1599	535	2126	1631	1189	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)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	13.9	3.4	20.1	8.5	8.5	19.6	8.8	8.9	16.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.4	2.0	0.3	0.2	3.9	0.0	0.1	0.5	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/In	0.0	1.4	0.7	0.5	1.0	1.1	1.1	0.1	0.2	1.0	0.0	0.0
Unsig. Movement Delay, s/ve	h											
LnGrp Delay(d), s/veh	0.0	14.3	3.9	22.2	8.7	8.8	23.6	8.8	8.9	17.0	0.0	0.0
LnGrp LOS		В	А	С	А	А	С	А	А	В		
Approach Vol, veh/h		567			593			178			140	
Approach Delay, s/veh		12.2			10.0			18.5			17.0	
Approach LOS		В			А			В			В	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		21.8	7.7	16.5	9.0	12.7	0.0	24.2				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		51.4	6.3	36.0	14.1	32.4	4.0	38.3				
Max Q Clear Time (g_c+l1), s	i	2.7	3.4	6.9	5.1	5.7	0.0	6.5				
Green Ext Time (p_c), s		0.2	0.0	2.4	0.2	0.4	0.0	1.9				
Intersection Summary												
HCM 7th Control Delay, s/veh	l		12.5									
HCM 7th LOS			В									

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	××	**	*	55	**	*	¥7	≜t ⊾		3	**	1
Traffic Volume (vph)	114	417	106	50	377	62	137	244	32	114	285	143
Future Volume (vph)	114	417	106	50	377	62	137	244	32	114	285	143
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	200		195	110		115	190		0	80		80
Storage Lanes	2		1	2		1	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98		1.00				0.98
Frt			0.850			0.850		0.982				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3469	0	1630	3539	1458
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3162	3539	1432	3162	3539	1433	3162	3469	0	1630	3539	1433
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			130			130		15				155
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		1012			2084			1629			1012	
Travel Time (s)		12.5			25.8			20.2			12.5	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	124	453	115	54	410	67	149	265	35	124	310	155
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	453	115	54	410	67	149	300	0	124	310	155
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1	1	1	1		1	1	1
Detector Template												
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	CI+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	9.7	43.4	43.4	9.7	43.4	43.4	9.5	42.9		9.0	42.4	42.4
Total Split (%)	9.2%	41.3%	41.3%	9.2%	41.3%	41.3%	9.0%	40.9%		8.6%	40.4%	40.4%
Maximum Green (s)	4.0	37.7	37.7	4.0	37.7	37.7	4.6	38.0		4.1	37.5	37.5
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	6.2	21.9	21.9	6.2	16.9	16.9	6.0	15.1		5.5	14.6	14.6
Actuated g/C Ratio	0.10	0.36	0.36	0.10	0.28	0.28	0.10	0.25		0.09	0.24	0.24
v/c Ratio	0.39	0.36	0.19	0.17	0.42	0.14	0.48	0.35		0.86	0.37	0.34
Control Delay (s/veh)	35.8	17.5	4.2	33.4	19.6	0.6	37.9	19.1		80.0	20.6	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	35.8	17.5	4.2	33.4	19.6	0.6	37.9	19.1		80.0	20.6	6.2
LOS	D	В	A	С	В	A	D	В		F	С	A
Approach Delay (s/veh)		18.6			18.6			25.3			29.3	
Approach LOS		В			В			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 105												
Actuated Cycle Length: 61.	2											
Natural Cycle: 105												
Control Type: Actuated-Une	coordinated											
Maximum v/c Ratio: 0.86												
Intersection Signal Delay (s	s/veh): 22.7			Ir	ntersectio	n LOS: C						
Intersection Capacity Utiliza	ation 49.0%			[(CU Level	of Service	Α					
Analysis Period (min) 15												
Splits and Phases: 2: Alt	a Ave & El	Monte Wa	ау									1

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9 s	42,9 s		9.7 s		43.4 s	
5	ø5 📢	Ø6	5	Ø7	(*	Ø8
9.5 s	42.4 s		9.7 5		43.4 s	

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	* *	*	77	**	1	10	≜ 1,		3	* *	1
Traffic Volume (veh/h)	114	417	106	50	377	62	137	244	32	114	285	143
Future Volume (veh/h)	114	417	106	50	377	62	137	244	32	114	285	143
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adi	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adi(A pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus Adi	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00
Work Zone On Approach		No			No			No			No	
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	124	453	115	54	410	67	149	265	35	124	310	155
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh %	2	2	2	2	2	2	2	2	2	2	2	2
Can veh/h	321	978	394	245	893	360	295	697	91	167	818	329
Arrive On Green	0.10	0.28	0.28	0.08	0.25	0.25	0.00	0.22	0.20	0.10	0.23	023
Sat Flow, yeb/b	3183	355/	1/32	3183	3554	1/21	3183	3151	/11	16/1	3554	1/30
	100	452	145	5105	410	67	140	1/0	150	1041	210	1450
Gip volume(v), veh/h/h	124	400	1/20	1501	410	1/0/	149	140	102	1644	4777	1420
	1091	50	1452	1591	1///	1431	1091	2 5	1/00	1041	26	1430
Q Serve(g_s), s	1.0	5.Z	3.1	0.0	4.0	1.0	2.2	3.5	3.0	3.0	3.0	4.0
Cycle Q Clear(g_c), s	1.0	5.Z	3.1	0.0	4.0	1.0	Z.Z	3.5	3.0	3.0	3.0	4.0
Prop In Lane	1.00	070	1.00	1.00	000	1.00	1.00	202	0.23	1.00	040	1.00
Lane Grp Cap(c), ven/n	321	978	394	245	893	360	295	393	395	167	818	329
V/C Ratio(X)	0.39	0.46	0.29	0.22	0.46	0.19	0.50	0.38	0.38	0.74	0.38	0.47
Avail Cap(c_a), veh/h	369	2844	1146	369	2844	1146	356	1404	1411	167	2//2	1116
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	14.8	14.1	21.3	15.6	14.5	21.3	16.3	16.4	21.5	16.0	16.4
Incr Delay (d2), s/veh	0.8	0.3	0.4	0.4	0.4	0.2	1.3	0.6	0.6	16.5	0.3	1.0
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	0.6	1.6	0.8	0.3	1.5	0.5	0.7	1.1	1.2	1.9	1.1	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	21.5	15.2	14.5	21.8	16.0	14.7	22.6	16.9	17.0	37.9	16.3	17.4
LnGrp LOS	С	В	В	С	В	В	С	В	В	D	В	В
Approach Vol, veh/h		692			531			449			589	
Approach Delay, s/veh		16.2			16.4			18.8			21.1	
Approach LOS		В			В			В			С	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.0	14.9	7.8	17.5	8.6	15.3	9.0	16.4				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	4.1	38.0	4.0	37.7	4.6	37.5	4.0	37.7				
Max Q Clear Time (q c+l1), s	5.6	5.6	2.8	7.2	4.2	6.6	3.8	6.8				
Green Ext Time (p_c), s	0.0	1.0	0.0	2.4	0.0	1.9	0.0	2.0				
Intersection Summary												
HCM 7th Control Delay, s/veh			18.0									
HCM 7th LOS			В									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	ň	7	≜ ta		3	1	
Traffic Volume (vph)	22	62	80	7	46	79	
Future Volume (vph)	22	62	80	7	46	79	
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900	
Storage Length (ft)	0	100		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00	
Frt		0.850	0.987				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1630	1458	3493	0	1630	1863	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1630	1458	3493	0	1630	1863	
Link Speed (mph)	55		55			55	
Link Distance (ft)	522		452			482	
Travel Time (s)	6.5		5.6			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	24	67	87	8	50	86	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	24	67	95	0	50	86	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Right	Left	Left	
Median Width(ft)	12		12			12	
Link Offset(ft)	0		0			0	
Crosswalk Width(ft)	16		16			16	
Two way Left Turn Lane							
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00	
Turning Speed (mph)	15	9		9	15		
Sign Control	Stop		Free			Free	
Intersection Summary							
Area Type: 0	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizat	tion 19.4%			IC	U Level o	of Service A	A
Analysis Period (min) 15							

Intersection

Int Delay, s/veh	3.8						
Movement	WBL	WBR	NBT	NBR	SBL	SBT	•
Lane Configurations	1	1	∱ ĵa		٦	1	
Traffic Vol, veh/h	22	62	80	7	46	79)
Future Vol, veh/h	22	62	80	7	46	79)
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	100	-	-	150	-	•
Veh in Median Storage	e, # 0	-	0	-	-	0)
Grade, %	0	-	0	-	-	0)
Peak Hour Factor	92	92	92	92	92	92	2
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	24	67	87	8	50	86	i

Major/Minor	Minor1	Ν	/lajor1	Ма	ajor2		
Conflicting Flow All	277	47	0	0	95	0	
Stage 1	91	-	-	-	-	-	
Stage 2	186	-	-	-	-	-	
Critical Hdwy	6.63	6.93	-	-	4.13	-	
Critical Hdwy Stg 1	5.83	-	-	-	-	-	
Critical Hdwy Stg 2	5.43	-	-	-	-	-	
Follow-up Hdwy	3.519	3.319	-	- 2	.219	-	
Pot Cap-1 Maneuver	701	1012	-	- '	1498	-	
Stage 1	923	-	-	-	-	-	
Stage 2	845	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	678	1012	-	- '	1498	-	
Mov Cap-2 Maneuver	678	-	-	-	-	-	
Stage 1	923	-	-	-	-	-	
Stage 2	817	-	-	-	-	-	

Approach WB	NB	SB
HCM Control Delay, s/v 9.25	0	2.75
HCM LOS A		

Minor Lane/Major Mvmt	NBT	NBRV	VBLn1V	VBLn2	SBL	SBT	
Capacity (veh/h)	-	-	678	1012	1498	-	
HCM Lane V/C Ratio	-	-	0.035	0.067	0.033	-	
HCM Control Delay (s/veh)	-	-	10.5	8.8	7.5	-	
HCM Lane LOS	-	-	В	А	А	-	
HCM 95th %tile Q(veh)	-	-	0.1	0.2	0.1	-	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		3	•	1	3	≜t ₀			≜ 16	
Traffic Volume (vph)	23	36	26	14	59	42	43	137	8	39	185	21
Future Volume (vph)	23	36	26	14	59	42	43	137	8	39	185	21
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.937				0.850		0.991			0.985	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1745	0	1630	1863	1458	1630	3507	0	1630	3486	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1745	0	1630	1863	1458	1630	3507	0	1630	3486	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28				229		7			13	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	39	28	15	64	46	47	149	9	42	201	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	25	67	0	15	64	46	47	158	0	42	224	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	CI+Ex		Cl+Ex	Cl+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			CI+Ex			CI+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						

Scenario 1 Baseline

AM 2024 06/06/2024

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	12.0	36.5		10.0	34.5	34.5	13.0	40.5		13.0	40.5	
Total Split (%)	12.0%	36.5%		10.0%	34.5%	34.5%	13.0%	40.5%		13.0%	40.5%	
Maximum Green (s)	6.0	30.5		4.0	28.5	28.5	7.0	34.5		7.0	34.5	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	6.1	12.9		4.2	10.5	10.5	6.8	42.2		6.8	42.2	
Actuated g/C Ratio	0.09	0.18		0.06	0.15	0.15	0.09	0.59		0.09	0.59	
v/c Ratio	0.18	0.20		0.16	0.24	0.11	0.31	0.08		0.27	0.11	
Control Delay (s/veh)	41.4	17.6		44.6	30.6	0.5	42.3	13.5		41.7	13.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	41.4	17.6		44.6	30.6	0.5	42.3	13.5		41.7	13.0	
LOS	D	В		D	С	А	D	В		D	В	
Approach Delay (s/veh)		24.1			21.2			20.1			17.5	
Approach LOS		С			С			С			В	
Intersection Summary												
Area Type:	Other											
Cycle Length: 100												
Actuated Cycle Length: 71	.6											
Natural Cycle: 95												
Control Type: Semi Act-Ur	lcoord											
Maximum v/c Ratio: 0.31												
Intersection Signal Delay (s/veh): 19.8			Ir	ntersectio	n LOS: B						
Intersection Capacity Utiliz	ation 32.2%			10	CU Level	of Service	eΑ					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		3	•	1	3	≜t a		3	≜ ta	
Traffic Volume (veh/h)	23	36	26	14	59	42	43	137	8	39	185	21
Future Volume (veh/h)	23	36	26	14	59	42	43	137	8	39	185	21
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	25	39	28	15	64	46	47	149	9	42	201	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	75	54	24	124	97	57	1769	106	53	1663	188
Arrive On Green	0.02	0.07	0.07	0.01	0.07	0.07	0.03	0.52	0.52	0.03	0.52	0.52
Sat Flow, veh/h	1641	1013	727	1641	1870	1460	1641	3406	204	1641	3218	364
Grp Volume(v), veh/h	25	0	67	15	64	46	47	77	81	42	110	114
Grp Sat Flow(s).veh/h/ln	1641	0	1740	1641	1870	1460	1641	1777	1834	1641	1777	1805
Q Serve(q_s), s	1.0	0.0	2.5	0.6	2.2	1.6	1.9	1.5	1.5	1.7	2.1	2.2
Cycle Q Clear(q_c), s	1.0	0.0	2.5	0.6	2.2	1.6	1.9	1.5	1.5	1.7	2.1	2.2
Prop In Lane	1.00		0.42	1.00		1.00	1.00		0.11	1.00		0.20
Lane Grp Cap(c), veh/h	36	0	129	24	124	97	57	923	952	53	918	933
V/C Ratio(X)	0.69	0.00	0.52	0.63	0.51	0.47	0.82	0.08	0.08	0.79	0.12	0.12
Avail Cap(c a), veh/h	147	0	795	98	799	623	172	923	952	172	918	933
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.4	0.0	29.8	32.7	30.1	17.9	32.0	8.1	8.1	32.1	8.3	8.3
Incr Delay (d2), s/veh	20.3	0.0	3.2	24.1	3.3	3.6	24.1	0.2	0.2	22.2	0.3	0.3
Initial Q Delav(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	0.6	0.0	1.0	0.4	1.0	0.7	1.1	0.4	0.5	0.9	0.6	0.7
Unsig, Movement Delay, s/veh												-
LnGrp Delav(d), s/veh	52.7	0.0	33.0	56.8	33.4	21.5	56.1	8.2	8.2	54.3	8.6	8.6
LnGrp LOS	D		С	E	С	С	E	Α	Α	D	A	A
Approach Vol. veh/h		92	-		125	-		205			266	
Approach Delay, s/veh		38.3			31.8			19.2			15.8	
Approach LOS		D			С			B			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.2	40.7	7.0	10.9	8.3	40.5	7.5	10.4				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	7.0	34.5	4.0	30.5	7.0	34.5	6.0	28.5				
Max Q Clear Time (g c+l1), s	3.7	3.5	2.6	4.5	3.9	4.2	3.0	4.2				
Green Ext Time (p_c), s	0.0	0.7	0.0	0.2	0.0	1.0	0.0	0.4				
Intersection Summary												
HCM 7th Control Delay, s/veh			22.7									
HCM 7th LOS			С									

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	44	*	3	≜t i		3	4	1		4	
Traffic Volume (vph)	Ö	417	109	50	483	20	115	22	34	91	34	4
Future Volume (vph)	0	417	109	50	483	20	115	22	34	91	34	4
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95		180	105		0	100		100	0		0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97		1.00				0.98		1.00	
Frt			0.850		0.994				0.850		0.996	
Flt Protected				0.950			0.950				0.966	
Satd. Flow (prot)	1716	3539	1458	1630	3513	0	1630	1863	1458	0	1791	0
Flt Permitted				0.950			0.950				0.778	
Satd. Flow (perm)	1716	3539	1415	1630	3513	0	1630	1863	1431	0	1443	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			124		4				83		1	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	453	118	54	525	22	125	24	37	99	37	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	453	118	54	547	0	125	24	37	0	140	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template	50	50	50	50	50		50	50	50	50	50	
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(It)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(II)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	CI+EX	CI+EX	CI+EX	CI+EX	CI+EX		CI+EX	CI+EX	CI+EX	CI+EX	CI+EX	
Detector 1 Channel	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delev (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	0.0 Drot	0.0	0.0 Dorm	0.0 Prot			0.0 Drot	0.0	0.0 Dorm	0.0 Dorm	0.0	
	7101		Feilii	2	IN/A Q		F10(2	Feili	Felli	NA 6	
Permitted Phases	1	4	Λ	3	0		5	2	2	6	0	
Detector Phases	7	1	4	3	8		5	2	2	6	6	
Switch Phase	1			5	0			2	2	0	0	

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	9.7	41.7	41.7	12.0	44.0		19.0	56.3	56.3	37.3	37.3	
Total Split (%)	8.8%	37.9%	37.9%	10.9%	40.0%		17.3%	51.2%	51.2%	33.9%	33.9%	
Maximum Green (s)	4.0	36.0	36.0	6.3	38.3		14.1	51.4	51.4	32.4	32.4	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lag			Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)		19.5	19.5	9.5	25.4		12.6	27.8	27.8		15.6	
Actuated g/C Ratio		0.31	0.31	0.15	0.40		0.20	0.44	0.44		0.25	
v/c Ratio		0.41	0.23	0.22	0.39		0.39	0.03	0.05		0.39	
Control Delay (s/veh)		22.0	5.8	37.8	15.2		34.6	12.6	0.1		28.2	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)		22.0	5.8	37.8	15.2		34.6	12.6	0.1		28.2	
LOS		С	А	D	В		С	В	А		С	
Approach Delay (s/veh)		18.7			17.2			24.9			28.2	
Approach LOS		В			В			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 63	.1											
Natural Cycle: 100												
Control Type: Actuated-Un	coordinated											
Maximum v/c Ratio: 0.41												
Intersection Signal Delay (s/veh): 19.8			Ir	ntersection	n LOS: B						
Intersection Capacity Utiliz	ation 43.4%			10	CU Level	of Service	Α					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way

† _{ø2}		ſ	Ø3	→ ø4
56.3 s		12 s 👘		41.7 s
↓ ⊗6	h ø5	Ĵ	Ø7	الله ۵۶
37.3 s	19 s	9.7 s	4	4 s

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	* *	7	3	≜t a			•	1		4	
Traffic Volume (veh/h)	0	417	109	50	483	20	115	22	34	91	34	4
Future Volume (veh/h)	0	417	109	50	483	20	115	22	34	91	34	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	0	453	118	54	525	22	125	24	37	99	37	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	4	967	385	131	1519	64	190	731	561	307	97	8
Arrive On Green	0.00	0.27	0.27	0.08	0.44	0.40	0.12	0.39	0.39	0.19	0.19	0.17
Sat Flow, veh/h	1641	3554	1414	1641	3471	145	1641	1870	1435	928	516	42
Grp Volume(v), veh/h	0	453	118	54	268	279	125	24	37	140	0	0
Grp Sat Flow(s),veh/h/ln	1641	1777	1414	1641	1777	1839	1641	1870	1435	1486	0	0
Q Serve(q s), s	0.0	5.0	1.6	1.5	4.7	4.7	3.4	0.4	0.8	3.0	0.0	0.0
Cycle Q Clear(q c), s	0.0	5.0	1.6	1.5	4.7	4.7	3.4	0.4	0.8	3.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.08	1.00		1.00	0.71		0.03
Lane Grp Cap(c), veh/h	4	967	385	131	778	805	190	731	561	413	0	0
V/C Ratio(X)	0.00	0.47	0.31	0.41	0.35	0.35	0.66	0.03	0.07	0.34	0.00	0.00
Avail Cap(c a), veh/h	201	2877	1145	282	1526	1580	529	2101	1612	1175	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)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	14.1	3.4	20.4	8.7	8.7	19.7	8.8	8.9	16.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.4	2.1	0.3	0.3	3.8	0.0	0.0	0.5	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/In	0.0	1.4	0.7	0.5	1.1	1.1	1.2	0.1	0.2	1.0	0.0	0.0
Unsig. Movement Delay, s/vel	h											
LnGrp Delay(d), s/veh	0.0	14.5	3.9	22.5	8.9	9.0	23.5	8.8	8.9	17.3	0.0	0.0
LnGrp LOS		В	А	С	А	А	С	А	А	В		
Approach Vol. veh/h		571			601			186			140	
Approach Delay, s/veh		12.3			10.2			18.7			17.3	
Approach LOS		В			В			В			В	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		22.2	7.7	16.7	9.4	12.8	0.0	24.4				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		51.4	6.3	36.0	14.1	32.4	4.0	38.3				
Max Q Clear Time (g_c+I1), s	;	2.8	3.5	7.0	5.4	5.8	0.0	6.7				
Green Ext Time (p_c), s		0.2	0.0	2.4	0.2	0.4	0.0	1.9				
Intersection Summary												
HCM 7th Control Delay, s/veh	1		12.7									
HCM 7th LOS			B									

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7 7	* *	1	ሻሻ	**	*	¥.¥	≜ 1,		3	**	7
Traffic Volume (vph)	114	417	110	53	377	62	151	247	39	114	286	143
Future Volume (vph)	114	417	110	53	377	62	151	247	39	114	286	143
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	200		195	110		115	190		0	80		80
Storage Lanes	2		1	2		1	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98		1.00				0.98
Frt			0.850			0.850		0.980				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3460	0	1630	3539	1458
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3162	3539	1432	3162	3539	1433	3162	3460	0	1630	3539	1433
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			130			130		19				155
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		1012			2084			1629			1012	
Travel Time (s)		12.5			25.8			20.2			12.5	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	124	453	120	58	410	67	164	268	42	124	311	155
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	453	120	58	410	67	164	310	0	124	311	155
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24	Ŭ		24	Ŭ		24	Ŭ		24	Ŭ
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1	1	1	1		1	1	1
Detector Template												
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type	CI+Ex	Cl+Ex	CI+Ex	CI+Ex	CI+Ex	Cl+Ex	Cl+Ex	Cl+Ex		CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	9.7	43.4	43.4	9.7	43.4	43.4	9.0	42.9		9.0	42.9	42.9
Total Split (%)	9.2%	41.3%	41.3%	9.2%	41.3%	41.3%	8.6%	40.9%		8.6%	40.9%	40.9%
Maximum Green (s)	4.0	37.7	37.7	4.0	37.7	37.7	4.1	38.0		4.1	38.0	38.0
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	6.2	21.8	21.8	6.2	16.8	16.8	5.5	14.6		5.5	14.6	14.6
Actuated g/C Ratio	0.10	0.36	0.36	0.10	0.28	0.28	0.09	0.24		0.09	0.24	0.24
v/c Ratio	0.38	0.36	0.20	0.18	0.42	0.14	0.58	0.37		0.84	0.37	0.34
Control Delay (s/veh)	35.5	17.3	4.5	33.2	19.4	0.6	41.2	19.1		77.6	20.3	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	35.5	17.3	4.5	33.2	19.4	0.6	41.2	19.1		77.6	20.3	6.1
LOS	D	В	А	С	В	А	D	В		E	С	A
Approach Delay (s/veh)		18.3			18.6			26.7			28.6	
Approach LOS		В			В			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 105												
Actuated Cycle Length: 60.	7											
Natural Cycle: 105												
Control Type: Actuated-Une	coordinated											
Maximum v/c Ratio: 0.84												
Intersection Signal Delay (s	s/veh): 22.8			li	ntersectio	n LOS: C						
Intersection Capacity Utiliza	ation 49.3%	1		10	CU Level	of Service	A					
Analysis Period (min) 15												
Splits and Phases: 2: Alt	a Ave & El	Monte W	ау		_							

9 s 42,9 s	9.7 s 43.4 s
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9 s 42.9 s	9.7 s 43.4 s

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	* *	*	77	* *	1	19	≜t a		3	^	1
Traffic Volume (veh/h)	114	417	110	53	377	62	151	247	39	114	286	143
Future Volume (veh/h)	114	417	110	53	377	62	151	247	39	114	286	143
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	124	453	120	58	410	67	164	268	42	124	311	155
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	319	966	389	250	889	358	312	697	108	165	815	328
Arrive On Green	0.10	0.27	0.27	0.08	0.25	0.25	0.10	0.23	0.21	0.10	0.23	0.23
Sat Flow, veh/h	3183	3554	1432	3183	3554	1431	3183	3074	475	1641	3554	1430
Grp Volume(v), veh/h	124	453	120	58	410	67	164	153	157	124	311	155
Grp Sat Flow(s).veh/h/ln	1591	1777	1432	1591	1777	1431	1591	1777	1773	1641	1777	1430
Q Serve(q , s), s	1.8	5.3	3.3	0.8	4.9	1.8	2.4	3.6	3.7	3.7	3.7	4.7
Cycle Q Clear(q, c), s	1.8	5.3	3.3	0.8	4.9	1.8	2.4	3.6	3.7	3.7	3.7	4.7
Prop In Lane	1.00	0.0	1.00	1.00		1.00	1.00	0.0	0.27	1.00	•	1.00
Lane Grp Cap(c), veh/h	319	966	389	250	889	358	312	403	402	165	815	328
V/C Ratio(X)	0.39	0 47	0.31	0.23	0.46	0.19	0.53	0.38	0.39	0.75	0.38	0 47
Avail Cap(c, a) veh/h	365	2819	1136	365	2819	1135	320	1391	1388	165	2783	1120
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1 00
Uniform Delay (d) s/veh	20.9	15.1	14.4	21.5	15.8	14.6	21.3	16.3	16.4	21.7	16.2	16.5
Incr Delay (d2) s/yeh	0.8	0.4	0.4	0.5	0.4	0.2	1.5	0.6	0.6	17.3	0.3	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	0.6	1.6	0.8	0.3	1.5	0.5	0.8	12	12	1.9	12	12
Unsig Movement Delay s/vet	י <u>י</u> יי ו	1.0	0.0	0.0	1.0	0.0	0.0			1.0		
InGrp Delay(d) s/veh	. 21.7	15 4	14 8	21.9	16.2	14 9	22.8	16.8	17 0	39.1	16.5	17 6
InGrp LOS	C	B	B	C	10. <u>2</u> B	B	C	B	B	D	B	B
Approach Vol. veh/h	0	697	0	•	535	0	Ŭ	474	<u> </u>	U	590	
Approach Delay, s/yeb		16 /			16.6			10 0			21.5	
Approach LOS		10.4 R			10.0 B			13.0 R			21.5	
		D			D			U			0	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.0	15.3	7.9	17.5	8.9	15.4	9.0	16.4				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	4.1	38.0	4.0	37.7	4.1	38.0	4.0	37.7				
Max Q Clear Time (g_c+l1), s	5.7	5.7	2.8	7.3	4.4	6.7	3.8	6.9				
Green Ext Time (p_c), s	0.0	1.0	0.0	2.4	0.0	1.9	0.0	2.0				
Intersection Summary												
HCM 7th Control Delay, s/veh			18.3									
HCM 7th LOS			В									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	×.	7	≜ ti-		*	1
Traffic Volume (vph)	22	74	80	7	49	79
Future Volume (vph)	22	74	80	7	49	79
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900
Storage Length (ft)	0	100		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850	0.987			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1630	1458	3493	0	1630	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1630	1458	3493	0	1630	1863
Link Speed (mph)	55		55			55
Link Distance (ft)	522		452			482
Travel Time (s)	6.5		5.6			6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	80	87	8	53	86
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	80	95	0	53	86
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type: C	Other					
Control Type: Unsignalized						
Intersection Capacity Utilizat	ion 19.6%			IC	CU Level of	of Service /
Analysis Period (min) 15						

Intersection

Int Delay, s/veh	4						
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	1	7	∱ î,		1	1	
Traffic Vol, veh/h	22	74	80	7	49	79	
Future Vol, veh/h	22	74	80	7	49	79	
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	100	-	-	150	-	
Veh in Median Storage	, # 0	-	0	-	-	0	
Grade, %	0	-	0	-	-	0	
Peak Hour Factor	92	92	92	92	92	92	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	24	80	87	8	53	86	

Major/Minor	Minor1	Ν	lajor1	Ν	ajor2		
Conflicting Flow All	283	47	0	0	95	0	
Stage 1	91	-	-	-	-	-	
Stage 2	192	-	-	-	-	-	
Critical Hdwy	6.63	6.93	-	-	4.13	-	
Critical Hdwy Stg 1	5.83	-	-	-	-	-	
Critical Hdwy Stg 2	5.43	-	-	-	-	-	
Follow-up Hdwy	3.519	3.319	-	- 1	2.219	-	
Pot Cap-1 Maneuver	695	1012	-	-	1498	-	
Stage 1	923	-	-	-	-	-	
Stage 2	840	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	671	1012	-	-	1498	-	
Mov Cap-2 Maneuver	671	-	-	-	-	-	
Stage 1	923	-	-	-	-	-	
Stage 2	810	-	-	-	-	-	

Approach WB	NB	SB
HCM Control Delay, s/v 9.25	0	2.87
HCM LOS A		

Minor Lane/Major Mvmt	NBT	NBRV	VBLn1V	VBLn2	SBL	SBT	
Capacity (veh/h)	-	-	671	1012	1498	-	
HCM Lane V/C Ratio	-	-	0.036	0.079	0.036	-	
HCM Control Delay (s/veh)	-	-	10.6	8.9	7.5	-	
HCM Lane LOS	-	-	В	А	А	-	
HCM 95th %tile Q(veh)	-	-	0.1	0.3	0.1	-	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	1.		2	•	*	2	≜ 16		2	≜ 15	
Traffic Volume (vph)	47	36	38	14	59	42	47	137	8	39	185	29
Future Volume (vph)	47	36	38	14	59	42	47	137	8	39	185	29
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.923				0.850		0.991			0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1719	0	1630	1863	1458	1630	3507	0	1630	3465	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1719	0	1630	1863	1458	1630	3507	0	1630	3465	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		41				182		7			20	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	39	41	15	64	46	51	149	9	42	201	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	51	80	0	15	64	46	51	158	0	42	233	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	CI+Ex		Cl+Ex	Cl+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			Cl+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	10.0	34.5		10.0	34.5	34.5	13.0	35.5		10.0	32.5	
Total Split (%)	11.1%	38.3%		11.1%	38.3%	38.3%	14.4%	39.4%		11.1%	36.1%	
Maximum Green (s)	4.0	28.5		4.0	28.5	28.5	7.0	29.5		4.0	26.5	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	4.2	16.6		4.2	10.4	10.4	6.7	36.3		4.2	34.7	
Actuated g/C Ratio	0.06	0.25		0.06	0.15	0.15	0.10	0.54		0.06	0.51	
v/c Ratio	0.51	0.18		0.15	0.22	0.12	0.31	0.08		0.42	0.13	
Control Delay (s/veh)	56.1	13.1		39.9	27.3	0.7	38.9	14.1		50.7	14.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	56.1	13.1		39.9	27.3	0.7	38.9	14.1		50.7	14.8	
LOS	E	В		D	С	А	D	В		D	В	
Approach Delay (s/veh)		29.9			19.0			20.1			20.3	
Approach LOS		С			В			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 67.0	6											
Natural Cycle: 95												
Control Type: Actuated-Unc	coordinated	1										
Maximum v/c Ratio: 0.51												
Intersection Signal Delay (s	/veh): 21.7			Ir	ntersectio	n LOS: C						
Intersection Capacity Utilization	ation 33.9%)		10	CU Level	of Service	eΑ					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	1		3	•	1	3	≜ 1₀		3	≜ 1a	
Traffic Volume (veh/h)	47	36	38	14	59	42	47	137	8	39	185	29
Future Volume (veh/h)	47	36	38	14	59	42	47	137	8	39	185	29
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	51	39	41	15	64	46	51	149	9	42	201	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	62	67	71	42	129	101	62	1616	97	54	1446	227
Arrive On Green	0.04	0.08	0.08	0.03	0.07	0.07	0.04	0.47	0.47	0.03	0.47	0.47
Sat Flow, veh/h	1641	835	878	1641	1870	1460	1641	3406	204	1641	3078	482
Grp Volume(v), veh/h	51	0	80	15	64	46	51	77	81	42	115	118
Grp Sat Flow(s),veh/h/ln	1641	0	1712	1641	1870	1460	1641	1777	1834	1641	1777	1784
Q Serve(q s), s	1.9	0.0	2.8	0.6	2.1	1.9	1.9	1.5	1.5	1.6	2.3	2.3
Cycle Q Clear(q c), s	1.9	0.0	2.8	0.6	2.1	1.9	1.9	1.5	1.5	1.6	2.3	2.3
Prop In Lane	1.00		0.51	1.00		1.00	1.00		0.11	1.00		0.27
Lane Grp Cap(c), veh/h	62	0	138	42	129	101	62	843	870	54	835	838
V/C Ratio(X)	0.83	0.00	0.58	0.36	0.50	0.46	0.83	0.09	0.09	0.77	0.14	0.14
Avail Cap(c a), veh/h	106	0	785	106	857	669	185	843	870	106	835	838
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.7	0.0	27.6	29.8	27.9	27.8	29.7	9.0	9.0	29.8	9.3	9.4
Incr Delay (d2), s/veh	23.0	0.0	3.8	5.0	2.9	3.2	23.0	0.2	0.2	20.2	0.3	0.4
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	1.1	0.0	1.1	0.3	0.9	0.7	1.1	0.5	0.5	0.9	0.7	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	52.7	0.0	31.3	34.8	30.9	31.1	52.7	9.2	9.2	50.0	9.7	9.7
LnGrp LOS	D		С	С	С	С	D	А	А	D	А	А
Approach Vol. veh/h		131			125			209			275	
Approach Delay, s/veh		39.7			31.4			19.8			15.9	
Approach LOS		D			С			В			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.1	35.5	7.6	11.0	8.3	35.2	8.3	10.3				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	4.0	29.5	4.0	28.5	7.0	26.5	4.0	28.5				
Max Q Clear Time (q. c+l1), s	3.6	3.5	2.6	4.8	3.9	4.3	3.9	4.1				
Green Ext Time (p_c), s	0.0	0.7	0.0	0.3	0.0	1.0	0.0	0.4				
Intersection Summary												
HCM 7th Control Delay, s/veh			23.8									
HCM 7th LOS			С									

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	2	^	۲	2	≜ 1a		×	1	*		4	
Traffic Volume (vph)	Ö	615	131	72	685	29	167	52	52	129	68	6
Future Volume (vph)	0	615	131	72	685	29	167	52	52	129	68	6
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95		180	105		0	100		100	0		0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97		1.00				0.98		1.00	
Frt			0.850		0.994				0.850		0.996	
Flt Protected				0.950			0.950				0.969	
Satd. Flow (prot)	1716	3539	1458	1630	3513	0	1630	1863	1458	0	1797	0
Flt Permitted				0.950			0.950				0.774	
Satd. Flow (perm)	1716	3539	1415	1630	3513	0	1630	1863	1431	0	1435	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			142		4				83		2	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	668	142	78	745	32	182	57	57	140	74	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	668	142	78	777	0	182	57	57	0	221	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12	J -		12	J -		12	J -		12	J -
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	Cl+Ex		CI+Ex	CI+Ex	CI+Ex	Cl+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2	,		6	
Permitted Phases			4	-	-				2	6		
Detector Phase	7	4	4	3	8		5	2	2	6	6	
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	9.7	41.7	41.7	11.0	43.0		20.0	57.3	57.3	37.3	37.3	
Total Split (%)	8.8%	37.9%	37.9%	10.0%	39.1%		18.2%	52.1%	52.1%	33.9%	33.9%	
Maximum Green (s)	4.0	36.0	36.0	5.3	37.3		15.1	52.4	52.4	32.4	32.4	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lag			Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)		24.2	24.2	7.5	32.4		14.7	38.7	38.7		19.7	
Actuated g/C Ratio		0.30	0.30	0.09	0.41		0.18	0.49	0.49		0.25	
v/c Ratio		0.62	0.27	0.51	0.54		0.60	0.06	0.08		0.62	
Control Delay (s/veh)		28.2	6.0	54.5	19.8		44.4	13.2	1.8		36.9	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)		28.2	6.0	54.5	19.8		44.4	13.2	1.8		36.9	
LOS		С	А	D	В		D	В	A		D	
Approach Delay (s/veh)		24.3			23.0			30.2			36.9	
Approach LOS		С			С			С			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 79	.7											
Natural Cycle: 100												
Control Type: Actuated-Un	coordinated											
Maximum v/c Ratio: 0.62												
Intersection Signal Delay (s/veh): 25.9			lr	ntersection	n LOS: C						
Intersection Capacity Utiliz	ation 52.4%			10	CU Level	of Service	A					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way

† _{Ø2}		ſ	ØЗ	→ Ø4
57.3 s		11 s 👘		41.7 s
▶ ∞	n ø5	Ĵ	Ø7	← Ø8
37.3 s	20 s	9.7 s	4	13 s

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	† †	۲	2	≜ 1₽		1	1	7		\$	
Traffic Volume (veh/h)	0	615	131	72	685	29	167	52	52	129	68	6
Future Volume (veh/h)	0	615	131	72	685	29	167	52	52	129	68	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	0	668	142	78	745	32	182	57	57	140	74	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	3	1058	421	138	1535	66	245	813	624	277	125	10
Arrive On Green	0.00	0.30	0.30	0.08	0.44	0.42	0.15	0.43	0.43	0.22	0.22	0.21
Sat Flow, veh/h	1641	3554	1415	1641	3467	149	1641	1870	1436	836	556	46
Grp Volume(v), veh/h	0	668	142	78	382	395	182	57	57	221	0	0
Grp Sat Flow(s),veh/h/ln	1641	1777	1415	1641	1777	1839	1641	1870	1436	1437	0	0
Q Serve(g_s), s	0.0	10.6	2.8	3.0	10.0	10.0	6.9	1.2	1.5	8.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	10.6	2.8	3.0	10.0	10.0	6.9	1.2	1.5	9.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.08	1.00		1.00	0.63		0.03
Lane Grp Cap(c), veh/h	3	1058	421	138	787	814	245	813	624	412	0	0
V/C Ratio(X)	0.00	0.63	0.34	0.57	0.49	0.49	0.74	0.07	0.09	0.54	0.00	0.00
Avail Cap(c_a), veh/h	143	2050	816	176	1060	1097	402	1525	1171	821	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)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	19.8	5.2	28.8	12.9	13.0	26.6	10.8	10.9	23.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.6	0.5	3.6	0.5	0.4	4.4	0.0	0.1	1.1	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	0.0	3.7	1.3	1.2	3.1	3.2	2.6	0.4	0.4	2.8	0.0	0.0
Unsig. Movement Delay, s/veh	1											
LnGrp Delay(d), s/veh	0.0	20.5	5.7	32.4	13.4	13.4	31.0	10.8	10.9	24.3	0.0	0.0
LnGrp LOS		С	A	С	В	В	С	В	В	С		
Approach Vol, veh/h		810			855			296			221	
Approach Delay, s/veh		17.9			15.1			23.2			24.3	
Approach LOS		В			В			С			С	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		32.4	9.5	23.5	13.8	18.6	0.0	32.9				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		52.4	5.3	36.0	15.1	32.4	4.0	37.3				
Max Q Clear Time (g_c+I1), s		3.5	5.0	12.6	8.9	11.2	0.0	12.0				
Green Ext Time (p_c), s		0.4	0.0	3.5	0.3	0.7	0.0	2.9				
Intersection Summary												
HCM 7th Control Delay, s/veh			18.2									
HCM 7th LOS			В									

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	×7	**	1	55	**	*	7 7	≜t a		3	**	1
Traffic Volume (vph)	164	602	153	75	681	93	196	495	46	166	601	208
Future Volume (vph)	164	602	153	75	681	93	196	495	46	166	601	208
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	200		195	110		115	190		0	80		80
Storage Lanes	2		1	2		1	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98		1.00				0.98
Frt			0.850			0.850		0.987				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3488	0	1630	3539	1458
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3162	3539	1432	3162	3539	1433	3162	3488	0	1630	3539	1433
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			173			173		10				188
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		1012			2084			1629			1012	
Travel Time (s)		12.5			25.8			20.2			12.5	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	178	654	166	82	740	101	213	538	50	180	653	226
Shared Lane Traffic (%)												
Lane Group Flow (vph)	178	654	166	82	740	101	213	588	0	180	653	226
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1	1	1	1		1	1	1
Detector Template												
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type	CI+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												

Scenario 1 Baseline

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	10.0	44.4	44.4	9.7	44.1	44.1	12.4	42.9		13.0	43.5	43.5
Total Split (%)	9.1%	40.4%	40.4%	8.8%	40.1%	40.1%	11.3%	39.0%		11.8%	39.5%	39.5%
Maximum Green (s)	4.3	38.7	38.7	4.0	38.4	38.4	7.5	38.0		8.1	38.6	38.6
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	6.2	25.9	25.9	7.8	25.0	25.0	8.9	22.6		9.3	23.0	23.0
Actuated g/C Ratio	0.08	0.32	0.32	0.10	0.31	0.31	0.11	0.28		0.12	0.29	0.29
v/c Ratio	0.72	0.57	0.29	0.27	0.67	0.18	0.60	0.59		0.95	0.64	0.41
Control Delay (s/veh)	57.5	26.5	5.2	40.1	27.5	0.8	45.2	26.9		93.8	28.2	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	57.5	26.5	5.2	40.1	27.5	0.8	45.2	26.9		93.8	28.2	8.4
LOS	E	С	А	D	С	А	D	С		F	С	A
Approach Delay (s/veh)		28.5			25.7			31.8			35.1	
Approach LOS		С			С			С			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 79.	7											
Natural Cycle: 105												
Control Type: Actuated-Und	coordinated	ł										
Maximum v/c Ratio: 0.95												
Intersection Signal Delay (s	s/veh): 30.3	i		I	ntersectio	n LOS: C						
Intersection Capacity Utilization	ation 66.8%)		10	CU Level	of Service	эC					
Analysis Period (min) 15												

Splits and Phases: 2: Alta Ave & El Monte Way

Ø3	Ø1	1 ø2		→ Ø4	F
13 s		42,9 s		44.4 s	9,7 s
4	Ø6		1 Ø5	チ ₀₇ ← ₀₈	
43.5 s			12.4 s	10 s 44.1 s	

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	* *	*	33	**	*	10	≜1 4		3	**	1
Traffic Volume (veh/h)	164	602	153	75	681	93	196	495	46	166	601	208
Future Volume (veh/h)	164	602	153	75	681	93	196	495	46	166	601	208
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adi	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00	1 00
Ped-Bike Adi(A phT)	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Parking Bus Adi	1.00	1 00	1.00	1.00	1 00	1.00	1.00	1 00	1 00	1.00	1 00	1 00
Work Zone On Approach	1.00	No	1.00	1.00	No	1.00	1.00	No	1.00	1.00	No	1.00
Adi Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	178	654	166	82	740	101	213	538	50	180	653	226
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh %	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Can yeh/h	265	1007	406	3/15	1096	1/2	222	856	70	205	1001	403
Arrive On Green	0.08	0.28	0.28	0.11	0.31	0.31	0.10	0.26	0.25	0.13	0.28	0.28
Sat Flow, yeb/b	2183	355/	1/33	3183	3554	1/33	3183	3281	304	16/1	355/	1/32
	170	654	1400	0100	740	1400	010	0201	207	1041	050	1452
Grp Volume(v), veh/h	1/0	4777	1422	02	140	101	213	4777	297	160	4777	1420
Grp Sat Flow(s), ven/n/in	1591	1///	1433	1591	1771	1433	1591	1///	1000	1041	1111	1432
Q Serve(g_s), s	3.9	11.0	0.0	1.7	13.1	3.0	4.0	10.4	10.5	7.0	11.0	0.7
Cycle Q Clear(g_c), s	3.9	11.0	0.8	1.7	13.1	3.8	4.0	10.4	10.5	1.0	11.0	0.7
Prop In Lane	1.00	4007	1.00	1.00	4000	1.00	1.00	400	0.17	1.00	4004	1.00
Lane Grp Cap(c), veh/h	265	1007	406	345	1096	442	332	463	4/2	205	1001	403
V/C Ratio(X)	0.67	0.65	0.41	0.24	0.67	0.23	0.64	0.63	0.63	0.88	0.65	0.56
Avail Cap(c_a), veh/h	265	1995	804	345	1980	799	3/1	960	977	205	1950	786
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.0	22.6	20.9	29.4	21.7	18.5	30.9	23.5	23.6	30.9	22.8	10.6
Incr Delay (d2), s/veh	6.4	0.7	0.7	0.4	0.7	0.3	3.2	1.4	1.4	32.1	0.7	1.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/In	1.6	4.2	2.0	0.6	4.7	1.1	1.7	3.9	4.0	4.5	4.2	2.7
Unsig. Movement Delay, s/veł	۱											
LnGrp Delay(d), s/veh	38.4	23.4	21.6	29.7	22.5	18.8	34.1	24.9	25.0	63.0	23.5	11.9
LnGrp LOS	D	С	С	С	С	В	С	С	С	E	С	В
Approach Vol, veh/h		998			923			801			1059	
Approach Delay, s/veh		25.7			22.7			27.4			27.7	
Approach LOS		С			С			С			С	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	13.0	22.8	11.8	24.4	11.5	24.3	10.0	26.2				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	8.1	38.0	4.0	38.7	7.5	38.6	4.3	38.4				
Max Q Clear Time (g c+l1), s	9.8	12.5	3.7	13.6	6.6	13.6	5.9	15.1				
Green Ext Time (p_c), s	0.0	2.1	0.0	3.5	0.1	3.8	0.0	3.6				
Intersection Summary												
HCM 7th Control Delay. s/veh			25.9									
HCM 7th LOS			С									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	7	1	≜t a			4	
Traffic Volume (vph)	32	91	142	18	71	186	
Future Volume (vph)	32	91	142	18	71	186	
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900	
Storage Length (ft)	0	100		0	150		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00	
Frt		0.850	0.983				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1630	1458	3479	0	1630	1863	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1630	1458	3479	0	1630	1863	
Link Speed (mph)	55		55			55	
Link Distance (ft)	522		452			482	
Travel Time (s)	6.5		5.6			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	35	99	154	20	77	202	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	35	99	174	0	77	202	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Right	Left	Left	
Median Width(ft)	12		12			12	
Link Offset(ft)	0		0			0	
Crosswalk Width(ft)	16		16			16	
Two way Left Turn Lane							
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00	
Turning Speed (mph)	15	9		9	15		
Sign Control	Stop		Free			Free	
Intersection Summary							
Area Type: C	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizati	ion 22.1%			IC	CU Level o	of Service A	4
Analysis Period (min) 15							

Intersection

Int Delay, s/veh	3.3						
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations	٦	1	- ≜ î∌		٦	1	
Traffic Vol, veh/h	32	91	142	18	71	186	
Future Vol, veh/h	32	91	142	18	71	186	
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	100	-	-	150	-	
Veh in Median Storage	,# 0	-	0	-	-	0	
Grade, %	0	-	0	-	-	0	
Peak Hour Factor	92	92	92	92	92	92	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	35	99	154	20	77	202	

Major/Minor	Minor1	Ν	/lajor1	Ν	lajor2		
Conflicting Flow All	521	87	0	0	174	0	
Stage 1	164	-	-	-	-	-	
Stage 2	357	-	-	-	-	-	
Critical Hdwy	6.63	6.93	-	-	4.13	-	
Critical Hdwy Stg 1	5.83	-	-	-	-	-	
Critical Hdwy Stg 2	5.43	-	-	-	-	-	
Follow-up Hdwy	3.519	3.319	-	-	2.219	-	
Pot Cap-1 Maneuver	500	955	-	-	1401	-	
Stage 1	849	-	-	-	-	-	
Stage 2	708	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	473	955	-	-	1401	-	
Mov Cap-2 Maneuver	473	-	-	-	-	-	
Stage 1	849	-	-	-	-	-	
Stage 2	669	-	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay	, s/v10.25	0	2.13
HCM LOS	В		

Minor Lane/Major Mvmt	NBT	NBRW	/BLn1\	VBLn2	SBL	SBT	
Capacity (veh/h)	-	-	473	955	1401	-	
HCM Lane V/C Ratio	-	-	0.074	0.104	0.055	-	
HCM Control Delay (s/veh)	-	-	13.2	9.2	7.7	-	
HCM Lane LOS	-	-	В	А	А	-	
HCM 95th %tile Q(veh)	-	-	0.2	0.3	0.2	-	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	eî.		2	1	۲	2	A		1	≜ ti-	
Traffic Volume (vph)	33	77	38	20	127	61	64	300	12	68	376	36
Future Volume (vph)	33	77	38	20	127	61	64	300	12	68	376	36
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.951				0.850		0.994			0.987	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1771	0	1630	1863	1458	1630	3518	0	1630	3493	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1771	0	1630	1863	1458	1630	3518	0	1630	3493	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22				208		4			10	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	84	41	22	138	66	70	326	13	74	409	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	36	125	0	22	138	66	70	339	0	74	448	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	CI+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						

Scenario 1 Baseline

AM 2044 06/06/2024

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	13.0	37.0		12.0	36.0	36.0	18.0	43.0		18.0	43.0	
Total Split (%)	11.8%	33.6%		10.9%	32.7%	32.7%	16.4%	39.1%		16.4%	39.1%	
Maximum Green (s)	7.0	31.0		6.0	30.0	30.0	12.0	37.0		12.0	37.0	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	6.7	16.2		6.1	13.4	13.4	8.9	40.2		9.1	40.3	
Actuated g/C Ratio	0.08	0.19		0.07	0.16	0.16	0.10	0.47		0.11	0.47	
v/c Ratio	0.28	0.35		0.19	0.47	0.16	0.41	0.20		0.43	0.27	
Control Delay (s/veh)	49.1	28.3		48.4	39.3	0.9	47.7	17.8		47.9	18.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	49.1	28.3		48.4	39.3	0.9	47.7	17.8		47.9	18.0	
LOS	D	С		D	D	А	D	В		D	В	
Approach Delay (s/veh)		33.0			29.0			22.9			22.3	
Approach LOS		С			С			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 85												
Natural Cycle: 95												
Control Type: Actuated-Un	coordinated	ł										
Maximum v/c Ratio: 0.47												
Intersection Signal Delay (s	s/veh): 24.9			Ir	ntersectio	n LOS: C						
Intersection Capacity Utilization	ation 45.4%)		(CU Level	of Servic	e A					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ħ		3	•	1	3	≜t a		3	≜ 16	
Traffic Volume (veh/h)	33	77	38	20	127	61	64	300	12	68	376	36
Future Volume (veh/h)	33	77	38	20	127	61	64	300	12	68	376	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	36	84	41	22	138	66	70	326	13	74	409	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	46	138	67	32	201	157	88	1707	68	93	1617	153
Arrive On Green	0.03	0.12	0.12	0.02	0.11	0.11	0.05	0.49	0.49	0.06	0.49	0.49
Sat Flow, veh/h	1641	1187	579	1641	1870	1460	1641	3484	139	1641	3280	311
Grp Volume(v), veh/h	36	0	125	22	138	66	70	166	173	74	221	227
Grp Sat Flow(s),veh/h/ln	1641	0	1766	1641	1870	1460	1641	1777	1845	1641	1777	1814
Q Serve(g s), s	1.6	0.0	5.1	1.0	5.4	2.4	3.2	4.0	4.0	3.4	5.4	5.5
Cycle Q Clear(g c), s	1.6	0.0	5.1	1.0	5.4	2.4	3.2	4.0	4.0	3.4	5.4	5.5
Prop In Lane	1.00		0.33	1.00		1.00	1.00		0.08	1.00		0.17
Lane Grp Cap(c), veh/h	46	0	205	32	201	157	88	870	904	93	876	895
V/C Ratio(X)	0.78	0.00	0.61	0.68	0.69	0.42	0.80	0.19	0.19	0.80	0.25	0.25
Avail Cap(c_a), veh/h	152	0	725	130	743	580	261	870	904	261	876	895
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.5	0.0	31.7	36.8	32.5	18.1	35.3	10.8	10.8	35.2	11.1	11.1
Incr Delay (d2), s/veh	24.2	0.0	2.9	22.7	4.1	1.8	15.1	0.5	0.5	14.2	0.7	0.7
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/In	0.9	0.0	2.1	0.6	2.4	1.1	1.5	1.3	1.4	1.6	1.8	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	60.7	0.0	34.7	59.5	36.6	19.9	50.4	11.3	11.3	49.4	11.8	11.8
LnGrp LOS	Е		С	E	D	В	D	В	В	D	В	В
Approach Vol, veh/h		161			226			409			522	
Approach Delay, s/veh		40.5			33.9			18.0			17.1	
Approach LOS		D			С			В			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.3	43.0	7.5	14.8	10.0	43.2	8.1	14.1				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	12.0	37.0	6.0	31.0	12.0	37.0	7.0	30.0				
Max Q Clear Time (g c+l1), s	5.4	6.0	3.0	7.1	5.2	7.5	3.6	7.4				
Green Ext Time (p_c), s	0.1	1.7	0.0	0.5	0.1	2.3	0.0	0.8				
Intersection Summary												
HCM 7th Control Delay, s/veh			23.1									
HCM 7th LOS			С									
Lanes, Volumes, Timings 1: Monte Vista Dr/Alice Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	* *	*	3	≜t i		3	4	1		4	
Traffic Volume (vph)	0	617	133	72	692	29	174	52	52	129	68	6
Future Volume (vph)	0	617	133	72	692	29	174	52	52	129	68	6
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	95		180	105		0	100		100	0		0
Storage Lanes	1		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.97		1.00				0.98		1.00	
Frt			0.850		0.994				0.850		0.996	
Flt Protected				0.950			0.950				0.969	
Satd. Flow (prot)	1716	3539	1458	1630	3513	0	1630	1863	1458	0	1797	0
Flt Permitted				0.950			0.950				0.774	
Satd. Flow (perm)	1716	3539	1415	1630	3513	0	1630	1863	1431	0	1435	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145		4				83		2	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2696			1643			681			697	
Travel Time (s)		33.4			20.4			8.4			8.6	
Confl. Peds. (#/hr)			5			5			5			5
Confl. Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	671	145	78	752	32	189	57	57	140	74	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	671	145	78	784	0	189	57	57	0	221	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2	_		6	
Permitted Phases			4	-	-		_		2	6		
Detector Phase	7	4	4	3	8		5	2	2	6	6	
Switch Phase												

Scenario 1 Baseline

Synchro 12 Report

Lanes, Volumes, Timings 1: Monte Vista Dr/Alice Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.7	40.7	40.7	9.7	23.7		8.9	34.2	34.2	37.3	37.3	
Total Split (s)	9.7	41.7	41.7	11.0	43.0		20.0	57.3	57.3	37.3	37.3	
Total Split (%)	8.8%	37.9%	37.9%	10.0%	39.1%		18.2%	52.1%	52.1%	33.9%	33.9%	
Maximum Green (s)	4.0	36.0	36.0	5.3	37.3		15.1	52.4	52.4	32.4	32.4	
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7		3.9	3.9	3.9	3.9	3.9	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7		-0.9	-0.9	-0.9		-0.9	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lag			Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		None	Min	Min	Min	Min	
Walk Time (s)		7.0	7.0		7.0			7.0	7.0	7.0	7.0	
Flash Don't Walk (s)		28.0	28.0		11.0			22.3	22.3	25.4	25.4	
Pedestrian Calls (#/hr)		5	5		5			5	5	5	5	
Act Effct Green (s)		24.2	24.2	7.5	32.4		15.0	39.0	39.0		19.7	
Actuated g/C Ratio		0.30	0.30	0.09	0.41		0.19	0.49	0.49		0.25	
v/c Ratio		0.63	0.27	0.51	0.55		0.62	0.06	0.08		0.62	
Control Delay (s/veh)		28.3	6.0	54.8	20.0		44.9	13.2	1.8		37.1	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay (s/veh)		28.3	6.0	54.8	20.0		44.9	13.2	1.8		37.1	
LOS		С	А	D	В		D	В	А		D	
Approach Delay (s/veh)		24.4			23.1			30.8			37.1	
Approach LOS		С			С			С			D	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 80												
Natural Cycle: 100												
Control Type: Actuated-Un	coordinated											
Maximum v/c Ratio: 0.63												
Intersection Signal Delay (s/veh): 26.1			lr	ntersection	n LOS: C						
Intersection Capacity Utiliz	ation 52.6%			IC	CU Level	of Service	Α					
Analysis Period (min) 15												

Splits and Phases: 1: Monte Vista Dr/Alice Ave & El Monte Way

† _{ø2}		f ø3	→ ø4
57.3 s		11 s	41.7 s
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37.3 s	20 s	9.7 s	43 s

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	7	* *	7	3	≜t a		1	•	7		4	
Traffic Volume (veh/h)	Ö	617	133	72	692	29	174	52	52	129	68	6
Future Volume (veh/h)	0	617	133	72	692	29	174	52	52	129	68	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	0	671	145	78	752	32	189	57	57	140	74	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	2	1057	421	137	1531	65	252	819	629	276	124	10
Arrive On Green	0.00	0.30	0.30	0.08	0.44	0.42	0.15	0.44	0.44	0.22	0.22	0.21
Sat Flow, veh/h	1641	3554	1415	1641	3468	148	1641	1870	1436	836	554	45
Grp Volume(v), veh/h	0	671	145	78	385	399	189	57	57	221	0	0
Grp Sat Flow(s),veh/h/ln	1641	1777	1415	1641	1777	1839	1641	1870	1436	1436	0	0
Q Serve(g_s), s	0.0	10.8	2.8	3.0	10.2	10.3	7.3	1.2	1.5	8.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	10.8	2.8	3.0	10.2	10.3	7.3	1.2	1.5	9.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.08	1.00		1.00	0.63		0.03
Lane Grp Cap(c), veh/h	2	1057	421	137	784	812	252	819	629	410	0	0
V/C Ratio(X)	0.00	0.63	0.34	0.57	0.49	0.49	0.75	0.07	0.09	0.54	0.00	0.00
Avail Cap(c_a), veh/h	141	2024	806	174	1047	1084	397	1506	1156	811	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)	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	20.1	5.2	29.2	13.2	13.2	26.8	10.8	10.9	23.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.6	0.5	3.7	0.5	0.5	4.4	0.0	0.1	1.1	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/In	0.0	3.8	1.4	1.2	3.2	3.3	2.8	0.4	0.4	2.8	0.0	0.0
Unsig. Movement Delay, s/vel	h											
LnGrp Delay(d), s/veh	0.0	20.8	5.7	32.8	13.7	13.7	31.2	10.8	11.0	24.7	0.0	0.0
LnGrp LOS		С	А	С	В	В	С	В	В	С		
Approach Vol, veh/h		816			862			303			221	
Approach Delay, s/veh		18.1			15.4			23.6			24.7	
Approach LOS		В			В			С			С	
Timer - Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		33.0	9.5	23.7	14.2	18.8	0.0	33.2				
Change Period (Y+Rc), s		4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s		52.4	5.3	36.0	15.1	32.4	4.0	37.3				
Max Q Clear Time (g_c+l1), s		3.5	5.0	12.8	9.3	11.3	0.0	12.3				
Green Ext Time (p_c), s		0.4	0.0	3.5	0.3	0.7	0.0	2.9				
Intersection Summary												
HCM 7th Control Delay, s/veh			18.5									
HCM 7th LOS			В									

Lanes, Volumes, Timings 2: Alta Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	× *	**	*	**	**	*	¥.¥	≜ 1⊾		*	**	1
Traffic Volume (vph)	164	602	157	78	681	93	210	498	53	166	602	208
Future Volume (vph)	164	602	157	78	681	93	210	498	53	166	602	208
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	200		195	110		115	190		0	80		80
Storage Lanes	2		1	2		1	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util, Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor			0.98			0.98		1.00				0.98
Frt			0.850			0.850		0.985				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd, Flow (prot)	3162	3539	1458	3162	3539	1458	3162	3480	0	1630	3539	1458
Flt Permitted	0.950			0.950			0.950	• • • • •	· ·	0.950		
Satd, Flow (perm)	3162	3539	1432	3162	3539	1433	3162	3480	0	1630	3539	1433
Right Turn on Red	0.01		Yes	0.01		Yes	•••=	• • • • •	Yes			Yes
Satd, Flow (RTOR)			173			173		11				188
Link Speed (mph)		55			55	•		55			55	
Link Distance (ft)		1012			2084			1629			1012	
Travel Time (s)		12.5			25.8			20.2			12.5	
Confl Peds (#/hr)		12.0	5		20.0	5		20.2	5		12.0	5
Confl Bikes (#/hr)			2			2			2			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adi Flow (vph)	178	654	171	85	740	101	228	541	58	180	654	226
Shared Lane Traffic (%)		001		00	110	101	220	011		100	001	220
Lane Group Flow (vph)	178	654	171	85	740	101	228	599	0	180	654	226
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	l eft	Left	Right	Left	Left	Right	Left	Left	Right	l eft	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		10						10			10	
Headway Factor	1 11	1 00	1 1 1	1 11	1 00	1 11	1 11	1 00	1 11	1 11	1 00	1 11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1	1	1	1	-	1	1	1
Detector Template												
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50	50	50		50	50	50
Detector 1 Type	CI+Ex	Cl+Ex	Cl+Ex	Cl+Ex	CI+Ex	Cl+Ex	Cl+Ex	Cl+Ex		CI+Ex	Cl+Ex	CI+Ex
Detector 1 Channel												-
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4	,	3	8	,	5	2		1	6	
Permitted Phases			4		-	8	-				-	6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase				-	-	-	-	_			-	

Scenario 1 Baseline

Synchro 12 Report

Lanes, Volumes, Timings 2: Alta Ave & El Monte Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.7	39.1	39.1	9.7	42.8	42.8	8.9	42.9		8.9	42.3	42.3
Total Split (s)	10.0	44.4	44.4	9.7	44.1	44.1	12.9	42.9		13.0	43.0	43.0
Total Split (%)	9.1%	40.4%	40.4%	8.8%	40.1%	40.1%	11.7%	39.0%		11.8%	39.1%	39.1%
Maximum Green (s)	4.3	38.7	38.7	4.0	38.4	38.4	8.0	38.0		8.1	38.1	38.1
Yellow Time (s)	4.7	4.7	4.7	4.7	4.7	4.7	3.9	3.9		3.9	3.9	3.9
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-0.9	-0.9		-0.9	-0.9	-0.9
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	Min		None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Don't Walk (s)		26.0	26.0		30.1	30.1		31.0			30.1	30.1
Pedestrian Calls (#/hr)		5	5		5	5		5			5	5
Act Effct Green (s)	6.2	27.8	27.8	5.9	25.0	25.0	9.2	21.6		10.8	23.2	23.2
Actuated g/C Ratio	0.08	0.35	0.35	0.07	0.31	0.31	0.11	0.27		0.13	0.29	0.29
v/c Ratio	0.73	0.53	0.28	0.37	0.67	0.18	0.63	0.63		0.83	0.64	0.41
Control Delay (s/veh)	58.2	24.3	4.9	45.3	27.8	0.8	46.2	28.7		67.8	28.1	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay (s/veh)	58.2	24.3	4.9	45.3	27.8	0.8	46.2	28.7		67.8	28.1	8.3
LOS	E	С	А	D	С	А	D	С		E	С	A
Approach Delay (s/veh)		27.0			26.4			33.5			30.6	
Approach LOS		С			С			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 80.	2											
Natural Cycle: 105												
Control Type: Actuated-Une	coordinated	1										
Maximum v/c Ratio: 0.83												
Intersection Signal Delay (s	s/veh): 29.3			lr	ntersectio	n LOS: C						
Intersection Capacity Utilization	ation 67.1%)		(CU Level	of Service	эC					
Analysis Period (min) 15												
Splits and Phases: 2. Alt	a Ave & Fl	Monte Wa	av									

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12.9 s 43 s	44.1 s	10 s

HCM 7th Signalized Intersection Summary 2: Alta Ave & El Monte Way

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	* *	*	55	**	1	77	≜1 4			* *	1
Traffic Volume (veh/h)	164	602	157	78	681	93	210	498	53	166	602	208
Future Volume (veh/h)	164	602	157	78	681	93	210	498	53	166	602	208
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adj Flow Rate, veh/h	178	654	171	85	740	101	228	541	58	180	654	226
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	263	1143	461	218	1093	441	347	812	87	227	998	402
Arrive On Green	0.08	0.32	0.32	0.07	0.31	0.31	0.11	0.25	0.24	0.14	0.28	0.28
Sat Flow, veh/h	3183	3554	1434	3183	3554	1433	3183	3231	345	1641	3554	1432
Grp Volume(v), veh/h	178	654	171	85	740	101	228	297	302	180	654	226
Grp Sat Flow(s),veh/h/ln	1591	1777	1434	1591	1777	1433	1591	1777	1800	1641	1777	1432
Q Serve(q s), s	3.9	11.1	6.7	1.9	13.2	3.8	5.0	10.9	11.0	7.7	11.8	6.8
Cycle Q Clear(q c), s	3.9	11.1	6.7	1.9	13.2	3.8	5.0	10.9	11.0	7.7	11.8	6.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.19	1.00		1.00
Lane Grp Cap(c), veh/h	263	1143	461	218	1093	441	347	446	452	227	998	402
V/C Ratio(X)	0.68	0.57	0.37	0.39	0.68	0.23	0.66	0.66	0.67	0.79	0.66	0.56
Avail Cap(c a), veh/h	263	1976	797	250	1961	791	390	951	963	227	1907	769
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.4	20.5	19.0	32.4	22.0	18.7	31.1	24.5	24.6	30.3	23.0	10.9
Incr Delay (d2), s/veh	6.8	0.5	0.5	1.1	0.7	0.3	3.4	1.7	1.7	17.1	0.7	1.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	4.0	1.9	0.7	4.8	1.1	1.9	4.2	4.3	3.8	4.3	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	39.2	21.0	19.5	33.5	22.8	19.0	34.5	26.2	26.3	47.4	23.8	12.1
LnGrp LOS	D	С	В	С	С	В	С	С	С	D	С	В
Approach Vol. veh/h		1003			926			827			1060	
Approach Delay, s/veh		23.9			23.3			28.5			25.3	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.1	22.3	9.0	27.4	11.9	24.4	10.0	26.3				
Change Period (Y+Rc), s	4.9	4.9	5.7	5.7	4.9	4.9	5.7	5.7				
Max Green Setting (Gmax), s	8.1	38.0	4.0	38.7	8.0	38.1	4.3	38.4				
Max Q Clear Time (q c+l1), s	9.7	13.0	3.9	13.1	7.0	13.8	5.9	15.2				
Green Ext Time (p_c), s	0.0	2.1	0.0	3.6	0.1	3.8	0.0	3.6				
Intersection Summary												
HCM 7th Control Delay, s/veh			25.2									
HCM 7th LOS			С									

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	×.	7	≜ ti-		*	1
Traffic Volume (vph)	32	103	142	18	74	186
Future Volume (vph)	32	103	142	18	74	186
Ideal Flow (vphpl)	1750	1750	1900	1750	1750	1900
Storage Length (ft)	0	100		0	150	
Storage Lanes	1	1		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	1.00
Frt		0.850	0.983			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1630	1458	3479	0	1630	1863
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1630	1458	3479	0	1630	1863
Link Speed (mph)	55		55			55
Link Distance (ft)	522		452			482
Travel Time (s)	6.5		5.6			6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	112	154	20	80	202
Shared Lane Traffic (%)						
Lane Group Flow (vph)	35	112	174	0	80	202
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.11	1.11	1.00	1.11	1.11	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type: 0	Other					
Control Type: Unsignalized						
Intersection Capacity Utilizat	ion 22.3%			IC	CU Level	of Service
Analysis Period (min) 15						

Intersection

Int Delay, s/veh	3.5						
Movement	WBL	WBR	NBT	NBR	SBL	SBT	-
Lane Configurations	1	7	_ ∱ î,		1	1	
Traffic Vol, veh/h	32	103	142	18	74	186	5
Future Vol, veh/h	32	103	142	18	74	186	6
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	100	-	-	150	-	-
Veh in Median Storage	, # 0	-	0	-	-	0)
Grade, %	0	-	0	-	-	0)
Peak Hour Factor	92	92	92	92	92	92	2
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	35	112	154	20	80	202	2

Major/Minor	Minor1	Ν	/lajor1	Μ	ajor2		
Conflicting Flow All	527	87	0	0	174	0	
Stage 1	164	-	-	-	-	-	
Stage 2	363	-	-	-	-	-	
Critical Hdwy	6.63	6.93	-	-	4.13	-	
Critical Hdwy Stg 1	5.83	-	-	-	-	-	
Critical Hdwy Stg 2	5.43	-	-	-	-	-	
Follow-up Hdwy	3.519	3.319	-	- 2	2.219	-	
Pot Cap-1 Maneuver	496	955	-	-	1401	-	
Stage 1	849	-	-	-	-	-	
Stage 2	703	-	-	-	-	-	
Platoon blocked, %			-	-		-	
Mov Cap-1 Maneuver	467	955	-	-	1401	-	
Mov Cap-2 Maneuver	467	-	-	-	-	-	
Stage 1	849	-	-	-	-	-	
Stage 2	662	-	-	-	-	-	

Approach Wi	NB	SB
HCM Control Delay, s/v10.2	0	2.2
HCM LOS		

Minor Lane/Major Mvmt	NBT	NBRWB	Ln1V	VBLn2	SBL	SBT	
Capacity (veh/h)	-	-	467	955	1401	-	
HCM Lane V/C Ratio	-	- 0.	074	0.117	0.057	-	
HCM Control Delay (s/veh)	-	- ´	13.3	9.3	7.7	-	
HCM Lane LOS	-	-	В	А	А	-	
HCM 95th %tile Q(veh)	-	-	0.2	0.4	0.2	-	

Lanes, Volumes, Timings 4: Alta Ave & Surabian Dr/Uruapan Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	î,		7	•	1		≜1 6			≜1 6	
Traffic Volume (vph)	57	77	50	20	127	61	68	300	12	68	376	44
Future Volume (vph)	57	77	50	20	127	61	68	300	12	68	376	44
Ideal Flow (vphpl)	1750	1900	1750	1750	1900	1750	1750	1900	1750	1750	1900	1750
Storage Length (ft)	125		0	75		30	200		0	200		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.941				0.850		0.994			0.984	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1753	0	1630	1863	1458	1630	3518	0	1630	3483	0
Flt Permitted	0.950			0.950			0.950			0.950		-
Satd, Flow (perm)	1630	1753	0	1630	1863	1458	1630	3518	0	1630	3483	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd, Flow (RTOR)		30				208		4			12	
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		353			661			1215			1629	
Travel Time (s)		4.4			8.2			15.1			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adi, Flow (vph)	62	84	54	22	138	66	74	326	13	74	409	48
Shared Lane Traffic (%)		•••	• •									
Lane Group Flow (vph)	62	138	0	22	138	66	74	339	0	74	457	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11	1.11	1.00	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						

Scenario 1 Baseline

Synchro 12 Report

Lanes, Volumes, Timings 4: Alta Ave & Surabian Dr/Uruapan Way

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	34.2		10.0	34.5	34.5	10.0	38.2		10.0	29.9	
Total Split (s)	16.0	39.0		12.0	35.0	35.0	17.0	42.0		17.0	42.0	
Total Split (%)	14.5%	35.5%		10.9%	31.8%	31.8%	15.5%	38.2%		15.5%	38.2%	
Maximum Green (s)	10.0	33.0		6.0	29.0	29.0	11.0	36.0		11.0	36.0	
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Max		None	Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Don't Walk (s)		21.2			21.5	21.5		21.2			16.9	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	8.4	20.7		6.1	13.7	13.7	9.0	38.7		9.0	38.7	
Actuated g/C Ratio	0.10	0.24		0.07	0.16	0.16	0.10	0.44		0.10	0.44	
v/c Ratio	0.40	0.32		0.20	0.48	0.16	0.45	0.22		0.45	0.30	
Control Delay (s/veh)	50.3	24.8		49.4	41.0	0.9	50.6	19.9		50.6	20.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay (s/veh)	50.3	24.8		49.4	41.0	0.9	50.6	19.9		50.6	20.3	
LOS	D	С		D	D	А	D	В		D	С	
Approach Delay (s/veh)		32.7			30.1			25.4			24.5	
Approach LOS		С			С			С			С	
Intersection Summary												
Area Type:	Other											
Cycle Length: 110												
Actuated Cycle Length: 87.	.8											
Natural Cycle: 95												
Control Type: Actuated-Un	coordinated	1										
Maximum v/c Ratio: 0.48												
Intersection Signal Delay (s	s/veh): 26.9			li	ntersectio	n LOS: C						
Intersection Capacity Utilization	ation 46.3%)		10	CU Level	of Service	eΑ					
Analysis Period (min) 15												

Splits and Phases: 4: Alta Ave & Surabian Dr/Uruapan Way



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	3	ţ,		۲	•	1		≜1 ₀		3	≜ 1₀	
Traffic Volume (veh/h)	57	77	50	20	127	61	68	300	12	68	376	44
Future Volume (veh/h)	57	77	50	20	127	61	68	300	12	68	376	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1870	1723	1723	1870	1723	1723	1870	1723	1723	1870	1723
Adi Flow Rate, veh/h	62	84	54	22	138	66	74	326	13	74	409	48
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh. %	2	2	2	2	2	2	2	2	2	2	2	2
Cap. veh/h	77	143	92	32	201	157	93	1650	66	93	1518	177
Arrive On Green	0.05	0.13	0.13	0.02	0.11	0.11	0.06	0.47	0.47	0.06	0.47	0.47
Sat Flow, veh/h	1641	1064	684	1641	1870	1460	1641	3484	139	1641	3206	374
Grp Volume(v), veh/h	62	0	138	22	138	66	74	166	173	74	226	231
Grp Sat Flow(s),veh/h/ln	1641	0	1747	1641	1870	1460	1641	1777	1845	1641	1777	1803
Q Serve(q s), s	2.8	0.0	5.6	1.0	5.4	3.2	3.4	4.1	4.1	3.4	5.8	5.9
Cycle Q Clear(q c), s	2.8	0.0	5.6	1.0	5.4	3.2	3.4	4.1	4.1	3.4	5.8	5.9
Prop In Lane	1.00		0.39	1.00		1.00	1.00		0.08	1.00		0.21
Lane Grp Cap(c), veh/h	77	0	235	32	201	157	93	841	874	93	841	854
V/C Ratio(X)	0.81	0.00	0.59	0.69	0.69	0.42	0.80	0.20	0.20	0.80	0.27	0.27
Avail Cap(c a), veh/h	216	0	758	129	713	557	237	841	874	237	841	854
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.9	0.0	30.9	37.0	32.7	31.7	35.4	11.6	11.6	35.4	12.1	12.1
Incr Delay (d2), s/veh	17.5	0.0	2.3	22.8	4.1	1.8	14.3	0.5	0.5	14.3	0.8	0.8
Initial Q Delav(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	2.3	0.6	2.4	1.1	1.6	1.4	1.5	1.6	2.0	2.1
Unsig, Movement Delay, s/veh	1	0.0		0.0			•					
LnGrp Delav(d), s/veh	53.4	0.0	33.2	59.8	36.9	33.5	49.7	12.1	12.1	49.7	12.8	12.9
LnGrp LOS	D		С	E	D	С	D	В	В	D	В	В
Approach Vol. veh/h		200	-		226	-		413			531	
Approach Delay, s/veh		39.5			38.1			18.9			18.0	
Approach LOS		D			D			В			В	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.3	42.0	7.5	16.2	10.3	42.0	9.6	14.2				
Change Period (Y+Rc) s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax) s	11.0	36.0	6.0	33.0	11.0	36.0	10.0	29.0				
Max Q Clear Time (q. c+11) s	5.4	61	3.0	7.6	5.4	79	4.8	74				
Green Ext Time (p_c), s	0.1	1.6	0.0	0.6	0.1	2.3	0.0	0.8				
Intersection Summary	5.1		0.0	0.0	0.1		0.0	5.0				
HCM 7th Control Dolov, shiph			24.7									
HCM 7th LOS			24.7 C									



Metro Traffic Data Inc. 310 N. Irwin Street - Suite 20 Hanford, CA 93230 800-975-6938 Phone/Fax

www.metrotrafficdata.com

Prepared For:	
	Ruettge

Ruettgers & Schuler Civil Engineers 1800 30th St, Ste 260 Bakersfield, CA 93301

LOCATION	Monte Vista Dr @ El Monte Way	LATITUDE	36.5460
COUNTY	Tulare		-119.4041
COLLECTION DATE	Wednesday, May 29, 2024	WEATHER	Clear

		1	lorthboun	d			S	outhbour	d			1	Eastboun	d			١	Vestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
6:00 AM - 6:15 AM	0	9	1	3	3	0	5	4	2	0	0	1	36	15	7	0	4	73	1	2
6:15 AM - 6:30 AM	0	17	0	1	6	0	4	1	4	0	0	0	33	7	3	0	5	92	2	3
6:30 AM - 6:45 AM	0	11	0	2	1	0	6	2	1	0	0	0	33	18	7	0	10	99	2	3
6:45 AM - 7:00 AM	0	15	3	6	2	0	9	3	2	0	0	1	56	23	3	0	11	94	3	6
7:00 AM - 7:15 AM	0	30	4	5	3	0	7	5	2	0	0	0	59	18	8	0	7	103	4	12
7:15 AM - 7:30 AM	0	20	6	5	1	0	14	7	0	2	0	0	101	26	6	0	11	113	5	7
7:30 AM - 7:45 AM	0	26	2	11	3	0	27	8	0	1	0	0	136	27	0	0	10	126	5	5
7:45 AM - 8:00 AM	0	32	10	13	2	0	43	14	2	0	0	0	119	36	9	0	22	134	6	4
TOTAL	0	160	26	46	21	0	115	44	13	3	0	2	573	170	43	0	80	834	28	42

		I	Northbour	nd			S	outhbour	nd				Eastboun	d			١	Vestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	0	63	9	30	1	0	10	9	1	0	0	0	161	46	4	0	13	95	9	3
4:15 PM - 4:30 PM	0	64	10	33	3	0	13	3	3	0	0	1	164	37	6	0	9	115	9	2
4:30 PM - 4:45 PM	0	65	11	23	1	0	12	11	2	1	0	0	148	37	3	0	17	123	7	1
4:45 PM - 5:00 PM	0	64	11	29	0	0	17	10	3	1	0	1	146	49	2	0	22	96	6	5
5:00 PM - 5:15 PM	0	64	14	30	4	0	18	7	2	0	0	3	162	31	0	0	18	124	10	4
5:15 PM - 5:30 PM	0	58	8	20	1	0	20	3	1	0	0	0	145	31	3	0	13	121	6	1
5:30 PM - 5:45 PM	1	55	13	22	4	0	22	7	2	1	0	1	134	46	4	0	14	93	10	1
5:45 PM - 6:00 PM	0	54	5	15	3	0	11	8	0	0	0	1	171	42	4	0	5	100	7	2
TOTAL	1	487	81	202	17	0	123	58	14	3	0	7	1231	319	26	0	111	867	64	19

		1	lorthboun	ıd			S	outhbour	ıd				Eastboun	d			١	Nestboun	d	
PEAK HOUR	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
7:00 AM - 8:00 AM	0	108	22	34	9	0	91	34	4	3	0	0	415	107	23	0	50	476	20	28
4:15 PM - 5:15 PM	0	257	46	115	8	0	60	31	10	2	0	5	620	154	11	0	66	458	32	12

	PHF	Trucks
АМ	0.789	4.6%
РМ	0.960	1.8%

						Alice	e Ave		PHF				
				РМ	10	31	60	0	0.842				
	_		_	AM	4	34	91	0	0.547				
	<u>PHF</u>	0.964	0.801		┢	Ţ	L	IJ		AM	РМ		
		0	0	5		·			1	20	32		
		5	0						-	476	458		
El Monte Way		620	415				North		L	50	66		El Monte Way
		154	107						5	0	0		
	-	РМ	AM	<u>PHF</u>	ฦ		1	┢		0.843	0.914	<u>PHF</u>	
				0.745	0	108	22	34	AM	-			
				0.968	0	257	46	115	РМ				
						Monte '	Vista Dr						



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Prepared For:

Ruettgers & Schuler Civil Engineers 1800 30th St, Ste 260 Bakersfield, CA 93301

LOCATION	Monte Vista Dr @ Surabian Dr	LATITUDE	36.5423
COUNTY	Tulare		-119.4041
COLLECTION DATE	Wednesday, May 29, 2024	WEATHER	Clear

		N	lorthboun	d			S	outhboun	d			1	Eastboun	d				Vestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
6:00 AM - 6:15 AM	0	0	6	1	2	0	10	6	0	5	0	0	0	0	0	0	2	0	10	4
6:15 AM - 6:30 AM	0	0	5	3	1	0	3	7	0	0	0	0	0	0	0	0	5	0	6	2
6:30 AM - 6:45 AM	0	0	8	0	0	0	5	13	0	3	0	0	0	0	0	0	6	0	6	1
6:45 AM - 7:00 AM	0	0	12	1	1	0	9	15	0	3	0	0	0	0	0	0	3	0	12	2
7:00 AM - 7:15 AM	0	0	13	2	2	0	7	11	0	1	0	0	0	0	0	0	3	0	15	4
7:15 AM - 7:30 AM	0	0	17	0	0	0	12	20	0	2	0	0	0	0	0	0	4	0	8	2
7:30 AM - 7:45 AM	0	0	16	3	0	0	12	24	0	2	0	0	0	0	0	1	4	0	9	1
7:45 AM - 8:00 AM	0	0	34	2	0	0	15	24	0	3	0	0	0	0	0	0	10	0	30	2
TOTAL	0	0	111	12	6	0	73	120	0	19	0	0	0	0	0	1	37	0	96	18

		1	Northboun	d			S	outhbour	d				Eastbound	ł			١	Vestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	0	0	40	2	2	0	19	28	0	8	0	0	0	0	0	0	3	0	17	2
4:15 PM - 4:30 PM	0	0	37	6	3	0	9	31	0	1	0	0	0	0	0	0	2	0	14	0
4:30 PM - 4:45 PM	0	0	37	1	1	0	19	41	0	2	0	0	0	0	0	0	11	0	24	1
4:45 PM - 5:00 PM	0	0	46	4	1	0	20	33	0	2	0	0	0	0	0	0	6	0	18	1
5:00 PM - 5:15 PM	0	0	39	4	1	0	11	38	0	0	0	0	0	0	0	0	4	0	22	1
5:15 PM - 5:30 PM	0	0	36	6	2	0	11	36	0	1	0	0	0	0	0	0	5	0	18	2
5:30 PM - 5:45 PM	0	0	38	4	2	0	18	16	0	2	0	0	0	0	0	0	8	0	19	1
5:45 PM - 6:00 PM	0	0	29	1	2	0	13	24	0	3	0	0	0	0	0	0	8	0	15	0
TOTAL	0	0	302	28	14	0	120	247	0	19	0	0	0	0	0	0	47	0	147	8

		1	Northbour	nd			S	Southbour	nd				Eastboun	d			1	Nestboun	d	
PEAK HOUR	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
7:00 AM - 8:00 AM	0	0	80	7	2	0	46	79	0	8	0	0	0	0	0	1	21	0	62	9
4:30 PM - 5:30 PM	0	0	158	15	5	0	61	148	0	5	0	0	0	0	0	0	26	0	82	5

	PHF	Trucks
АМ	0.643	6.4%
РМ	0.921	3.1%



Page 1 of 3



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800-975-6938 Phone/Fax www.metrotrafficdata.com Prepared For:

Ruettgers & Schuler Civil Engineers 1800 30th St, Ste 260 Bakersfield, CA 93301

LOCATION	Alta Ave @ El Monte Wy	LATITUDE	36.5459
COUNTY	Tulare	LONGITUDE	-119.3951
COLLECTION DATE	Wednesday, May 29, 2024	WEATHER	Clear

		1	lorthboun	d			S	outhbour	d			1	Eastboun	d			١	Nestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
6:00 AM - 6:15 AM	0	18	21	4	2	0	6	39	3	3	0	8	16	14	1	0	6	57	7	2
6:15 AM - 6:30 AM	1	16	25	5	1	0	3	21	11	0	0	12	21	9	3	0	4	68	10	4
6:30 AM - 6:45 AM	0	23	26	4	3	0	8	23	15	0	0	9	29	7	4	0	12	71	13	4
6:45 AM - 7:00 AM	0	16	29	5	2	0	9	35	22	1	0	15	48	15	1	0	9	77	9	7
7:00 AM - 7:15 AM	0	25	38	6	5	1	11	36	24	2	0	16	70	17	4	0	5	86	7	8
7:15 AM - 7:30 AM	0	27	39	2	1	1	26	58	36	3	0	21	96	16	7	0	11	91	6	6
7:30 AM - 7:45 AM	1	36	72	8	2	0	26	65	39	4	0	40	109	33	3	0	17	90	24	5
7:45 AM - 8:00 AM	0	48	95	16	1	1	48	126	44	2	0	37	142	40	7	0	17	110	25	2
TOTAL	2	209	345	50	17	3	137	403	194	15	0	158	531	151	30	0	81	650	101	38

		1	orthboun	d			S	outhbour	d			I	Eastboun	d			١	Nestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	1	55	59	15	4	4	31	60	40	1	0	60	151	34	5	0	11	99	20	3
4:15 PM - 4:30 PM	2	51	55	15	1	1	29	58	40	3	0	56	138	28	3	0	9	126	28	4
4:30 PM - 4:45 PM	4	37	85	23	1	5	31	57	29	1	0	57	151	32	3	0	19	135	29	1
4:45 PM - 5:00 PM	3	44	62	12	2	2	28	54	46	2	0	57	151	32	3	0	12	93	29	3
5:00 PM - 5:15 PM	1	59	73	9	5	1	36	55	42	1	0	41	179	32	4	0	15	105	24	1
5:15 PM - 5:30 PM	1	47	47	9	0	5	29	69	42	0	0	52	161	28	5	0	11	109	29	0
5:30 PM - 5:45 PM	2	51	72	9	1	3	33	55	41	0	1	63	162	33	2	0	15	93	34	1
5:45 PM - 6:00 PM	3	36	51	9	1	1	41	52	42	2	0	49	161	36	4	0	11	101	27	0
TOTAL	17	380	504	101	15	22	258	460	322	10	1	435	1254	255	29	0	103	861	220	13

		1	Northbour	ıd			S	Southbour	nd				Eastboun	d			1	Nestboun	d	
PEAK HOUR	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
7:00 AM - 8:00 AM	1	136	244	32	9	3	111	285	143	11	0	114	417	106	21	0	50	377	62	21
4:30 PM - 5:30 PM	9	187	267	53	8	13	124	235	159	4	0	207	642	124	15	0	57	442	111	5

	PHF	Trucks
АМ	0.695	3.0%
РМ	0.947	1.2%

						Alta	Ave		PHF	_			
				РМ	159	235	124	13	0.916				
				AM	143	285	111	3	0.619				
-	<u>PHF</u>	0.965	0.727		┢	L	Ŀ	J		AM	РМ	_	
		0	0	5	I	•			L	62	111		
		207	114						-	377	442		
<u>El Monte Way</u>		642	417	\rightarrow			North		F	50	57		El Monte Way
		124	106						G	0	0		
		PM	AM	PHF	ฦ		1	P		0.804	0.833	<u>PHF</u>	
				0.649	1	136	244	32	AM				
				0.866	9	187	267	53	РМ				
						Alta	Ave		-				

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Metro Traffic Data Inc. 310 N. Irwin Street - Suite 20 Hanford, CA 93230 800-975-6938 Phone/Fax

800-975-6938 Phone/Fax www.metrotrafficdata.com Prepared For:

Ruettgers & Schuler Civil Engineers 1800 30th St, Ste 260 Bakersfield, CA 93301

LOCATION	Alta Ave @ Surabian Dr	LATITUDE	36.5413
COUNTY	Tulare	LONGITUDE	-119.3951
COLLECTION DATE	Wednesday, May 29, 2024	WEATHER	Clear

		١	lorthboun	ıd			S	outhbour	ıd			1	Eastboun	d				Nestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
6:00 AM - 6:15 AM	1	4	10	0	1	0	5	15	2	2	0	6	5	1	1	0	2	7	2	0
6:15 AM - 6:30 AM	0	4	15	1	1	0	4	15	3	1	0	6	0	4	0	0	1	8	4	1
6:30 AM - 6:45 AM	0	7	16	0	2	0	4	31	1	1	0	5	5	1	0	0	1	6	6	1
6:45 AM - 7:00 AM	0	10	14	2	0	0	9	30	3	1	0	7	4	5	2	0	2	10	9	0
7:00 AM - 7:15 AM	0	9	19	1	2	0	7	35	3	1	0	6	8	5	0	0	1	10	7	3
7:15 AM - 7:30 AM	0	3	20	1	0	0	5	38	3	0	0	4	6	7	0	0	3	12	8	0
7:30 AM - 7:45 AM	0	10	52	4	0	0	15	49	4	1	0	7	8	4	1	0	2	13	15	1
7:45 AM - 8:00 AM	0	21	46	2	0	0	12	63	11	4	0	6	14	10	0	0	8	24	12	1
TOTAL	1	68	192	11	6	0	61	276	30	11	0	47	50	37	4	0	20	90	63	7

		1	orthboun	d			S	outhbour	d				Eastbound	d			١	Vestboun	d	
Time	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
4:00 PM - 4:15 PM	0	18	46	3	1	0	13	44	2	1	0	7	26	9	3	0	3	19	12	2
4:15 PM - 4:30 PM	0	11	34	4	1	0	7	45	6	2	0	6	20	11	0	0	1	20	14	0
4:30 PM - 4:45 PM	0	14	46	5	0	0	12	54	3	0	0	14	28	7	0	0	2	16	12	2
4:45 PM - 5:00 PM	0	13	54	2	1	0	14	48	2	1	0	17	18	12	0	0	1	27	6	0
5:00 PM - 5:15 PM	0	15	40	3	1	0	16	43	4	0	0	8	18	9	0	0	4	30	13	2
5:15 PM - 5:30 PM	0	15	46	3	0	0	10	40	6	0	0	4	19	15	1	0	0	23	4	0
5:30 PM - 5:45 PM	0	10	54	5	0	0	13	35	6	0	0	4	22	6	1	0	1	23	10	1
5:45 PM - 6:00 PM	0	16	34	3	0	0	19	42	8	0	0	7	13	10	0	0	1	25	6	1
TOTAL	0	112	354	28	4	0	104	351	37	4	0	67	164	79	5	0	13	183	77	8

		1	Northbour	d			9	Southbour	nd				Eastboun	d			1	Nestboun	d	
PEAK HOUR	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks	U-Turn	Left	Thru	Right	Trucks
7:00 AM - 8:00 AM	0	43	137	8	2	0	39	185	21	6	0	23	36	26	1	0	14	59	42	5
4:30 PM - 5:30 PM	0	57	186	13	2	0	52	185	15	1	0	43	83	43	1	0	7	96	35	4

	PHF	Trucks
АМ	0.691	2.2%
РМ	0.952	1.0%

				_		Alta	Ave		PHF	_				
				РМ	15	185	52	0	0.913					
			_	AM	21	185	39	0	0.712					
	<u>PHF</u>	0.862	0.708		┢	Ţ	L	l		AM	РМ			
		0	0	5		•			L	42	35			
		43	23						-	59	96			
<u>Surabian Dr</u>		83	36				North		F	14	7		<u>Uruapan Way</u>	
		43	26						ç	0	0			
		РМ	AM	<u>PHF</u>	ฦ			P		0.653	0.734	<u>PHF</u>		
				0.681	0	43	137	8	AM					
				0.928	0	57	186	13	РМ					
						Alta	Ave							

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2020 Quality/ Level of Service Handbook

FDO

June 2020

State of Florida Department of Transportation Systems Implementation Office 605 Suwannee St. MS 19

Tallahassee, FL 32399

www.fdot.gov/planning

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1 Executive Summary

This Quality Level of Service (Q/LOS) Handbook is intended to be used by engineers, planners, and decisionmakers in the development and review of roadway capacity and roadway users' Q/LOS at generalized planning levels. This Q/LOS Handbook provides tools to quantify multimodal transportation service inside the roadway environment (essentially inside the right of way).

This edition of the Q/LOS Handbook is updated and reorganized, still providing a foundation for high-quality, consistent capacity, and level of service (LOS) analyses and review in the State of Florida. It includes new analytical techniques from the Transportation Research Board's Highway Capacity Manual (HCM), Sixth Edition, and updated Generalized Service Volume Tables. With these professionally accepted techniques, analysts can easily evaluate roadways from a multimodal perspective, which results in better multimodal decisions for projects in generalized planning phases.

The focus of generalized planning is the extensive use of default values and is intended for broad applications such as regional analyses, initial problem identification, and future year analyses. Florida's Generalized Service Volume Tables at the end of this Q/LOS Handbook are the primary tools for conducting this type of planning analysis. At this time, only Freeways and Uninterrupted Flow Highways Generalized Service Volume Tables have been updated to be consistent with the HCM methodology. The State Signalized Arterials Generalized Service Volume Tables remained the same as the 2013 Q/LOS Handbook. There are future plans to update the State Signalized Arterials Generalized Service Volume Tables to be consistent with the HCM methodology.

Florida Department of Transportation (FDOT) welcomes questions and comments on the content and concepts of this Q/LOS Handbook. FDOT will provide technical assistance and training as needed for usage of the Q/LOS process. For additional resources, see the FDOT's Systems Implementation Office (SIO) website at https://www.fdot.gov/planning/systems/. Initial contacts should be made with FDOT District and Florida's Turnpike Enterprise personnel.

2 Q/LOS Handbook Purpose and Scope

This Q/LOS Handbook is a tool that can be utilized to analyze and review a roadway's capacity at a generalized planning level.

The quality of service (QOS) is a traveler-based perception of how well a transportation service or facility operates. The LOS is a quantitative stratification of the QOS into six letter grades. The LOS provides a measure that assesses multimodal service inside the roadway environment (essentially inside the right of way). Capacity conceptually relates to the maximum number of vehicles that can pass a point on a roadway in a given amount of time under normal conditions. The Q/LOS Handbook provides Generalized Service Volume Tables and background regarding statewide default values used in their development. The Generalized Service Volume Tables, found at the end of the Q/LOS Handbook, present maximum service volumes, or the highest numbers of vehicles for a given LOS.

Directions found within the Q/LOS Handbook provide assistance in selecting the most appropriate tools for Q/LOS analysis. This handbook offers specific instructions on how to use the Generalized Service Volume Tables.

2.1. Levels of Analysis

There are many methods for computing capacity and the LOS, which form a hierarchy ranging from Generalized Service Volume Tables (the simplest to use but potentially least accurate) to complex operational analysis tools (very precise, but time-intensive and costly). **Figure 2-1** provides a list of some traffic analysis tools measured by accuracy and complexity. In selecting the appropriate tools, tradeoffs among study purposes (e.g., generalized planning application, signal timing application), accuracy and precision of results (e.g., variability in data for current year analyses, variability in future year analyses), and data preparation effort (e.g., use of existing statewide traffic data, use of direct field measurements) should be considered. Please refer to the <u>FDOT Traffic Analysis Handbook</u> for additional tools and guidance in selecting the appropriate analysis tool.



Figure 2-1: Traffic Analysis Tools

2.1.1. Generalized Planning

Generalized planning covered in this handbook makes extensive use of default values and is intended for broad applications, such as initial problem identification (e.g., deficiency and needs analyses, geographic influence areas), statewide analyses (e.g., statewide calculation of delay), and future year analyses (e.g., 10-year planning horizon).

Florida's Generalized Service Volume Tables provided at the end of this handbook are the primary tools for conducting Generalized planning analysis. The updated tables have been developed using guidance provided in the HCM.

2.2 Travel Modes

The HCM defines four major travel modes: automobile, pedestrian, bicycle, and transit. Each mode includes a unique set of characteristics that define a traveler's experience during a trip, and it is important to consider each perspective when analyzing a multimodal facility.

2.2.1 Automobile

The three major elements that affect the operation of a vehicle are: roadway characteristics, traffic characteristics, and control characteristics.

Vehicles include passenger cars, trucks, vans, buses, recreational vehicles, and motorcycles. Each vehicle type has a unique set of operational characteristics, and the percentage makeup of each vehicle type within a traffic stream affects the capacity of a facility because of these differences. For example, trucks, buses, and recreational

vehicles have lower acceleration and deceleration rates than standard passenger cars. Factors, such as pavement type and condition, time of day, and weather, affect the operational characteristics of vehicles as well as driver behavior. Other factors, such as fatigue, health, and driving under the influence of drugs and alcohol, also affect driver behavior. This handbook assumes base conditions that include typical drivers on dry pavement during daylight hours.

2.2.2 Pedestrian

Many trips include at least one part where the traveler is a pedestrian. This is particularly important for transit trips, where the pedestrian section of the trip may have an impact on future mode choice.

Analyzing the pedestrian experience can be summarized by two primary types of analysis: individual delay and facility attributes. Delay at intersections can be easily quantified and analyzed. The factors that describe a facility and, therefore, contribute to the overall walking experience are less easily quantified, including safety, security, lighting, grades, surface conditions, and even street activity levels. Automobile and heavy vehicle traffic volume, and the extent to which pedestrians are separated from vehicular traffic, also influence pedestrians' perception of QOS while using a sidewalk. This handbook accounts for the user's perception and facility attributes when determining Pedestrian LOS (PLOS).

2.2.3 Bicycle

Bicycles are used to make a variety of trips, including trips for recreation, commuting, and errands. Bicycles can help extend the market area of transit service as bicycle travel is typically five times faster than travel on foot.

Similar to the pedestrian experience, Bicycle LOS (BLOS) can be summarized by delays encountered at intersections as well as the attributes of the facility itself. As with the pedestrian analysis, the Q/LOS Handbook focuses on facility attributes when determining BLOS. These attributes include the volume and speed of adjacent vehicles, heavy vehicle presence, the presence of on-street parking and pavement conditions. Because of the severe deterioration of perceived QOS at flow levels well below the theoretical capacity of a bike path, the concept of capacity has little utility in the design and analysis of bicycle paths.

2.2.4 Transit

Transit riders can be grouped into two primary categories: choice and captive riders. Choice transit riders typically have other means of transportation readily available, but choose transit to avoid congestion, save money on fuel and parking, use their travel time productively for other activities, and/or reduce their impact on the environment. Captive riders, however, are unable to drive because of age, physical, mental, or financial reasons, and depend on transit or other modes for their daily transportation needs.

Unlike other modes, transit is primarily focused on service levels rather than facility characteristics. Infrastructure for driving, biking, or walking is available at all times, once constructed; transit service is only available during certain times along designated routes. Additionally, transit passengers are not in direct control of their travel time, service frequency and reliability, therefore, these are important factors that affect the quality and utility of transit service.

When bus service frequencies reach a high enough level of demand (headway of approximately 10 minutes or less),

bus passengers do not feel the need to consult bus schedules. This allows transit users the freedom to treat the system as they would treat other modes. Service frequencies that require passengers to plan their trips around a limited transit schedule offer much less utility, and deter choice riders.

Because transit passengers typically must walk to and from transit stops on either end of their trip, the quality of the walking experience at the beginning or end of a trip may be just as important to the transit passenger as the actual transit experience.

2.3 What's New in This Version of the Q/LOS Handbook?

This edition of the Q/LOS Handbook primarily reflects an update to the 2013 edition and incorporates updates included in the sixth edition of the HCM. The Q/LOS Handbook has been revised to focus on generalized planning for freeways and highways. No changes have been made in this version of the handbook to the arterial methodology and arterial Generalized Service Volume Tables from the 2013 Q/LOS Handbook.

The Generalized Service Volume Tables are the primary tools supported by FDOT for generalized planning. The freeway and highway automobile mode portions of the tables have been updated using the Highway Capacity Software 7 (HCS7), which incorporates the latest procedures provided in the HCM, Sixth Edition. The updated tables also include revised inputs and parameters that coincide with the current methodology in the HCM and default values. The updated tables can be found at the end of this handbook. A summary of the methodology changes is provided below:

- The Generalized Service Volume Tables
 - The 2020 freeway and highway Generalized Service Volume Tables were developed using HCS7, which is based on the HCM, Sixth Edition.
 - There are **no changes** for arterial service volumes between the 2012 and 2020 Generalized Service Volume Tables.
- The freeway service volumes are now based on freeway facilities procedures, incorporating basic segments and interchanges rather than just basic segments.
- The inputs are generally consistent between the 2012 and 2020 versions of the tables, but there have been some updates to maintain internal consistency in the 2020 set of tables.
- New inputs such as Speed Adjustment Factor (SAF) and Capacity Adjustment Factor (CAF) have been introduced into the development of the tables because the input requirements for HCS7 are more extensive than those for Level of Service Planning (LOSPLAN).
- FDOT **no longer** supports the LOSPLAN program and it has not been included in this version of the handbook.

3 Q/LOS Principles

Providing safety and mobility for people and goods remains transportation's most essential function and part of FDOT's mission. There are four dimensions of mobility:

- Quality of travel: traveler satisfaction with a facility or service.
- Quantity of travel: magnitude of use of a facility or service.
- Accessibility: ease in which travelers can engage in desired activities.
- Capacity utilization: quantity of operations relative to capacity.

This Q/LOS Handbook focuses primarily on quality, followed by capacity utilization. The quantity of travel and accessibility dimensions are not addressed in this Q/LOS Handbook.

The QOS is based on a user's perception of how well a transportation service or facility operates. In other words, it's how travelers perceive the overall QOS.

The LOS is a quantitative stratification of the QOS. The HCM divides highways QOS into six letter grades, A through F, with A being the best and F being the worst. With this scheme, traffic engineers more easily explained operating and proposed design concepts to the general public and elected officials.

Despite its widespread use as an independent measurement, it is important to note that the LOS is simply a quantitative breakdown from transportation users' perspectives of transportation QOS. The LOS reflects the QOS, as measured by a scale of user satisfaction, and is applicable to each of the following modes that use roadways: automobiles, trucks, bicycles, pedestrians, and buses.

Because this handbook deals with the overall quality of user satisfaction and its quantitative breakdown, it is labeled as the Q/LOS Handbook. The measurement techniques, however, are simply referred to as LOS analysis. This Q/LOS Handbook deals with the QOS and the LOS that roadways provide to users (i.e., motorists, bicyclists, pedestrians, and transit passengers) and provides planning tools to assist transportation planners and engineers. The overall quality of the entire trip experience, which depends on a variety of factors, including aesthetics, safety, and other social measures are not covered in this handbook.

3.1 Common Q/LOS Misconceptions

Common misconceptions about Q/LOS that often arise:

The QOS is directly related to all other dimensions of mobility.

This misconception is related to the relationship between quality and other dimensions of mobility. *The QOS is frequently related to the other dimensions of mobility, but not in all cases.* Q/LOS for automobile drivers is usually closely linked to how many other vehicles are on the road. However, the relationship is not always perfect.

For example, arterial speeds are more closely tied to signalization conditions than the number of other vehicles on the roadway. A higher Q/LOS grade may exist on a four-lane arterial with twice the volume of another arterial due to efficient signal progression. For transit users, pedestrians, and bicyclists, there is often an even weaker relationship between total demand and Q/LOS. In most situations in Florida, the total number of bicyclists and pedestrians on a facility has very little, if any, impact on Q/LOS.Similarly, in most of Florida, bus

Chapter 3 – Q/LOS Principles

frequency is typically much more important to transit users than how many people are actually on a bus.

In some cases, particularly for the non-automobile modes, an analysis of total potential demand is a more important component of the decision-making process than the QOS. This handbook only addresses Q/LOS, not the methods of determining overall demand or mode splits. Other tools, such as logit models, are more appropriate for these types of analyses.

The LOS is applicable only to automobile analysis, while the QOS is related to the non-automobile modes.

This misconception is that LOS applies only to automobiles, and QOS applies to the non-automobile modes. It is often assumed that while automobile analyses are highly quantitative, the bicycle, pedestrian, and transit analyses are more qualitative. *However, the bicycle, pedestrian, and transit techniques are as quantitative and rigorously developed and tested as those for automobiles.* An example of LOS by mode for arterials is illustrated in Figure 3-1.



Figure 3-1: Examples of LOS by Mode for Arterials

The LOS A–F grades are comparable to American school letter grades.

The most common misconception about LOS A–F grades is that they are comparable to school letter grades. Although they share some basic similarities, there are some important distinctions to make at a planning level. *Unlike school grades, LOS A is not necessarily a desirable goal, and the meaning of A–F is not entirely consistent across modes.* Although it is true that LOS A is best and LOS F is worst, this is strictly from a traveler experience and perspective. LOS A is not necessarily a desirable goal to achieve from an overall transportation or societal perspective. LOS A in a peak travel hour could be an indicator of an inefficient use of limited funding. It is simply not cost-effective to design the state's roadways to operate at LOS A during the peak hour. FDOT's LOS targets in Chapter 10 should be considered a desirable condition during the peak hour, with significant variance from those targets in either direction an undesirable condition. The LOS targets are an FDOT Policy (<u>000-525-006</u>) and discussed in Chapter 10.

Although LOS F represents a failing condition, there are more factors to consider when the LOS reaches F. Essentially, LOS F either means travel demand exceeds capacity and the roadway is operating in oversaturated conditions, or another undesirable condition exists.

Although each of the methodologies for automobiles, bicycles, pedestrians, and buses make use of the LOS A-F

scales, the meaning of A-F is not entirely consistent across the modes.

Transportation professionals widely consider LOS D for the automobile mode an acceptable condition, and this threshold is often used as a design condition in urbanized areas. The bus and automobile LOS scales were developed by transportation professionals, with the objective of classifying various levels of congestion in undersaturated conditions. Members of the general public, however, determined the derivation of the bicycle and PLOS thresholds, thus incorporating a general perception of LOS D as a largely undesirable condition. Because of this, LOS D likely represents a worse condition from the user perspective for the bicycle and pedestrian modes than the automobile and bus modes. FDOT and its research team evaluated and considered various methods to make the LOS thresholds more consistent across modes, but found no scientific basis to adjust the scales. Users should therefore simply be cautious about comparing the same LOS letter grade across modes.

3.2. Highway Capacity Manual

For capacity and automobile, pedestrian, and bicycle Q/LOS analysis, the HCM is the foremost recognized and accepted analysis tool. HCM defines capacity as the maximum sustainable flow rate, which persons or vehicles can reasonably be expected to traverse a point or a uniform segment of a lane or a roadway during a given time period under prevailing roadway, environmental, traffic, and control conditions.

3.2.1 Traffic Flow and Capacity Concepts

The HCM defines two primary facility types: uninterrupted and interrupted flow facilities. The terms refer to the type of facility and, therefore, the analysis type, not the quality of traffic flow at any given time.

Uninterrupted flow facilities have no fixed causes of delay or interruption external to the traffic stream, such as signals or stop signs. Non-tolled freeways represent the purest form of uninterrupted flow, because there are no fixed interruptions to traffic flow, and access to the facilities are limited to ramp locations. Multilane and two-lane highways operate under uninterrupted flow in long segments between points of fixed interruption (e.g., traffic signals), but it is often necessary to examine the points of fixed interruption using interrupted flow methodologies.

Interrupted flow facilities have fixed causes of periodic delay or interruption to the traffic stream, such as traffic signals or stop signs, with average spacing less than or equal to 2 miles. Traffic flow patterns on interrupted flow facilities are the result not only of vehicle interactions and the facility's geometric characteristics, but also of the traffic control used at intersections and the frequency of access points to the facility. Traffic signals, for example, allow designated movements to occur only during portions of the signal cycle, and therefore affect flow and capacity, because the facility is not available for continuous use. Traffic signals also create platoons of vehicles that travel along the facility as a group. By contrast, intersections controlled by all-way stops and roundabouts discharge vehicles more randomly, creating periodic but sometimes small gaps in traffic at downstream locations.

Capacity on uninterrupted and interrupted flow facilities can be defined in terms of, passenger cars per hour (pcph), or vehicles per hour (vph), depending on the type of analysis or system element.

Reasonable expectancy is the basis for defining capacity. Capacity is, therefore, not the absolute maximum flow rate observed at a facility, but rather a flow rate that can be achieved repeatedly for peak periods of sufficient

demand.

Prevailing roadway, traffic, and control conditions define capacity. These conditions should be relatively uniform for any segment of a facility that is analyzed. Base conditions, by comparison, assume optimum conditions, including good weather, dry pavement conditions, users who are familiar with the system, and no impediments to traffic flow. In most cases, prevailing conditions differ from base conditions (e.g., there are trucks in the traffic stream, rolling terrain). As a result, the computations of capacity, service flow rate, and LOS include an adjustment to capacity under base conditions.

3.2.2. Bicycle LOS (BLOS)

BLOS is based on bicyclists' perceptions of the roadway environment. BLOS is based on five variables, with relative importance ordered in the following list:

- Average effective width of the outside through lane
- Vehicle volumes
- Vehicle speeds
- Heavy vehicle (truck) volumes
- Pavement condition

Average effective width is largely determined by the width of the outside travel lane and striping for bicyclists but includes other factors, such as the effects of street parking and drainage grates. Each of the variables is weighted by coefficients derived by stepwise regression modeling importance. A numerical LOS score, generally ranging from 0.5 to 6.5, is determined and stratified to an LOS letter grade. Thus, unlike the determination of automobile LOS, in which there is typically only one service measure (e.g., average travel speed), BLOS is determined by multiple factors.

3.2.3. Pedestrian LOS (PLOS)

Like BLOS, **PLOS is based on the pedestrians' perceptions of the roadway or nearby roadside environment.** PLOS is based on four variables with relative importance ordered in the following list:

- Existence of a sidewalk
- Lateral separation of pedestrians from vehicles
- Vehicle volumes
- Vehicle speeds

The PLOS model applies to the roadway facilities within the right of way. Therefore, estimating PLOS for facilities outside the right of way at significantly greater distance, may exceed the validated range of the model and is not recommended.

3.3. Transit Capacity and QOS

The Transportation Research Board (TRB) <u>Transit Capacity and Quality of Service Manual (TCQSM)</u> is the nation's leading document for transit and Q/LOS analysis. As used in this Q/LOS Handbook, transit or bus is limited to scheduled, fixed-route bus transit.

One significant exhibit in the TCQSM is a table for urban scheduled transit service based on service frequency. **Table 3-1** replicates this TCQSM table, but includes Florida-specific modifications to the adjusted service frequency.

Level of Service	Adjusted Service Frequency (Vehicles/hour)	Headway (minutes)	Comments
Α	>6	<10	Passengers don't need schedules
В	>4	<15	Frequent service, passengers consult schedules
С	≥3	≤20	Maximum desirable time to wait if transit vehicle missed
D	≥2	≤30	Service unattractive to choice riders
E	≥1	≤60	Service available during hour
F	<1	>60	Service unattractive to all riders

Table 3-1: Service Frequency LOS Thresholds

3.4. Simplifying Assumptions

Planning-level analyses make extensive use of default values and simplifying assumptions to the operational models on which they are based. As such, there are multiple simplifying assumptions used in this Q/LOS Handbook.

3.4.1. Averages

This Q/LOS Handbook makes extensive use of averages. For generalized planning (Generalized Service Volume Tables), most of the default input variables represent statewide averages. Similarly, for generalized planning, simple averages are recommended. For example, if an arterial facility has daily volumes of 20,000, 25,000, and 24,000, it would be reasonable to use the average (23,000) of the three. However, users should be cautious of outlying values and use some judgment when applying simple averages. In the above example, if the first value were 10,000, the user may want to disregard that value or use the median value (i.e., 24,000).

3.4.2. Turning Movements

One of the most significant planning assumptions is that the mainline turning movements are adequately accommodated. Within this Q/LOS Handbook, the through movement is defined as the traffic stream with the greatest number of vehicles passing directly through a point. While this movement is typically the Straight Ahead movement, occasionally the right or left turn could qualify as the through movement. When the turning movement has the greatest number of vehicles (more than the Straight Ahead), it is recommended to consider the turning movement as the controlling movement. See **Section 5.9** for additional details.

Most analyses of through movements in the HCM are relatively straightforward. Complications arise with the treatment of turning or merging movements, especially for signalized intersections and arterials. By handling turning arterial movements (i.e., turns from the arterial, side-street movements) in a general way, Q/LOS and capacity analyses are greatly simplified. This is also true for some two-lane uninterrupted flow highways in which

mid-block turning movements may affect capacity. Off- and on-ramp movements along freeways are also handled in a general way and are assumed to be adequately accommodated. Most importantly, it is assumed that movements at off-ramps do not back up into the through lanes of the freeway.

When turning movements are not adequately accommodated in the available storage, the techniques to determine the LOS for an arterial found in this handbook are not appropriate. Although, the arterial analysis in this handbook includes all vehicles on the arterial, the focus is on the vehicles making through movements rather than turning movements. For example, only the green time for the through movement is included, and penalties are assigned if there are no left-turn lanes at signalized intersections and no medians exist mid-block.

3.4.3. Queue Spillback

Another major assumption is that turning movements do not back up into adjacent through lanes. Essentially, adequate storage is assumed to be available for turning vehicles on arterials and for vehicles exiting freeways. Therefore, where mainline turning movements are not adequately accommodated, the planning techniques found in the Q/LOS Handbook are not appropriate. If this is the case, higher level analysis is recommended.

3.4.4. Capacity

For the HCM analyses of uninterrupted flow facilities, capacity is set in terms of passenger cars per hour per lane (pcphpl). Free-flow speed is estimated based on other variables, such as percent heavy vehicles, CAFs and SAFs, median type, and lateral clearance.

For the HCM analyses of interrupted flow facilities, capacity represents the maximum number of vehicles that can pass a point during a specified time period under prevailing roadway, traffic, and control conditions.

The Q/LOS Handbook primarily relies on and reports capacity values based on the interrupted flow concept of capacity, with free-flow speed considered a roadway variable input. For planning purposes, the assumed free-flow speed is 5 mph over the posted speed limit.

3.4.5. Bus Frequency

For transit analysis purposes, the most significant assumption is that bus frequency is the single most important factor in determining the Q/LOS to transit users along a transit route segment or roadway facility. FDOT, in cooperation with the TCQSM authors and others, has incorporated that concept. Certainly, the LOS varies for individual transit users along a facility, but in the determination of bus LOS along a transit route segment or roadway facility, the availability of buses is usually the more relevant performance measure.

3.5. Arterial Analyses

ADJUSTED SATURATION FLOW RATE

Variables such as area type, speed limit, number of lanes, percent right turn lanes, percent heavy vehicles, median type, left turn lanes and population size have effects on adjusted saturation flow rates. Furthermore, as traffic queues get longer, traffic pressure affects capacity. These effects are included in FDOT's Generalized Service Volume Tables.

ADD-ON/DROP-OFF LANES

The add-on/drop-off lane (or expanded intersection) will contribute to intersection capacity, but not likely to the extent of a full through lane. The add-on/drop-off lane contains up to half the capacity of a full through lane. For any capacity benefit to be considered, two conditions should be met:

- the add lane and drop lane each must be at least 800 feet in length
- the add-on/drop-off pair combined must be at least 1,760 feet in length

For additional discussion, see Section 4.3.1.

ONE-WAY STREETS

The Generalized Service Volume Tables include a factor that has been approved for the evaluation of one-way streets. Essentially, one-way pairs are assumed to have a 20 percent higher service volumes than corresponding two-way roadways with the same number of lanes.

LOS CRITERIA

The maximum control delay at a signalized intersection for LOS D is 55 seconds. While that value may be reasonable based on user perception in an urbanized area, in a small town or at an isolated intersection on a rural highway, that delay would be considered LOS F. To overcome this difference in user perception, FDOT has adopted different control delay criteria in rural undeveloped and rural developed areas. The criteria are one-half, rounded up, of the urbanized area criteria. For arterials in rural developed areas, arterial Class I LOS thresholds apply. These LOS criteria are embedded in FDOT's rural undeveloped and rural developed Generalized Service Volume Tables. The LOS criteria appear on the back of each table.

3.5.1 Pedestrian and Bus Analyses

PEDESTRIAN LOS

PLOS is determined by the methodology contained in this handbook. The methodology is consistent and unchanged from the 2013 Q/LOS Handbook. The pedestrian LOS adjustment factors as they relate to bus LOS are shown in Table 3-2.

Pedestrian Level of Service	Adjustment Factor
Pedestrian LOS A	1.15
Pedestrian LOS B	1.10
Pedestrian LOS C	1.05
Pedestrian LOS D	1.00
Pedestrian LOS E	0.80
Pedestrian LOS F	0.55

Table 3-2: PLOS Adjustment Factors on Bus LOS

ROADWAY CROSSING DIFFICULTY

When catching a bus, transit users frequently have to cross a road. **Crossing difficulty is typically influenced by three broad factors: traffic signal density, crossing length, and vehicle volume.** It is more difficult to cross roadways with low signal densities than roadways with closely spaced, signalized intersections. Mid-block crossing difficulty increases with road width and lack of pedestrian refuges (i.e. restrictive or raised medians). Mid-block crossing difficulty also increases as the number of vehicles increase, which results in fewer gaps. These three broad factors and other major factors, such as vehicle speed, are interrelated. To account for crossing difficulty in a general way, FDOT's approach includes a set of roadway crossing adjustment factors which capture the crossing difficulty. Roadway crossing adjustment factors are used to determine the adjusted bus frequency by applying a factor that captures crossing difficulty.

PASSENGER LOAD FACTOR

Bus crowding plays a role in the user's perception of QOS, particularly on overcrowded buses when no seating is available. FDOT's approach includes a set of passenger load factors, which are applied to help determine the adjusted bus frequency value. Passenger load factors are used to determine the adjusted bus frequency value by applying a factor commensurate to the level of passenger crowding. These factors can be found in Chapter 7 of this Q/LOS Handbook.

BUS STOP AMENITIES

Passenger comfort and safety within the passenger waiting areas play a role in user perception of the QOS and desirability of a transit system. FDOT's approach includes a set of bus stop amenity factors, which are used to help determine the adjusted bus frequency value. The factors can also be found in **Chapter 7** of this Q/LOS Handbook.

BUS STOP TYPE

Delay time at bus stops plays a role in travel times along routes, and thus impacts overall average travel speed. FDOT includes a bus stop type adjustment factor, which is used to add 15 to 35 seconds of delay per route for typical and major bus stops, respectively.

BUS FACILITY ANALYSIS

The TCQSM structure for Q/LOS analysis consists of points (e.g., bus stops), route segments, and systems. It does not include a facility analysis. Nevertheless, to maintain consistency, a method of aggregating segment-level bus frequency to facility-level was needed. At the generalized level, a simple average is acceptable. For example, if on a 3-mile facility, four buses serve the first 2 miles and two buses serve the last mile, then using a value of three buses [(4 + 2)/2] is acceptable for a generalized level analysis.

4 Roadway Variables

Florida's Generalized Service Volume Tables are based on the HCM, TCQSM, and Florida roadway, traffic, control (signalization), and multimodal data. The resulting tables are valid in Florida, and FDOT encourages the use of the generalized planning level approach. Recognizing varying characteristics with the state and differing roadway, traffic, control, and multimodal characteristics, the Generalized Service Volume Tables are not adequate for all analysis needs. Chapters 4 through 7 provide a description of input variables used in the development of the Generalized Service Volume Tables. Roadway variables describe the geometric and functional characteristics of a facility.

4.1. Roadway Type

Compatible with the terminology of the HCM, this Q/LOS Handbook is based on three major roadway types:

- Freeways
- Uninterrupted flow highways
- Interrupted flow roadways

Note: when using the Generalized Service Volume Tables, the number of lanes for arterials and other interrupted flow facilities should be determined at major intersections, rather than mid-block.

4.1.1. Freeways

Freeways are multilane, divided highways with at least two lanes for exclusive use of traffic in each direction and full control of ingress and egress.

4.1.2. Highways

Uninterrupted flow highways are roadways with a combination of roadway segments, which have average signalized intersection spacing greater than 2 miles and are not freeways. Because of the significantly different operating characteristics, these types of roadways are frequently also distinguished as two-lane highways and multilane highways.

4.1.3. Arterials

Interrupted flow roadways or arterials are characterized by signals with average signalized intersection spacing less than or equal to 2 miles. In this Q/LOS Handbook, signalized arterials are the predominant type of interrupted flow roadway. They primarily are operated by the state and serve through traffic. Also included in this category are signalized Non-State roadways, but not local streets. As used here, signalized intersections refer to all fixed causes of interruption to the traffic stream and may occasionally include stop signs or other control types.

Arterials are further classified based on posted speed. There are two arterial classes:

- Class I: Arterials with a posted speed of 40 mph or greater
- Class II: Arterials with a posted speed of 35 mph or less

4.2. Area Type

Four broad area type groupings are used in this Q/LOS Handbook, as shown in Figure 4-1:

- Core Urbanized areas (areas with a population of 1,000,000+) and Urbanized areas (other urbanized areas with a population of 50,000+)
- Transitioning areas (transitioning into urbanized areas)
- Urban areas (areas with a population of more than 5,000 not in urbanized areas)
- Rural areas (rural undeveloped areas or developed areas with less than 5,000 population)

Figure 4-1: Area Types



The area types in the Generalized Service Volume Tables correspond well with FDOT's LOS targets; however, there are a few special cases. FDOT District LOS Coordinators should be consulted for applicable boundaries within their districts.

There may be small lengths of roadways (e.g., approximately 6 miles for freeways, 3 miles for nonfreeways) between area types or adjacent to an area type that, from a logical and analytical sense, should be combined into one area type or another.

These situations typically occur with adjacent interchanges or in transitioning areas, but may also occur elsewhere. FDOT districts have the flexibility to adjust the area type boundaries or designate a roadway with a certain area
type under these circumstances.

As Florida's population grows, area types may change for a specific location or roadway in future years. FDOT's district offices (contact information available at <u>http://www.fdot.gov/info/moreDOT/districts/district</u>.<u>shtm</u>) should be consulted if analysts believe different area types are appropriate for a future study period.

4.2.1. Core Urbanized and Urbanized Areas

Core urbanized and urbanized areas are defined as approved boundary, which encompasses the entire Census Urbanized Area, as well as the surrounding geographic area likely to become urbanized within the next 20 years, as agreed on by FDOT, Federal Highway Administration (FHWA), and the Metropolitan/Transportation Planning Organization (MPO/TPO). Core urbanized area types are distinguished by whether the area's population is more or less than 1 million. Currently, the grouping of more than 1 million applies to the MPO areas that include central cities: Fort Lauderdale, Jacksonville, Miami, Orlando, St. Petersburg, Tampa, and West Palm Beach. These are referred to as "core urbanized." The minimum population for an urbanized area is 50,000.

Previously, core urbanized thresholds were developed by applying a different K factor to the urbanized design hourly volume (DHV) thresholds, but after careful consideration, it was noted that additional factors could be applied in the analysis process for a core urbanized area, such as speed and ramp density, and these should be considered. As a result, new DHV, directional design hourly volume (DDHV), and annual average daily traffic (AADT) thresholds were developed for core urbanized areas based on separate analysis from the urbanized thresholds. **The urbanized areas with less than 1 million population are referred to as "other urbanized."**

4.2.2. Transitioning Areas

Transitioning areas are fringe areas that exhibit characteristics between rural and urbanized/urban. Transitioning areas are intended to include areas that, based on their growth characteristics, are anticipated to become urbanized or urban in the next 20 years.

Frequently, the Metropolitan Planning Area is used for the transitioning area adjacent to an FHWA Urbanized Area (Adjusted Census Urbanized Area Boundary). The definition of Metropolitan Planning Area mentions the "contiguous area expected to become urbanized with the 20-year forecast period." It is the contiguous area that should be considered the transitioning area. However, in practice, most MPOs have not delineated those contiguous or transitioning areas, and many of the Metropolitan Planning Areas extend to remote rural areas of counties. When the MPO does not identify these transitioning areas, or areas adjacent to urban (but not urbanized) areas, FDOT districts, in cooperation with local governments, may delineate transitioning areas for LOS purposes.

Keeping the boundaries relatively consistent over time is desirable to achieve understanding by all potential parties. The transitioning boundary should be reviewed and adjusted as a part of the census cycle update, consistent with the setting of the FHWA Urbanized Area boundaries. It is appropriate to review the transitioning boundary in conjunction with a Long-Range Transportation Plan update. The FDOT District LOS Coordinators should be consulted for transitioning boundaries within their districts. It is recommended that boundaries for transitioning areas be based on the location of major roadways or at interchanges. This avoids portions of a freeway changing from transitioning to urbanized or rural between interchanges. It is desirable for an urban street to have the same designation between major roadways and not change mid-block when aligning the boundary with major roads is impractical.

4.2.3. Urban Areas

An urban area has a population between 5,000 and 50,000 and is not within an urbanized area. The boundaries for cities with populations over 5,000 and not within urbanized areas are primarily set by existing city limits and must be agreed upon by FDOT, the local government, and FHWA. However, the 5,000 population threshold is primarily a surrogate for areas that exhibit urban traffic characteristics. When a city has a population of less than 5,000 but the surrounding area has a population of more than 5,000 and the city has an urban character, then it is reasonable to classify it with a population of more than 5,000 in the Generalized Service Volume corresponding to a population of over 5,000. These are Generalized Service Threshold Volume Tables 2, 5 and 8 at the end of this handbook following the Glossary.

Other situations exist in which an area has a population of over 5,000 and yet, the area is more characteristic of a rural developed area. In this situation, it is reasonable to use the "developed areas less than 5,000 population" sections of Generalized Service Threshold Volume Tables 3, 6, and 9 included at the end of this handbook following the Glossary. In both of these situations, FDOT District Planning Offices, after consultation with the Central Office Systems Implementation Office, should determine the appropriate designation to use.

4.2.4. Rural Areas

Rural areas consist of two types:

- Rural undeveloped: areas in which there is no or minimal population or development
- Rural developed: areas consisting of cities and other populated areas with populations of less than 5,000 or along coastal roadways

Generally, the portion for cities or developed areas in Generalized Service Threshold Volume Tables 3, 6, and 9 should be applied to areas with a population between 500 and 5,000 and not immediately adjacent to urbanized, urban, or transitioning areas. This portion of the tables also should be generally applied to coastal roads not in urbanized, urban, or transitioning areas.

4.3. Number of Through Lanes

The number of through lanes is one of the most important variables to analyze a roadway's capacity and LOS. Emphasis is placed on through lanes, or lanes that directly accommodate through traffic. The number includes shared lanes (e.g., through/right), but does not include exclusive turn lanes or two-way left-turn lanes on arterials, auxiliary lanes on freeways, or passing lanes on two-lane highways. Arterials are often described as having an odd number of lanes when two-way left-turn lanes are present. However, for highway capacity and LOS analyses, that is not appropriate. The two-way left-turn lane does not accommodate through vehicles, and the facility is more appropriately characterized as having an even number of lanes with a non-restrictive median.

Usually the total number of through lanes in both directions is used to describe roadways. However, this Q/LOS Handbook bases analyses upon a single peak direction. As an example, an LOS analysis for a six-lane freeway is based on three lanes, using the higher directional traffic volume. Similarly, an LOS analysis for a four-lane urban street would be based on two directional lanes.

A common question when using the Generalized Service Volume Tables is how do we handle odd number lanes along the facility. The Generalized Service Volume Tables contain adjustment factors based on certain characteristics of the facility (i.e., turn lanes, medians, etc.). Any applicable adjustment factors are first applied and then the average service volumes are averaged.

For example, a rural undivided 5-lane arterial facility with exclusive left-turn lanes and without exclusive right-turn lanes will have an adjusted LOS C threshold of 35,388. This is calculated using the Generalized Service Volume Table 3. The LOS C thresholds for an undivided 4 and 6-lane arterial in a rural area is 29,300 and 45,200, respectively. To calculate the 5-lane LOS C threshold, first account for any applicable adjustment factors. For this example, the LOS thresholds must be adjusted by -5% for multilane arterials that have exclusive left-turn lanes and no exclusive right-turn lanes. After this adjustment is applied, the new 4 and 6-lane LOS C thresholds are 27,835 and 42,940, respectively. To obtain the final 5-lane LOS C threshold, the newly adjusted 4 and 6-lane LOS C thresholds, 27,835 and 42,940, are averaged to obtain the 5-lane LOS C threshold of 35,388 to be used in the analysis.

4.3.1. Arterials

An important aspect of this Q/LOS Handbook is the methodology for determining an arterial's number of through lanes. The ultimate result of the LOS analysis is a facility estimation of the LOS, and **it is widely recognized that signalized intersections are the arterial's primary capacity constraint; therefore, it is appropriate to place more emphasis on the intersections' characteristics than the mid-block characteristics.** Generally, mid-block segments have capacities far exceeding those of major intersections, and it is rare for significant delays to occur mid-block. By weighting the effects of intersections more heavily, a more accurate aggregate estimation is possible.

Site-specific characteristics (e.g., intensity and type of land use, driver behavior, speed, etc.) can dramatically affect the viability of add-on/drop-off pairs as through lanes; therefore, each approach should be examined on a caseby-case basis. Analysts are strongly cautioned to review all pertinent characteristics prior to adjusting the number of through lanes used. The reviews should be conducted during peak travel conditions. Analysts are encouraged to consult with their FDOT District LOS Coordinators prior to applying this concept. The following guidelines are offered as a capacity estimating tool only. This process should never be used for the design or redesign of an expanded intersection.

For any capacity estimation to be considered, two conditions should be met:

- The add and drop lanes must each be at least 800 feet in length
- The add-on/drop-off pair combined must be at least 1,760 feet in length

If either of these conditions is not met, then no additional capacity is assumed.

If the add-on/drop-off pair is at least one-third of a mile in length (roughly divided equally between approach and departure and exclusive of tapers and cross-street width, as represented by A+B in **Figure 4-2**), it may be reasonable to consider an additional one-half lane for capacity purposes. For example, in the accompanying diagram, if A = 1,000 feet and B = 1,000 feet, then it would be reasonable to consider that the intersection approach has 2.5 effective through lanes.

With a length of at least one-half mile (roughly divided equally between the add and drop lanes), it may be reasonable to consider the add-on/drop-off pair as adding up to one full through lane.

Figure 4-2: Usable Length



When using the Generalized Service Volume Tables, the number of through lanes on a facility is typically determined by the through and shared through/right lanes at major intersections rather than mid-block. Figure 4-3 shows the mid-block segments with four lanes, with two lanes in each direction. The major intersections each have six lanes, with two through and one shared through/right add-on/drop-off lane with tapers adequate for safe merging.

In this illustration, as in many cases, minor signalized intersections have green times so heavily weighted to the major urban street that they do not cause significant delays to through traffic. When this is the case, it is sometimes acceptable to disregard the number of lanes at these minor intersections; instead, the determination should be based on the lanes at major intersections. So in terms of the LOS, this particular facility has six lanes.



Figure 4-3: Example of Six-Lane Roadway

4.3.2. Highways

For uninterrupted flow highway facilities, the number of lanes is the basic segment or mid-block laneage. For example, a two-lane highway, which is widened to four lanes at major intersections, should be considered a two-lane highway.

4.4. Speed

4.4.1. Posted Speed

The maximum speed at which vehicles are legally allowed to travel over a roadway segment.

4.4.2. Free-Flow Speed

Free-flow speed is the average speed of vehicles not operating under the influence of speed reduction conditions. In general, free-flow is the average speed under low-flow conditions and not influenced by control conditions, such as signalized intersections. The assumption used in this handbook is that the free-flow speed is 5 mph above the posted speed. As an example, if an arterial has a posted speed of 40 mph, the default free-flow speed used is 45 mph; however, if a more accurate free-flow speed is available, it should be used.

4.5. Median Type

4.5.1. Arterials

As used in this document, medians may be classified in one of three ways:

- restrictive median (r)
- non-restrictive median (nr)
- no median (n)

A restrictive median is a raised or grassed area normally at least 10 feet in width separating opposing midblock traffic lanes and includes left-turn lanes.

A non-restrictive median is a painted at-grade area normally at least 10 feet in width separating opposing mid-block traffic lanes, and for arterials, accommodates mid-block left-turning vehicles to exit from through lanes. Continuous two-way left-turn lanes are considered a non-restrictive median under this definition. Situations in which restrictive or non-restrictive medians are less than 10 feet wide are considered as having no median.

FDOT included the median factor to account for lowering mid-block average travel speeds when no median is present. From the aspect of getting left-turning vehicles out of the traffic stream, the difference between a restrictive and a non-restrictive median is relatively inconsequential. Thus, in determining automobile LOS, restrictive and non-restrictive medians are treated the same.

From a pedestrian point of view, there is a significant difference between non-restrictive medians and restrictive medians. Restrictive medians give pedestrians a much safer mid-block crossing. Thus, this type of median is a consideration in determining the pedestrian crossing factor that enters the bus LOS analysis. A non-restrictive median provides no pedestrian refuge.

A pedestrian refuge is an area at least 5 feet but less than 10 feet in width (not a full, raised median) separating opposing mid-block traffic lanes and allowing pedestrians to cross the roadway more safely and comfortably. From a pedestrian point of view, a pedestrian refuge has nearly the same benefit as a restrictive

median. In terms of pedestrian crossing difficulty, the difference between a restrictive median and pedestrian refuge is relatively small; therefore, in determining pedestrian crossing difficulty, the two may be treated the same.

Pedestrian refuges are not included as a distinct category. If an analyst needs to evaluate the effects of a pedestrian refuge, it should be treated as a restricted median for transit analysis, but as no median for automobile analysis.

4.6. Exclusive Turn Lanes

4.6.1. Arterials

EXCLUSIVE LEFT-TURN LANES

The exclusive left-turn lanes are reserved for the exclusive use of left-turning vehicles. The length of these lanes must accommodate turning demand such that left-turn traffic (1) is able to enter the turn lanes behind through queues or (2) can be stored in the turn lane to ensure the through lane traffic is not blocked. When left-turn lanes are not present, a shared lane exists which is included in the number of through lanes.

When analyzing arterials without left-turn lanes, the use of the Generalized Service Volume Tables is discouraged in all but the most basic analyses. If used, the Generalized Service Volume Tables include adjustment factors for the absence of left turn-lanes. To account for the absence of left-turn lanes, adjustment factors provided in the Generalized Service Volume Tables must be manually applied to the service volumes. However, the user is cautioned that research indicates that the true value of the reduction is highly dependent on the distribution of traffic volumes among all the various movements, and a constant reduction factor, as used in the tables is not accurate.

Storage length refers to the total amount of storage available for left-turning vehicles, measured in feet. The default value is 235 feet. For new turn lanes, FDOT Design Standards must be consulted (found at https://www.fdot.gov/design/standardplans/DS.shtm).

EXCLUSIVE RIGHT-TURN LANES

Exclusive right-turn lanes are storage areas designated to exclusively accommodate right-turning vehicles.

The length of these lanes must be able to accommodate turning demand to allow for the free flow of the through movement. The number of pedestrians crossing at these locations should also be considered and accommodated.

4.7. Roadway Lengths

To properly apply the Generalized Service Volume Tables, it is necessary to partition roadways into appropriate lengths for analysis. Setting lengths too short may not adequately capture traffic flow characteristics. Vehicles will not achieve the same average running speed on a segment as over a longer facility length. Short lengths would also be subject to bias caused by signal control delay.

Furthermore, analysis results would not conform to the concept of LOS that is based on the driver perception of the operation of roadways and may not show where the most significant impact of proposed development traffic will occur. Conversely, setting lengths too long may dilute the impact of hot spots by averaging them into other portions that operate better.

FDOT District LOS Coordinators have primary responsibility for the segmentation of the State Highway System (SHS) for LOS purposes. FDOT Central Office may combine smaller segmentation lengths of a facility for statewide reporting and other purposes.

In general, the partitioning of roadways for facility analyses should be based on the following considerations, ranked in order:

- Highway system structure (including facility type, number of lanes, etc.)
- Area type boundaries
- Lengths
- AADTs

At the local level, government agencies frequently make highway capacity and LOS termini at their own jurisdictional boundaries, regardless of the appropriate facility length and termini considerations described above. Jurisdictional boundaries by themselves are usually not appropriate termini for capacity and LOS analyses. Local governments are encouraged to consult with FDOT District LOS Coordinators for applicable segmentation within their jurisdictional boundaries.

4.7.1. Arterials

For an arterial facility analysis, the general recommendation is that the facility be at least two (2) miles in length to use the service measure of average travel speed. Major intersecting arterials frequently serve as logical breaks in segmenting the arterial facility. In downtown areas, the general recommended length is at least one (1) mile.

When evaluating arterial section or facility LOS for planning, the roadway should begin and end at a signalized intersection. The following guidance is provided for some special cases:

- (1) Interchanges along an arterial: At a generalized planning level, it is typically appropriate to make a break at an interchange (highway system structure criterion) that does not include a signalized intersection.
- (2) Boundaries, especially urbanized area boundaries: When a signalized intersection lies just outside the boundary, it is proper to extend an analysis to the next signalized intersection if within 2 miles of a boundary for a conceptual planning analysis. For example, if a signalized intersection lies 1 mile beyond the existing urbanized boundary in a transitioning area, it is appropriate to include that signalized intersection and the 1 mile of transitioning area as part of an urbanized area analysis.

5 Traffic Variables

This chapter provides an overview of key traffic variables used in the development and use of the Generalized Service Volume Tables.

5.1. Volume and Demand

Traffic volume is the most basic of all traffic parameters and is generally defined as the number of vehicles passing a point on a transportation facility during a specified time period. Traffic volumes typically are developed separately from capacity/LOS analyses and provide input to those analyses. Various sources that determine traffic data include:

- FDOT's Florida Traffic Online (FTO) Web Application
- Extrapolation of historical growth trends
- FDOT's travel demand forecasting models
- Institute of Transportation Engineers (ITE) Trip Generation Manual

The sources listed below provide guidance on traffic forecasting and analysis:

- FDOT's Project Traffic Forecasting (PTF) Handbook
- HCM, Sixth Edition
- FDOT's Traffic Analysis Handbook

Volume is the parameter most often used to quantify traffic demand. Traffic demand is the number of vehicles with drivers who desire to traverse a particular highway during a specified time period. While traffic demand expresses a desire, volume typically represents actual measurement.

Misuse of measured volumes often occurs in capacity/LOS analysescausing traffic studies to report the observation and measurement of conditions as they presently exist. Current observations do not reflect constraints in the existing highway system that may prevent vehicles from accessing a desired segment of the system at any given point in time. Observed volumes on congested facilities are more a reflection of capacity constraints than of true demand.

Measured traffic volume cannot theoretically exceed roadway capacity, but traffic demand volume can exceed capacity. An example of a common misinterpretation of these two distinct terms typically occurs while collecting traffic data at an oversaturated intersection. The traffic volume that can physically be processed through a traffic signal is a measure of the capacity (or supply). When traffic volumes approach roadway capacity, the transportation system may experience abnormally long vehicle queues and excess vehicular delay. The length of the vehicle queue upstream of a traffic signal is a more accurate measure of the traffic demand that cannot be processed in the one-hour analysis period.

The impact of bottlenecks, alternative routes, latent demand, and future growth further complicates the relationship between measured traffic volume and traffic demand. If questions arise as to the appropriateness of using measured volumes or demand volumes for capacity and LOS analyses, it is clear demand volumes should be used.

5.2. Annual Average Daily Traffic (AADT)

AADT is the total volume of vehicle traffic on a highway or roadway segment for one year divided by the number of days in the year. Most planning applications require AADT volumes. Determining AADT values is a separate process and distinct from capacity/LOS analyses. FDOT routinely provides AADT values for state roads.

AADT values are easy to confuse with two other traffic count numbers that are used to estimate AADT. The average daily traffic (ADT) is the total traffic volume during a given time period, more than a day and less than a year, divided by the number of days in that time period. ADT is generated from a short-term traffic count and can be used to estimate AADT. Ensuring ADT counts are reflective of the normal average traffic is an important consideration when using them to estimate AADT on the roadways. Traffic taken during a four-day holiday, long weekend, or Saturday night when 50,000 or more football fans gather is not a normal occurrence.

Peak season weekday average daily traffic (PSWADT) is the average weekday traffic during the peak season. PSWADT numbers are normally generated by travel demand forecasting planning models, such as Florida Standard Urban Transportation Model Structure (FSUTMS). Like ADT, they can be converted to AADT by an adjustment factor.

FDOT operates two types of traffic monitoring programs: 1) continuous monitoring at selected locations using permanently installed equipment and 2) coverage counts at many temporary or short term sites using portable equipment. Further information about the traffic monitoring programs can be found in the FDOT PTF Handbook.

There are two count adjustment factors used to calculate AADT. The first, **axle correction factors are used to compensate for an axle counter's tendency to count more vehicles than are actually present.** For example, an axle counter would show a count of two when a four-axle truck runs over the sensor, even though only one vehicle is present. The second, **seasonal adjustment factors have been developed to adjust for the variation in traffic over the course of a year.** The peak season is the 13 consecutive weeks with the highest volumes. The weekly seasonal factors for those weeks will be the lowest, and the factors will be the highest for the weeks with the lowest volumes. The seasonal factor is used as follows:

AADT = (short-term traffic count) x (seasonal factor) x (axle correction factor)

Although, for planning purposes AADT is usually used, actual capacity and LOS analyses are conducted on an hourly or sub-hourly directional basis. All of FDOT's Generalized Service Volume Tables are based on peak hour directional roadway, traffic, control, and multimodal characteristics. FDOT's hourly directional tables may be viewed as the most fundamental of the tables, because the daily tables are created by dividing the peak hour directional values by the directional distribution factor (D) and the planning analysis hour factor (K). Although the determination of AADT is outside the capacity/LOS analyses, the determination of K and D is a fundamental part of capacity/LOS analyses in planning stages because of the need to convert AADT to peak hour directional volumes.

5.3. Planning Analysis Hour Factor (K)

The K factor is the ratio of the traffic volume in the study hour to AADT. Historically, FDOT has used a variety of study hours and K factors depending on the application. Frequently used K factors included the 30th highest volume hour of the year (K30), 100th highest volume hour of the year (K100), highest hourly volume to daily volume (Kp/d), 5–6 p.m. weekday volume to AADT (K5-6pm), average p.m. weekday peak volume to AADT (Kpm), average a.m. peak weekday volume to AADT (Kam), and noon weekday volume to AADT (Knoon). In general, K factors

are used for peak hour traffic analyses, but analyses can also be based on low-volume conditions, such as the analysis of truck travel in early morning hours. Roadway, traffic, and control conditions vary considerably during the day, potentially affecting capacity values and service volume thresholds.

Standard K is the primary planning analysis hour factor used in Florida, and the value is set based on the area type and facility type. The use of Standard K represents a design approach in which the K factor for a roadway is established from the planning phase through the design phase of the project development process. Rather than being a variable, Standard K values are a fixed, cost-effective parameter, much like the use of 12-foot through lanes on major, high-speed roadways. Unless otherwise noted, all references in this Q/LOS Handbook that refer to a study hour or K factor refer to Standard K.

The Standard K factor is used to convert a peak hour volume to an AADT and vice versa. The Standard K factors used in the Generalized Service Volume Tables were obtained through a methodical process to obtain representative Standard K factors. On the freeways in the seven largest urbanized areas in Florida (Fort Lauderdale, Jacksonville, Miami, Orlando, St. Petersburg, Tampa, and West Palm Beach), Standard K represents a peak study period. For all other facilities, Standard K represents a peak hour not within the peak season. Standard K Factors for planning and design analysis are not directly applicable to the Turnpike, other toll roads, and managed lanes. For more information on the K Factors, refer to FDOT's PTF Handbook.

The K factor generally drops as an area becomes more urbanized and high traffic volumes are spread out over longer time periods. If adequate documentation is provided, FDOT would consider deviations from the Standard K table for special facility types.

The recommended Standard K factors can be found in the FDOT PTF Handbook and the analyst must refer to the PTF Handbook for use of appropriate K factors in projects. The K values used in development of the Generalized Service Volume Tables included in this handbook are consistent with the PTF Handbook. They are listed below:

- Urbanized (Core urbanized/Core freeways)
 - Freeways: 0.09 (0.085)
 - Highways: 0.090
 - Arterials: 0.090
- Transitioning
 - Freeways: 0.098 (average of Transitioning to Urbanized Areas and Urban)
 - Highways and arterials: 0.090
- Rural developed and rural undeveloped
 - Freeways: 0.105
 - Highways and arterials: 0.095

Standard K values on freeways in large urbanized areas range from 8.0 to 9.0 percent, while Standard K values on these "core freeways" in large urbanized areas are typically lower in this range. The lower K values signify a peak period, as opposed to a peak hour. The urban core freeway K values in large urbanized areas are available on <u>FDOT FTO Web Application</u> managed by FDOT's Transportation Data and Analytics (TDA) Office.

5.3.1 Multimodal Transportation Districts (MMTD)

The purpose of MMTDs is to encourage desirable transportation environments for all users, including transit passengers, pedestrians, cyclists, and motorists. The designation of such districts recognizes the inherent, integral relationship between transportation, land use, and urban design and the degree to which each of these elements affect the others. Local governments opting to designate an MMTD assign secondary priority to vehicle mobility and primary priority to assuring a safe, comfortable, and attractive pedestrian environment, with convenient connections to transit. FDOT supports local governments that are committed to such efforts. Implementing MMTDs should help foster the use of multiple modes of transportation, leading to a reduction in automobile use while maintaining high mobility characteristics in the area.

The primary way FDOT supports these designated areas is through its LOS targets. FDOT promotes lower acceptable automobile travel speeds for longer durations in the planning, design, and operations of its facilities.

5.4. Directional Distribution Factor (D)

The peak hour D factor is the proportion of an hour's total volume occurring in the higher volume direction.

The preferred approach to obtain D factor data is from the FTO Web Application, which provides a D factor for all state roads. The FTO Web Application reports the average of measured D values around the 200th highest hour from nearby and comparable roadway sites. The statewide minimum acceptable D factor is 0.51 (this is not the default valueand should only be used in an LOS analysis if adequate justification is provided for the specific roadway). The D factor of 0.55 was used in the Generalized Service Volume Tables for all facility and area types. Using such an approach provides statewide consistency and reasonable accuracy in the values indicated and at a minimum cost. Additional guidance and the recommended range of D factors can be found in the FDOT PTF Handbook.

5.5. Peak Hour Factor (PHF)

The peak hour factor (PHF) is the hourly volume divided by the peak 15-minute rate of flow within the peak hour, specifically:

$$PHF = \frac{(Hourly \, Volume)}{4(Peak \, 15 - minute)}$$

The planning-level approach for addressing volume variations within the study hour has been adopted within this handbook. PHF based on area type were used to develop the vehicular service volumes in this Q/LOS Handbook. The PHF associated with each area type is:

- Urbanized areas: 0.95
- Transitioning/urban areas: 0.92
- Rural areas: 0.88

The PHF associated with the area type is consistent with the sixth edition of the HCM. For more information on the PHF, refer to FDOT's PTF Handbook.

5.6. Base Saturation Flow Rate

The HCM uses the term "base saturation flow rate" for interrupted flow roadways and capacity, or base capacity, for uninterrupted flow roadways to describe the maximum steady flow. Base saturation flow rate is the maximum steady flow rate, expressed in pcphpl, at which passenger cars can cross a point on interrupted flow roadways. These are not the same as capacity, as normally used to define how many vehicles a roadway can reasonably accommodate. The base saturation flow rates/capacities for Florida's roadway facilities are:

- Arterials and other interrupted flow facilities: 1,950 pcphpl (assuming 100 percent green time)
- Basic freeway segment (70 mph free flow speed): 2,400 pcphpl
- Uninterrupted flow multilane highway segments (60 mph free flow speed): 2,200 pcphpl
- Uninterrupted flow two-lane highway segments: 1,700 pcphpl

5.7. Heavy Vehicle Percent

The FHWA has a vehicle classification scheme in which vehicles larger than a pickup truck are considered heavy vehicles. This includes vehicles with more than four wheels or a classification group of four or higher. The percentage of these heavy vehicles in a given hour is frequently referred to as a truck factor (T). However, to be more consistent with HCM terminology and to overcome some definitional problems with the common understanding of the meaning of a truck, this Q/LOS Handbook uses the term "heavy vehicle" and makes use of the percent of heavy vehicles in a given hour.

The heavy vehicle percentage varies dramatically by the time of day, day of week, roadway type, and adjacent land uses. Operational characteristics of heavy vehicles also vary dramatically by type of heavy vehicle (e.g., a relatively small delivery truck compared to a fully loaded 18-wheel semi-truck) and whether they are operating on an uncongested freeway or on signalized roadways. The blast effect of heavy vehicles on bicyclists also varies significantly based on the type and speed of heavy vehicles.

5.8. Speed and Capacity Adjustment Factors

The HCM 6th Edition has replaced the local adjustment factor (LAF) with the SAF and CAF. The LAF previously provided an adjustment to capacity to account for driver aggression, hurriedness, and familiarity with the facility.

The SAF is used to adjust the speed of a facility based on a combination of sources, including weather and construction work zone effects. The SAF may also be used to calibrate the estimated free-flow speed for local conditions or other effects that contribute to a reduction in free-flow speed.

The CAF is used to adjust the capacity of a facility for reduced-capacity situations or to match field measurements. The capacity can be reduced to represent situations such as construction and maintenance activities, adverse weather, traffic incidents, and vehicle breakdowns.

The SAF and CAF can be used to adjust for driver familiarity (or unfamiliarity) with the facility. Additionally, these adjustment factors are used to calibrate a roadway to existing conditions. For the Generalized Service Volume Tables analysis, an SAF of 0.975 and a CAF of 0.968 was assumed for all analyses and area types. These values are derived from the HCM 6th Edition.

5.9. Percent Turns from Exclusive Turn Lanes

Percent turns from exclusive turn lanes is the percent of vehicles approaching an intersection served by an exclusive turn lane or lanes. More specifically, the percent left turns is the percentage of vehicles performing a left-turning movement at a signalized intersection, and the percent right turns is the percentage of vehicles performing a right-turning movement at a signalized intersection. Typically, the percent turns from an exclusive lane is the percent of traffic using an exclusive left-turn lane, with traffic predominantly moving straight ahead.

Some of the most complicated calculations within the HCM chapter on signalized intersections deal with accommodating left-turn movements. **The Generalized Service Volume Tables assume that left-turn lanes adequately serve left-turning vehicles.** In other words, the base condition assumes there is no queue spillback from the left-turn lane into the adjacent through lanes. If this assumption cannot be made, results obtained from the planning analysis tools are possibly inaccurate. For these reasons and more, the tables should not be used for intersection design or detailed traffic operations analysis.

The automobile LOS methodology described in this Q/LOS Handbook applies the HCM procedures to through traffic at each signalized intersection. Turning movement adjustments are made internally, based on the user-specified value of percent turns from exclusive lanes. Turning volumes are added to the through volumes to determine the overall service volumes shown in the Generalized Service Volume Tables.

The accuracy of LOS calculations is highly dependent on the percent turns from exclusive turn lanes. Although it is typically of moderate importance, at some key intersections, it may be one of the most significant variables. While FDOT does not routinely suggest acquiring percent turns from exclusive turn lanes, data collection should be considered at key intersections. Furthermore, some FDOT districts may require specific counts. If the percent turns at key intersections are obtained in the field, a value of 10 percent may be assumed for the other intersections, assuming an exclusive left-turn lane and no exclusive right-turn lane. If the percentage of turns from exclusive turn lanes is acquired, the turning movement count should be conducted during the peak hour, as illustrated in **Table 5-1**.

Measured Day	Peak Hour	Signalized Intersection	Total Peak Hour Predominant	Exclusive Lane	% Turns from Exclusive Turn Lanes	
			Approach volume	volume	Α	В
22 Jan		А	884	130	1 / 70/	16 70/
zz-Jan	4-5 PIVI	В	900	150	14.770	10.7%
22 lon	E E DM	А	1,152	150	12 00/	12 00/
23-Jan 5-0 i	D-0 PIVI	В	1,150	150	13.0%	13.0%
24 lon		А	1,102	150	12 60/	1 / 70/
24-Jan	5-6 PIVI	В	1,090	160	13.0%	14.7%
Totolo	otals – A B	А	3,138	430	40 70/	14 60/
IOTAIS		В	3,140	460	13.7%	14.0%

Table 5-1: Calculation of Percent Turns from Exclusive Turn Lanes

SPECIAL TURNING MOVEMENT CASES

There are two special cases when dealing with turns from exclusive lanes. The first is when the predominant movement is a turn movement instead of the straight-ahead movement. The second involves T intersections.

In **Figure 5-1**, the predominant movement is the left-turning movement, and the 550 vehicles turning left should be considered the through movement. The 200 vehicles going straight ahead should be treated as left-turning vehicles with 20 percent left turns [(200/(550 + 200 + 250))] from an exclusive left-turn lane. The 250 vehicles turning right should be treated normally, with 25 percent right turns [(250/(550 + 200 + 250))] from an exclusive right-turn lane.

In **Figure 5-2**, all vehicles are turning from exclusive turn lanes at a T intersection. The 600 vehicles turning right is the predominant movement and should be considered through vehicles. The 400 vehicles turning left should be treated normally, which is to say there are 40 percent left-turns [400/(400 + 600)] from an exclusive left-turn lane.

In **Figure 5-3**, another T intersection is shown, featuring a shared left/through lane in addition to the predominant movement served by the exclusive right lane. Normally, a shared left/through lane does not have the same capacity as a through lane because of the effect of opposing vehicles blocking permitted left turns for the main movement. However, in this case, there is no opposing movement, and the capacity of this shared lane is virtually the same as a typical through lane. In this situation, an analyst should assume one through lane and one shared through lane with 20 percent left turns [(200/(200 + 200 + 600].

Figure 5-1 Predominant Turning Movement







Figure 5-3 Through Movement at a T Intersection with Shared Lanes



6 Control Variables

This chapter provides an overview of each control variable used to generate the Generalized Service Volume Tables.

Control variables refer to roadway or area traffic controls and regulations in effect for a roadway point or segment, including the type, phasing, and timing of traffic signals, stop signs, lane use and turn controls, and other similar measures. In this Q/LOS Handbook, control variables refer to those regularly occurring at signalized intersections, unless otherwise noted. For uninterrupted flow facilities, such as freeways and highways, the LOS can readily be derived from the volume of vehicles and roadway capacity, and control variables are not applicable. For signalized roadways (interrupted flow), however, v/c is not sufficient to determine the LOS, and control variables must be considered. These include:

- Number of signals
- Arrival type
- Cycle length
- Effective green ratio (g/C)

The Generalized Service Volume Tables use default control variables that are representative of typical conditions on Florida roadways. The default control variables (or characteristics) — along with the roadway, traffic, and multimodal variables assumed in the creation of each table — are provided on the back of the Generalized Service Volume Tables.

 Table 6-1 provides an overview of the control variable input requirements within the Generalized Service Volume

 Tables.

	Input Variable	Generalized Service Volume Tables
	Number of Signals	D
	Arrival Type	D
Ъ	Signal Type	D
TRO	Cycle Length (C)	D
CON	Through Effective Green Ratio (g/C)	D
	Exclusive Left Effective Green Ratio	D

Table 6-1: Control Variable Input Requirements

Legend: D Default variables that cannot be altered

The effects that individual variables have on the computational process vary. **Table 6-2** indicates the sensitivity of the control variables on capacity and LOS.

Control Variable	Sensitivity on Service Volumes
Number of Signals	high
Arrival Type	medium
Signal Type	low
Cycle Length (C)	medium
Through Effective Green Ratio (g/C)	high
Exclusive Left Effective Green Ratio	medium

Table 6-2: Sensitivity of Control Variables on Service Volumes

Traffic variables, including AADT, Standard K, and D data, should be obtained from FDOT's FTO, PTF Handbook and field counts. Although turning movement counts at key intersections may be necessary, as discussed previously, FDOT does not recommend the use of travel time studies for LOS planning applications.

Field visits should be conducted to collect traffic and other items needed for analyses. Up-to-date aerial or satellite imagery may be sufficient for most of the data entry items. Signalization information is often available from the applicable traffic operations agency's signal timing plans. The applicable transit agency should be contacted for transit data.

6.1. Number of Signals

The cumulative effect of numerous traffic signals, lack of green time, and lack of effective signal progression often have a detrimental effect on the LOS of arterials. An important feature of FDOT's Generalized Service Volume Tables is the inclusion of the number of signals on the determination of the LOS.

The distance between signalized intersections is required to determine specific service volumes for a roadway. FDOT's Generalized Service Volume Tables use signalized intersections per mile as an input and assume uniform spacing. While this approach may be acceptable for an areawide analysis, precise distances between signalized intersections should be determined when an individual roadway is analyzed at the conceptual planning level.

For analysis purposes, 100 feet between signalized intersections is considered the minimum distance. When the actual distance is less than 100 feet (e.g., side streets with wide medians), it is reasonable to consider these together as one signalized intersection.

Roadway and traffic characteristics often change over time. The number of signals per mile is frequently the most significant change. As development takes place and an area becomes more urbanized, the number of signals per mile is likely to increase. The LOS analysis of future conditions should, therefore, take into account changes in roadway and signalization characteristics.

To avoid double counting when determining the number of signals, only one intersection at the ends of the facility should be counted, as shown in **Figure 6-1**. In general, FDOT recommends including the last intersection within the analysis and ignoring the first, or entry, intersection. This allows the analysis to include the effects of delay, backup, and the LOS from the last intersection for the facility under study.

Figure 6-1: Total Number of Signals



For example, in southeast Florida, principal arterials are often spaced 1 mile apart, with other signalized intersections in between. In this situation, only one of the signalized intersections at the ends of the roadway, plus the signals in between, should be counted when determining the number of signals per mile. In general, the last signalized intersection in the peak flow direction would be counted, ignoring the first signalized intersection.

As discussed previously, the arterial should begin and end at a signalized intersection. In unusual situations when this assumption is not applicable (e.g., lane drops, ramp junctions, etc.), the following guidance is provided:

For the Generalized Service Volume Tables, do not count the unsignalized terminus as a signalized intersection.

In general, only fixed, periodic interruptions should be considered in determining the number of signals. Only one intersection at the ends of the facility should be counted. Draw bridges, at-grade railroad crossings, school zones, pedestrian crossings, and median openings should not be counted. Depending on the site-specific conditions or analysis desired, there may be exceptions to this general guidance.

When using the Generalized Service Volume Tables, an intersection with a stop sign for the through movement is considered a signalized intersection for a state-signalized arterial. When analyzing a Non-State signalized roadway, the roadway must have at least one signalized intersection.

6.2. Arrival Type

Arrival type is a general categorization of the quality of signal progression. The HCM defines six arrival types, with Type 1 representing the worst progression quality and Type 6 representing the best. Uncoordinated operation, or random arrivals, is represented by Type 3 and is appropriate for actuated signals. Arrival Type 4 is FDOT's default for coordinated signal systems. A more favorable progression (Types 5 or 6) may be appropriate when progression design strongly favors the peak direction of travel, and all signals are coordinated for the length of the facility. One-way facilities tend to have better quality progression than two-way facilities. A higher level of progression may also be appropriate around freeway interchanges, where signals are typically highly coordinated. The arrival type may vary significantly from one signal to the next, even in coordinated signal systems. Actuated-coordinated signals have varying green times, with breaks between groups of coordinated signals.

The assumption of very good progression in one direction does not imply efficient progression in the other direction. Even with less traffic volume, off-peak direction speeds could be lower, if favorable progression has been established for the peak direction only.

6.3. Signal Type

The signal type indicates the degree to which a traffic signal's cycle length, phase plan, and phase times are preset or actuated. The three main types are:

- Actuated
- Actuated-coordinated
- Pretimed

It should be noted that modern traffic signals can handle multiple settings and can vary by time of day. Consequently, a traffic signal's operation (actuated, coordinated-actuated, or pretimed) can change by the time of day to best meet traffic demands.

6.3.1. Actuated

Actuated, or fully actuated signals, use vehicle detection for all signal phases on the main and side street approaches. Each phase is subject to a minimum and maximum green time, and some phases may be skipped if there is no demand for the phase. The length of the green time observed in the field generally depends on the amount of vehicular demand for the phase. If there is little demand, then a relatively short green time will be allocated to the phase. If there is significant demand, a relatively long green time will be allocated, subject to the maximum green time for that phase. The minimum and maximum green times for each phase can be easily changed by entering new values into the traffic signal controller.

Because phases can be skipped, and the amount of green time for each phase generally depends on demand, the cycle length will often vary substantially from cycle to cycle. The exception occurs during periods of heavy vehicular demand, when all phases consistently reach their maximum values, making it seem as if the cycle length is fixed. Actuated signal operations are most frequently used when the signalized intersection is isolated, or when there is a desire to minimize delay without concern for progression.

6.3.2. Actuated-Coordinated

A subset of actuated control is referred to as actuated-coordinated control. In this type of signal operation, the cycle length is typically fixed, while the amount of green time for the main street through phase varies. It consists of a minimum amount of green time plus any unused time from the minor phases. Holding the main street green in this manner at all of the signals along a facility allows platoons of vehicles to move relatively unimpeded along the main street with decent progression. Actuated-coordinated signal operations are typically used in Florida's developed areas, especially during peak travel times. This type of operation typically offers the best balance of capacity and progression for the main street through movement.

6.3.3. Pretimed

Pretimed signals use a preset sequence of phase times in a repetitive order and make no use of vehicle detection. Each phase is green for a fixed period of time, irrespective of vehicular demand, and none of

the phases can be skipped. Thus, the cycle length is fixed. This type of signal operation is most frequently used in downtown areas with high signal density, or when the desire is to maximize progression without extensive concern about maximizing capacity for the through movement.

6.4. Cycle Length (C)

Cycle length (C) is the total time for a signal to complete a sequence of signal indications for all traffic movements. The cycle lengths used in the development of the arterial service volume tables were based on representative cycle lengths for different functional classifications of arterials and for different area types. Cycle lengths are typically highest on principal arterials in urbanized areas, where the primary purpose of the facility is to provide a high level of mobility to through movements on the mainline and where roadways are typically at or near capacity during peak periods. Lower cycle lengths are typically used for the less saturated conditions typical of rural areas to provide better access and service to all directions. The cycle lengths used to develop the Generalized Service Volume Tables are provided on the back of each table.

6.5. Effective Green Ratio (g/C)

One of the most significant variables used in calculating the highway capacity and LOS on a signalized roadway is the through movement's effective green time (g) to signal cycle length ratio (g/C). It is the amount of time allocated for the through movement (typically calculated as the green plus yellow plus all-red indication times less the lost time) divided by C. Along with the number of through lanes, it is usually one of the two most important factors for determining the capacity of a roadway's through movement at any given intersection and for the roadway as a whole. Despite this, for generalized analyses, g/C is often ignored, because:

- g/C ratio typically varies from intersection to intersection along an arterial
- g/C ratio typically varies by time of day

Ignoring g/C undermines any arterial LOS analysis at a generalized planning level. This Handbook includes guidance to provide default g/Cs for generalized planning arterial analyses.

A major simplifying assumption that is essential to the development of the Generalized Service Volume Tables is the selection of one g/C for all intersections on an arterial. The g/C ratio of 0.44 was used for arterial analysis for all area types. FDOT has determined that for generalized planning analyses, the weighted average g/C ratio yields the closest results to actual conditions. The weighted g/C ratio of an arterial is the average of the critical intersection through movement g/C ratio and the average of all the other intersections through movement g/C ratio of 0.40, then the weighted average g/C ratio for urban street is 0.45 (Refer to HCM for additional information). Essentially, the worst intersection is given equal weight to all the other intersections combined.

As an example, for the through movement phase, G is the green displayed time, Y the yellow displayed time (typically 3 or 4 seconds), R the all-red indication (typically 1 or 2 seconds), and C the cycle length. The most representative situation in Florida is for cycles to consist of four phases and 12 indications: one phase each to accommodate the main road through movement, the side road left movement, the side road through movement, and the main road left movement, with G, Y, and R indications for each of the four phases. The effective green time, which includes the effects of vehicular startup and clearance lost times is g.

Chapter 6 - Control Variables

FDOT's preferred approach for g/C determination for current year analyses is to use the actual signal timing plan from the traffic operations agency for the p.m. peak hour (typically 5–6 p.m.) for each signalized intersection. This is a consistent and cost-effective approach that provides reasonable accuracy. If the signal is actuated, (G + 4)/Cshould be used for the through movement. This assumes the typical Y + R time of 4 seconds as additional time allocated to the through movement as a result of unused time from the other movements. If the signal is pretimed, the g/C for the through movement should be used.

For consistency and ease of review, FDOT recommends using signal timing plans from the applicable traffic operations agency.

Analysts should be aware that signal timing plans come in a variety of forms, use many notations, and are not designed to directly address the determination of g/C. It may be necessary to coordinate with the operating agency directly to interpret the output values.

Analysts should calculate and input g/C for the through movement at all intersections. The g/C for left turning movements need only be collected at major intersections. A 10 percent value can be assumed as the left g/C for other intersections.

In previous FDOT guidance, FDOT offered two other methods for determining g/C:

- actual signal timings from the traffic operations agency
- field studies

Both approaches have some merit; however, after FDOT analyzed and tested both approaches, the preferred approach of using signal timing plans in general offers the best combination of consistency, accuracy, and cost-effectiveness. The use of field studies for g/C is discouraged, unless an early agreement by the affected parties is reached. The maximum acceptable facility through movement g/C ratios during the peak hour typically should not exceed:

- State principal arterials
 - Current year: 0.50
 - Long term (≥ 10 years out): 0.47
- Other roadways: 0.44

Under most circumstances, arterial facilities are 1.5–5.0 miles in length and include principal arterials as terminus points. The g/C value of 0.50 approximates FDOT's maximum allowable arterial capacity volumes of 1,000 vehicles per hour per lane (vphpl) and 950 vphpl in large urbanized areas and other urbanized areas, respectively.

7 Multimodal Variables

This chapter provides an overview of each multimodal variable used within Generalized Service Volume Tables to allow the user to recognize these variations and analyze multimodal LOS on specific roadways. Where applicable, generally acceptable ranges are provided. Multimodal variables describe the various geometric and demand characteristics that are needed to determine pedestrian, bicycle, and bus LOS. As with the control variables, multimodal variables are only applicable for arterial analyses:

- Paved shoulder/bicycle lane
- Outside lane width
- Pavement condition
- Sidewalk
- Sidewalk/roadway separation
- Sidewalk protective barrier
- Bus frequency
- Bus stop amenities
- Bus stop type
- Passenger loads

 Table 7-1 provides an overview of the multimodal variable input requirements within the Generalized Service

 Volume Tables.

Table 7-1: Multimodal Variable Input Requirements

Input Variable	Generalized Service Volume Tables
Paved Shoulder/Bicycle Lane	R
Outside Lane Width	D
Pavement Condition	D
Sidewalk	R
Sidewalk/Roadway Separation	D
Sidewalk/Roadway Protective Barrier	D
Bus Frequency	R
Bus Stop Amenities	D
Bus Stop Type	D
Passenger Loads	D

Legend: R Required table input

D Default cannot be altered

The effects that individual variables have on the computational process vary. **Table 7-2** indicates the sensitivity of the multimodal variables on the capacity and LOS.

Control Variable	Sensitivity on Service Volumes
Paved Shoulder/Bicycle Lane	high
Outside Lane Width	low
Pavement Condition	low
Sidewalk	high
Sidewalk/Roadway Separation	medium
Sidewalk/Roadway Protective Barrier	medium
Bus Frequency	high
Bus Stop Amenities	low
Bus Stop Type	low
Passenger Loads	low

Table 7-2: Sensitivity of Multimodal Variables on Service Volumes

7.1. Paved Shoulder/Bicycle Lane

Within this Q/LOS Handbook, a bicycle lane is a designated or undesignated (paved shoulder) portion of a roadway for bicycles adjacent to vehicle lanes. Painted lines separate paved shoulders/bicycle lanes from vehicle lanes.

For planning purposes, a designated bicycle lane is usually 4 to 5 feet in width and has a bicycle logo. An undesignated bicycle lane is usually 4 feet in width and does not have a bicycle logo. To be considered a paved shoulder/bicycle lane, at least 3 feet of paved shoulder must exist outside the painted line. Facilities with striped shoulders between 1 and 3 feet should be considered as having wide outside lane widths.

7.2. Outside Lane Width

Within this Q/LOS Handbook, **the outside lane width is the width, in feet, of a roadway's outside vehicle through lane, not including the gutter.** This factor is usually important in the determination of a roadway's BLOS. The majority of the SHS lane widths are 12 feet. Many local roads and some state highways have 14-foot outside lanes; these are sometimes referred to as wide curb lanes. Many other local roads and some state facilities have outside lane widths less than 12 feet.

These dimensions as shown in **Figure 7-1**, are for planning analyses only:

- Wide: greater than or equal to 13.5 feet.
- Typical: greater than or equal to 11 feet and less than 13.5 feet.
- Narrow: less than 11 feet.

Figure 7-1: Outside Lane Width



7.3. Pavement Condition

Pavement condition for BLOS analysis is a general classification of the roadway surface where bicycling usually occurs, not necessarily that drivers of vehicles experience. Three general classifications are used: desirable, typical, and undesirable. These general classifications are used in lieu of detailed pavement surface grades found in the operational model on which this planning technique is based.

- Desirable pavement condition is new or recently resurfaced pavement. The pavement still maintains a dark black color, is free of cracks, and rides smoothly.
- Typical pavement condition is the most common type of pavement condition of Florida's roadways and is used in the Generalized Service Volume Tables. Generally, the pavement has a light gray color, the surface appears worn, and may have some cracks; however, the ride for the bicyclist is smooth.
- Undesirable pavement condition consists of pavement with noticeable cracks, broken pavement, or ruts. There may be existing or partially filled potholes, or drainage grates hazardous to bicycles. When the bicycle riding surface contains loose dirt, gravel, or debris, even if the roadway surface is typical or desirable, then it would be considered undesirable.

In general, FDOT recommends the use of a typical pavement condition for most analyses, especially those involving future years.

For analysts familiar with FHWA's PAVECON factors, "desirable" would equate to a 4.5 or 5.0 rating, "typical" would equate to a 3.0 to 4.0 rating, and "undesirable" would equate to 2.5 or less.

7.4. Sidewalk

Within this Q/LOS Handbook, a sidewalk is a paved walkway for pedestrians at the side of a roadway, typically 5 feet in width. Paved roadway shoulders are not considered sidewalks. Because LOS analyses are directional, the existence of a sidewalk is based on the directional side of the arterial being analyzed.

SIDEWALK/ROADWAY SEPARATION

Sidewalk/roadway separation is the lateral distance in feet from the outside edge of pavement to the inside edge of the sidewalk. Within this Q/LOS Handbook, sidewalk/roadway separation is classified in three ways, as shown in **Figure 7-2**:

- Adjacent: less than or equal to 3.0 feet
- Typical: greater than 3.0 feet and less than or equal to 8.0 feet
- Wide: greater than 8.0 feet

In general, pedestrians tend to walk toward the outer half of sidewalks, away from traffic.



Figure 7-2: Sidewalk/Roadway Separation

In downtown environments, sidewalks frequently extend at least 10-12 feet from the curb. When there are no tree plantings or other sidewalk/roadway protective barriers, sidewalks should be classified as adjacent. When there are tree plantings or some other barrier between where people walk and the outside edge of the travel lane, sidewalks are assumed to have typical separation.

When on-street parking and sidewalks both exist, the sidewalk/roadway separation should be considered wide, regardless of how close the sidewalk is to the edge of the pavement. Essentially, on-street parking adds approximately 8 additional feet between pedestrians and vehicles.

7.5. Sidewalk Protective Barrier

In addition to sidewalk width, this Q/LOS Handbook adds an overall sidewalk protective barrier factor to include the added benefits of trees, on-street parking, or other barriers.

7.6. Bus Frequency

Bus frequency, also known as headway, refers to the number of scheduled, fixed-route buses that have a potential to stop on a given roadway segment in one direction of flow in a one-hour time period. Express buses with no potential of stopping along a roadway are not included.

7.7. Bus Stop Amenities

The bus stop is often the first component of any transit system a passenger will encounter, and available amenities for comfort or safety can greatly influence the perceived QOS along a route. Rather than quantify all potential bus stop components, this Q/LOS Handbook creates four categories of bus stop amenities: excellent, good, fair, and poor. Having shelter from the weather and a place to sit is the most desirable condition at any bus stop, regardless of type, and is considered an excellent condition. A shelter without a bench represents a good condition, because rain, wind, and sun could otherwise deter choice riders. A stop with only a bench is less desirable than a stop with only a shelter and is considered a fair condition. A stop with no bench and no shelter is considered a poor condition. Because excellent bus stops may improve a user's perception of the system, the bus stop amenity factor is used to increase the adjusted bus frequency value. Bus stops with no amenities are uninviting and discourage use, and the variable is, therefore, used to decrease the adjusted bus frequency value, as shown in Table 7-3.

Bus Stop Amenities	Adjustment Factor
Excellent	1.1
Good	1.0
Fair	1.0
Poor	0.9

Table 7-3: Bus Stop Amenity Factors

7.8. Bus Stop Type

Bus travel speed depends not only on distances and congestion along the route, but also the number of stops and the dwell time at each stop. Typical bus stops delay a bus for around 15 seconds, while major stations with numerous boardings and alightings can add around 35 seconds of delay.

7.9. Passenger Loads

Just as traffic congestion contributes to the degradation of the LOS, crowding on buses can affect the QOS. Because overcrowded buses may reduce the overall desirability of a route, a passenger load factor is used to modify the adjusted bus frequency value, as shown in **Table 7-4**.

Table 7-4: Passenger Load Factor

Passenger Load Factor	Adjustment Factor
< 30%	1.05
< 70%	1.00
≤ 100%	0.95
> 100%	0.85

8 Future Year Analyses

Traffic and development conditions change on roadways over time. This raises questions about what input values, analysis tools, and LOS targets should be used for capacity and LOS analyses in future years. Analysis years and planning horizons vary appreciably in transportation planning. To help with understanding and for simplification in this text, "long term" means 10 or more years from the current year, and "short term" means less than 10 years from the current year. However, for a specific application, FDOT district LOS coordinators should be consulted for more detailed guidance.

For future year analyses, it is important to consider changes in the appropriate roadway, traffic volumes, land use, signal control, and multimodal characteristics. For example, under existing conditions in a transitioning area, signalization may be very infrequent; however, as development occurs, more signalized intersections can be anticipated and should be accounted for in future year capacity and LOS analyses. The traffic and control variables relevant to this handbook are discussed in the following sections. Refer to the FDOT PTF Handbook and the Traffic Analysis Handbook for further guidance on future year traffic development and analyses.

8.1. Change in Traffic Variables

8.1.1. AADT

Historical growth trends and the state's travel demand forecasting models are typically used for long-term traffic projections. Analysts and reviewers of capacity and LOS analyses need to agree on what future AADT values to use. Additional information can be found in the PTF Handbook.

For site impact analyses, volumes are frequently presented in terms of trips generated by the site rather than roadway-specific AADT, K, and D values. Institute of Transportation Engineer's (ITE's) Trip Generation Handbook is typically used for trip generation for site impact analyses; however, FDOT should be consulted about supplemental material. In all cases, care should be given to ensure final values are compatible with statewide Standard K and D factors.

8.1.2. Planning Analysis Hour Factor (K)

As areas become more developed, measured K values often drop, primarily for two reasons. The first is that more urban situations typically are not subject to highly volatile volumes, such as holiday traffic in rural areas. Generally, more developed areas are subject to frequent recurring volumes, such as weekday commuter traffic. The second is that as congestion develops, the spreading of the peak travel hour traffic also occurs. Refer to FDOT PTF Handbook for Standard K values used by facility type.

For future year generalized planning analyses, the Standard K values for the assumed area and facility types on the backs of FDOT's Generalized Service Volume Tables are appropriate. In the longer term, it may be necessary to determine if the area is projected to transition into a different area type over the analysis period.

8.1.3. Directional Distribution Factor (D)

For future year generalized planning analyses performed in this handbook, the D factor value for all area

and facility types is 0.55. If a site-specific analysis is conducted in the short term, FDOT's preferred approach is to use the FDOT's 200th Highest Hour Traffic Count Report from the FTO Web Application. In the longer term, some lowering of the factor may be appropriate. The analyst should refer to the D factors and their acceptable range in FDOT PTF Handbook.

8.2. Change in Control Variables

Making traffic and roadway projections into the future is a well-accepted practice for generalized planning analysis. For reasonable generalized planning analysis of signalized roadways, control variables must be addressed in the short and long terms. Typically, the two most important control variables are the through movement g/C and signal density.

8.2.1 g/C

Determining current and future g/Cs for a roadway is complicated, and judgments must be made. In the short and long terms:

- For Class II arterials, using the existing g/Cs is appropriate
- For Class I arterials not subject to significant development pressure, using the existing g/Cs is appropriate
- For Class I arterials incurring significant new development pressure, it is appropriate to lower through movement g/Cs
- For new individual signals, through movement g/Cs will vary greatly; however, for planning purposes, none should be assumed to be higher than 0.55

Within the HCS, an acceptable method to estimate future g/C ratios is by conducting intersection capacity analyses. The HCS will determine the required g/C ratios to progress through traffic movements on the major street, while simultaneously minimizing the delay to the minor street approaches.

8.2.2 Signal Density

As areas grow in population, additional traffic signals are frequently installed. Usually, these new signals do not significantly affect the capacity of roadways, unless they are in a previously undeveloped area or are so closely spaced that queue spillback occurs. They can play a major role in the determination of the LOS if stops occur more frequently and average travel speeds drop.

In short- and long-term analyses, it is appropriate to consider the probability of new traffic signals, especially based on proposed new developments. In the absence of specific development plans or intersecting traffic volume crossproduct signalization criteria, general guidance should be used in developed areas.

In the short term:

- For Class II arterials, using the existing signalized intersection locations is appropriate
- For Class I arterials not subject to significant development pressure, using the existing signalized intersection locations is appropriate
- For Class I arterials incurring significant new development pressure, one additional signalized intersection per mile may be assumed

In the long term:

- For Class II arterials, one additional signalized intersection per mile may be assumed
- For Class I in small towns, one additional signalized intersection per mile may be assumed

Because of the wide variety of circumstances along generally uninterrupted flow highways in rural areas, no specific guidance can be given on future signal locations. However, for capacity and LOS purposes, the possibility of new signalized intersections should be considered. Because of the importance of signal density on the LOS on state roadways, for site impact applications, the number of new signals should be reviewed and approved by the FDOT district prior to use in an analysis.

Typically, other roadway, traffic, control, and multimodal variables do not have as large of an effect on the capacity and LOS as the ones addressed above. If some of these other inputs (e.g., turning movement percentages) were determined in a current year analysis, they can usually be applied to future year analysis. If these other variables were not determined for a current year analysis, the statewide default values on the backs of the Generalized Service Volume Tables may be assumed.

9 Maximum Capacity Volumes

The use of highway capacity and LOS analysis, whether applied appropriately or not, has resulted in projected traffic volumes beyond normal capacity ranges found on Florida facilities. There are multiple reasons for this, but to aid analysts and reviewers on what capacity values will normally be acceptable, FDOT has adopted a set of general guidelines. The values provided below are based on site-specific freeway studies and counts, as well as arterial maximum acceptable g/C ratios.

9.1. Arterials

For arterials, the maximum generally acceptable per-lane approach volumes are:

- Large urbanized: 1,000 vehicles per hour per lane (vphpl)
- Other urbanized: 950 vphpl
- Transitioning: 920 vphpl
- Urban: 920 vphpl
- Rural: 850 vphpl

The Maximum volumes may vary due to widely varying g/C, turning movements at intersections, and the segmentation of roadways. The maximum volumes represent a weighted g/C of approximately 0.50, which is the average of the critical g/C and the average of all other g/Cs along an urban street facility. Typically, there will be at least one principal arterial intersecting an urban street being analyzed. Such intersections are usually the critical intersections (hot spots) for an arterial analysis, and g/C ratios for the through movements are in the range of about 0.40. Although these intersections are frequently flared out to achieve greater capacity, the through movement g/C ratios cannot increase appreciably if all intersection movements are included. Therefore, the use of a 0.50 g/C ratio for determining the capacity of an urban street should represent the upper bounds of what can be reasonably expected.

Arterial facility analyses typically involve intersecting principal arterials, but section analyses may not have intersecting principal arterials. Under these circumstances, urban street through movements during peak travel hours may feature g/C ratios in the 0.50 to 0.60 range. Such values may be appropriate for segment or section analyses; however, the use of such high g/C ratios is not normally acceptable for a facility analysis and may represent an inappropriate segmentation of roadways.

Another situation in which g/C ratios may be above 0.50 is in the outlying parts of urbanized areas or in transitioning areas for both arterials and generally uninterrupted flow highways. In these areas, signals have typically been recently installed, and side traffic has not yet reached the high levels that it will in future years. Therefore, although current maximum volumes per lane may be higher than those shown above, in the future, such values will likely not be sustained and should be avoided in the arterial analysis.

9.2. Freeways

For freeway facilities and sections, the maximum volumes at 70 mph free flow speed are 2,400 pcphpl as per HCM.

Freeway operational measures such as ramp metering may result in higher volumes.

In general, the implementation of ramp metering could have a 5 percent or less improvement on capacity.

9.3. Highways

For highway segments (generally uninterrupted flow highways), the maximum per-lane approach volumes as per HCM are:

- Two-lane
 - Developed: 1,700 pcphpl
 - Undeveloped: 1,700 pcphpl
- Multilane
 - Developed (55 mph free flow speed): 2,100 pcphpl
 - Undeveloped (60 mph free flow speed): 2,200 pcphpl

10 Florida's LOS Policy

REQUIREMENTS FOR LOS TARGETS FOR THE STATE HIGHWAY SYSTEM

It is FDOT's intent to plan, design, and operate the SHS at an acceptable LOS for the traveling public. The LOS targets are consistent with FDOT's Policy on Level of Service Targets for the SHS, <u>Topic No. 000-525-006</u>. The policy outlines the automobile mode LOS target for urbanized areas and outside urbanized areas. The automobile mode LOS targets for the SHS during peak travel hours are D in urbanized areas and C outside urbanized areas. FDOT shall work with local governments to establish appropriate LOS targets for multimodal mobility and system design. The targets shall be responsive to all users, for context, roadway function, network design, and user safety.

11 Generalized Planning Analysis

11.1. Introduction

FDOT's Generalized Service Volume Tables found at the end of this Q/LOS Handbook are the primary analysis tool in conducting this type of planning analysis. Although considered a good generalized planning tool, the Generalized Service Volume Tables are not detailed enough for project development and environment (PD&E) traffic analysis, final design, or operational analysis work, and should not be used for those purposes. In addition, the Generalized Service Volume Tables cannot be relied upon when approaching LOS E and LOS F thresholds, because of operational fluctuations at the thresholds. More detailed analysis should be performed in these situations.

Specific applications of the Generalized Service Volume Tables include:

- Generalized comprehensive plan amendment analyses
- Statewide highway system deficiencies and needs
- Statewide mobility performance measure reporting
- Areawide baseline capacity (e.g., MPO boundaries) and service volume values for travel demand forecasting models
- Areawide influence areas (e.g., impact areas) for major developments
- Future year analyses (e.g., SIS Needs Plans, MPO LRTPs which have a 10 to 25-year planning horizon)
- Baseline capacity and service volumes for concurrency management systems

Generalized Service Volume Tables must be appropriately applied using the right area type and facility type designations and interpreted selecting the right values from the tables. The adjustment factors must be applied, as applicable.

It is quite possible that no single roadway has the exact values for all the roadway, traffic volumes, land use, signal control, and multimodal variables used in the Generalized Service Volume Tables. The tables must be applied with care to roadway facilities and in the determination of the LOS grade.

The automobile, bicycle, and pedestrian parts of the Generalized Service Volume Tables were developed based on the definitions and methodology of the HCM. Nationally the TCQSM is the comparable document to the HCM for bus analyses.

FDOT's Generalized Service Volume Tables consist of five area types grouped into three tables:

- Urbanized areas
- Areas transitioning into urbanized/urban areas, or cities with population of more than 5,000 not in urbanized areas
- Rural undeveloped areas, or cities and developed areas with population of less than 5,000

Most planning applications begin with AADT volumes given as an input, or end with AADT as a calculated output. Therefore, the generalized daily service volumes shown in Tables 1 through 3 depict the AADT based on a standard peak hour. Some local and regional entities have adopted two-direction peak hour standards.

Chapter 11 - Generalized Planning Analysis

Tables 4 through 6 provide generalized peak hour two-way service volumes. Generalized peak hour directional volumes (Tables 7 through 9) are provided, because traffic engineering analyses are conducted on an hourly directional basis. These hourly directional tables may be viewed as the most fundamental of the tables, because the two-way tables are simply the peak hour directional values divided by D, and the daily tables are simply the peak hour directors.

All three sets of tables are internally consistent. All of the volumes within the tables are based on the Standard K factors. The urban/transitioning freeways are based on the average of urbanized and rural Standard K factors. The PHFs of 0.95, 0.92, and 0.88 were used in the creation of the urbanized, transitioning/urban, and rural tables, respectively. The 200th highest hour for the directional distribution variable is approximately equivalent to the typical peak hour of a day during a peak season in a developed area. Again, it is stressed that the daily, peak hour two-way, and peak hour directional tables are internally consistent and based on the same time period and directional flow of traffic.

The input values used to generate the Generalized Service Volume Tables can be found on the backs of Tables 1 through 9 and yield the results on the fronts of the Tables.

The Generalized Service Volume Tables present maximum service volumes, or the highest numbers of vehicles, for a given LOS. Any number greater than the value shown for a roadway with a given number of lanes would drop the LOS to the next letter grade.

The Generalized Service Volume Tables should not be referred to as capacity tables. In general, the values shown are the maximum service volumes for a given LOS based on roadway, traffic, control, and multimodal conditions during the peak hour in the peak travel direction. Whereas the maximum service volume deals with the highest number of vehicles for a given LOS, capacity deals with the maximum number of vehicles or persons that can pass a point during a specified time period under prevailing roadway, traffic, and control conditions. Many of the LOS E service volumes in the hourly directional tables also represent the capacity of the roadway, but in general, most of the values do not reflect a roadway's capacity.

A clear case of not representing capacity values is the daily tables. Roadway capacities for the day far exceed the volumes shown in the daily tables. All roadways are underutilized in the early morning hours and many heavily congested roads will have volumes higher than the highest volumes shown in the daily tables, because traffic is backed up for more than a one-hour time period.

Another case of not representing capacity is the arterial LOS E service volumes. **The primary criterion for the LOS on arterials is the average travel speed, not the capacity of the roadway.** The average travel speed along arterials is made of many control variables (e.g., progression, cycle length), not just the capacity (i.e., v/c ratios) of signalized intersections. Only in the special case of when the capacity of signalized intersections controls how many vehicles can pass through the intersections does capacity essentially dictate the lowest acceptable average travel speeds along arterials.

FDOT's Generalized Service Volume Tables are:

- Annual Average Daily Service Volume Tables
 - Table 1: urbanized areas
 - Table 2: transitioning into urbanized areas or urban areas

- Table 3: rural undeveloped or rural developed areas
- Peak hour two-way service volume
 - Table 4: urbanized areas
 - Table 5: transitioning into urbanized areas or urban areas
 - Table 6: rural undeveloped or rural developed areas
- Peak hour directional service volume tables
 - Table 7: urbanized areas
 - Table 8: transitioning into urbanized areas or urban areas
 - Table 9: rural undeveloped or rural developed areas

11.2. Special Cases

The volumes in the Generalized Service Volume Tables should be considered as average volumes over the facility under analysis.

For example: If a 4-mile facility has AADT counts of:

- Segment 1 23,000
- Segment 2 22,000
- Segment 3 25,000
- Segment 4 23,000 and
- Segment 5 27,000

FDOT recommends the use of the average value 24,000 for comparison to the tables to determine the LOS.

The use of the average volume works reasonably well, unless there is one segment that has a widely disparate value, in which case a median value may be more appropriate.

11.2.1. Mid-Block Considerations

In general, Q/LOS analyses for interrupted flow facilities primarily focus on signalized intersections. The majority of motorist aggravation is generally attributable to delay, which primarily occurs at signalized intersections on arterials. Therefore, when using the Generalized Service Volume Tables, the number of lanes for arterials and other interrupted flow facilities should be determined at major intersections rather than mid-block.

Travelers place a greater emphasis on mid-block considerations while traveling on uninterrupted flow facilities and non-automobile modes. For example, on two-lane highways in rural undeveloped areas, the LOS is largely determined by the ability to pass other vehicles. For freeways, most travelers are concerned about the operation of the whole facility and not the operation of particular interchanges. For bicycle and pedestrian movements, the BLOS and PLOS models are calibrated for mid-block conditions. For bus LOS, the emphasis is on the ability to travel by bus over the length of facility, with less importance placed on individual intersections. Therefore, in general, the number of lanes for these situations reflect mid-block considerations.

11.2.2. Non-State Signalized Roadways Adjustment

The primary purpose of this Q/LOS Handbook is to compute the LOS for state facilities. However, the Generalized Service Volume Tables are structured and are reasonably well-suited to local governments that desire to use them to evaluate roads under local jurisdiction. A feature of the urbanized and transitioning/urban Generalized Service Volume Tables is that Non-State roadways are addressed. The only types of roadways not addressed in the tables are unsignalized local streets and unpaved roads.

The mere fact that roadways are operated and maintained by different governmental entities has no effect on the capacity or LOS of the roadways. However, in general, Non-State roadways have lower capacities and service volumes than state facilities, because they have lower green times at signalized intersections. The Generalized Service Volume Tables contain a 10 percent adjustment factor for Non-State roadways.

The HCM LOS criteria address arterials rather than collectors or local streets. FDOT considers it appropriate for local governments to decide how to analyze collectors.

Uninterrupted flow facilities are analyzed the same, regardless of whether they are state facilities or not.

11.2.3. Variations in Levels of Service

Higher Q/LOS for the automobile, bicycle, and pedestrian modes may not be achieved, even with extremely low traffic volumes, given the default values used in the Generalized Service Volume Tables. In the case of automobiles, the higher Q/LOS cannot be achieved primarily because the control characteristics simply will not allow vehicles to attain relatively high average travel speeds. In the case of bicycles and pedestrians, it is primarily caused by the lack of facilities serving those modes. The tables have adequate footnotes to reflect this unachievable concept.

Lower Q/LOS for the automobile, bicycle, and pedestrian modes may not be applicable, even with extremely high traffic volumes, given the default values used in the Generalized Service Volume Tables. In the case of automobiles, the lower Q/LOS are not applicable, primarily because the control characteristics do not allow enough vehicles to pass through an intersection in an hour. If vehicles could get through the intersection, they could obtain the applicable LOS speed threshold, but there is not enough capacity at the intersection to let them pass through.

In the case of bicycles and pedestrians, it is primarily caused by the existence of facilities adequately serving those modes. For example, if a sidewalk exists, it is very difficult to establish a set of conditions in which the LOS to the pedestrian is F.

Essentially, once the maximum service volume is reached, the next LOS grade is F. For example, in Service Volume Table 1 for multilane Class I arterials, if demand volumes are greater than the LOS D threshold, then the LOS is F, and if the volume is at the LOS D threshold, the LOS is D; essentially, LOS E does not exist.

11.2.4. Median and Turn Lane Adjustment (Divided/Undivided Roadways)

For simplicity, the Generalized Service Volume Tables have factors to adjust for the effects of mid-block medians and exclusive turn lanes at intersections. The cumulative effects of medians and exclusive turn lanes from common

occurrences are shown in the Generalized Service Volume Tables.

A median has the effect of changing the adjusted saturation flow rate or service volume by 5 percent. In Florida, most two-lane roadways do not have a median (e.g., a two-way left turn lane), so the tables assume no median for those facilities. However, if there is a median, appropriate service volumes should be increased 5 percent. Most multilane arterials and highways in Florida have medians, so the tables are set up to assume medians for those facilities. However, if there is no median, appropriate service volumes should be decreased 5 percent.

Most major roadways in Florida have exclusive left-turn lanes at intersections, except those with very low volumes. If a roadway does not have left-turn lanes at major intersections, its service volume drops 20 to 25 percent, depending on the number of lanes, as indicated in the table. The common design practice in Florida is to use shared through/right-turn lanes to accommodate right-turning vehicles. However, exclusive right-turn lanes have large capacity and service volume impacts for vehicles at major intersections.

11.2.5. One-Way Facility Adjustments

For simplicity, the urbanized and transitioning/urban area Generalized Service Volume Tables have an intuitive factor for the effects of one-way streets on vehicles. Essentially, one-way pairs are assumed to have a 20 percent higher service volumes than corresponding two-way roadways with the same number of lanes.

However, the Generalized Service Volume Tables treat each facility of a one-way pair separately. To account for that, the volumes in the daily and hourly two-way Tables 1 through 6 should be multiplied by 0.6, while the volumes in the hourly directional Tables 7 through 9 should be multiplied by 1.2, to obtain the correct volume and LOS.

For example, the AADT LOS D threshold for a 2-lane Class I arterial one-way facility in a transitioning area would be 9,720. This example is calculated using the Generalized Service Volume Table 2. The AADT LOS D threshold for a 2-lane Class I arterial in a transitioning area is 16,200. To calculate the LOS D threshold for a one-way facility, multiply 16,200 by the one-way facility adjustment, 0.6, to calculate the one-way facility LOS D threshold of 9,720.

11.2.6. Auxiliary Lane Adjustment

Freeway auxiliary lanes (lanes connecting on- and off-ramps) usually have significant capacity and LOS benefits. The values contained in the tables indicate their importance in a general way. To apply the values, simply add the volume shown in the freeway adjustment to the maximum service volume shown in the table.

11.2.7. Ramp Metering Adjustment

Freeway ramp metering has the benefit of smoothing out traffic demand entering a freeway during peak travel times. This benefit is reflected by increasing the service volumes shown on the tables by 5 percent.

11.2.8. Bicycle LOS (BLOS)

The bicycle portions of the Generalized Service Volume Tables make primary use of the two most important factors in determining the LOS for bicyclists: the existence of paved shoulders/bicycle lanes and vehicle volumes. It is important to note that the volumes shown in the tables are not the number of bicyclists; rather, they are the number of vehicles in the outside lane. Unlike automobile LOS, which is highly dependent on the number
of other vehicles on the roadway, **BLOS is not determined by how many other bicyclists are on road; rather**, **it is primarily determined by the bicycle accommodations on the roadway and volume of vehicles.**

The other factor used in the Generalized Service Volume Tables is the volume of vehicles in the outside lane. For analysis purposes, vehicle volumes are assumed to be equally spread across the number of directional roadway lanes. Unlike the automobile entries in the table, in which the number of lanes is an entry into the tables, a step of multiplying the volume by the number of lanes is needed to use the volume (hourly directional, hourly two-way, or daily) of vehicles. For example, in Table 7, the LOS C threshold for zero percent bicycle lane coverage is 150 vehicles for the outside lane. If the roadway has four lanes, then the 150 vehicles would be multiplied by 2 (number of directional lanes) to determine the maximum volume of vehicles for BLOS C in one direction of flow. The additional step was included to simplify the appearance of the tables and save space.

11.2.9. Pedestrian LOS (PLOS)

The pedestrian portions of the Generalized Service Volume Tables make primary use of the two most important factors in determining the LOS for pedestrians: the existence of a sidewalk and vehicle volumes. It is important to note that the volumes shown in the tables are not the number of pedestrians; rather, they are the number of vehicles in the outside lane. Unlike automobile LOS, which is highly dependent on the number of other vehicles on the roadway, PLOS is not determined by how many other pedestrians use the facility; rather, it is primarily determined by the presence of sidewalks and the volume of vehicles.

The other factor used in these tables is the volume of vehicles in the outside lane. For analysis purposes, vehicle volumes are assumed to be equally spread across the number of directional roadway lanes. Unlike the automobile entries in the table, in which the number of lanes is an entry into the tables, a step of multiplying the vehicle volume by the number of lanes is needed to use the volume (hourly directional, hourly nondirectional, or daily) of vehicles. For example, in Table 7, the LOS C threshold for 100 percent sidewalk coverage is 540 vehicles for the outside lane. If the roadway has four lanes, then the 540 vehicles would be multiplied by 2 (number of directional lanes) to determine the maximum volume of vehicles for PLOS C in one direction of flow. The additional step was included to simplify the appearance of the tables and save space.

All techniques in this Q/LOS Handbook are based on a directional analysis. For example, in the case of evaluating the automobile LOS on arterials, the LOS is for the peak directional flow, and the LOS for the off-peak direction could be higher, lower, or the same. This directional technique results in some unique perspectives when evaluating PLOS. Sidewalks, whether on one or both sides of a road, serve pedestrians in both directions, unlike facilities for the other modes. Furthermore, analysts should be especially careful when using the Generalized Service Volume Tables for determining PLOS when there is a sidewalk only on one side of the roadway. Because all the Generalized Service Volume Tables are based on peak hour directional analyses, PLOS based on the tables should be considered applicable only to the direction of the peak flow of traffic. When using the tables, there is typically a difference of two LOS grades if the sidewalk is, or is not, on the same side of roadway as the peak flow of traffic. Generally, having sidewalks on both sides of arterials in developed areas is considered desirable; yet, the Generalized Service Volume Tables do not adequately reflect that concept.

11.2.10. Bus LOS

The bus portions of the Generalized Service Volume Tables are primarily dependent on bus frequency,

which is the number of scheduled fixed-route buses that have a potential to stop in a given segment in the peak direction of flow in a one-hour time period. That measure is supplemented by pedestrian accessibility. In the Generalized Service Volume Tables, pedestrian accessibility is represented by two broad ranges of sidewalk coverage.

There are two unique aspects of bus mode entries of the Generalized Service Volume Tables. First, it is important to note that the volumes shown in the tables are the number of buses per hour. Unlike automobile, bicycle, and PLOS thresholds, the bus mode LOS thresholds are not related to the number of vehicles on the roadway. Second, regardless of the table used, all numbers are shown in terms of buses per hour for the peak hour in the peak direction. Thus, even in the daily urbanized table (Table 1), the threshold values shown are still in terms of peak hour directional buses.

11.3. Service Volume Calculation Process

All service volumes and resulting tables are first calculated for the peak hour in the peak direction. The peak hour two-way values are obtained by dividing the peak hour peak direction service volumes by D. The daily volumes are obtained by dividing the peak hour two-way service volumes by K.

Peak hour directional and peak hour two-way service volumes are rounded to the nearest 10 vehicles. Daily service volumes are rounded to the nearest 100 vehicles.

11.3.1. Arterial LOS

For the automobile mode, arterial analyses starts with a volume of 10 vph and then calculates the v/c ratio at each intersection. Then, the speed on each segment is calculated, which also accounts for the signal delay and the overall average speed for the facility. The average speed is checked against the average speed criterion for LOS A. If the speed is below the LOS A threshold, the volume is incremented by either 50 vph (if the difference in the actual speed and LOS threshold speed is large) or 10 vph (if the difference in actual speed and LOS threshold speed is large) or 10 vph (if the difference in actual speed and LOS threshold speed is small). This process is repeated until the average facility speed is approximately equal to the LOS A threshold. The volume level at which this occurs is the service volume for LOS A. The volume (i.e., LOS A service volume) is then incremented by 10 vph and incrementally increased until the average facility speed is approximately equal to the LOS B threshold speed. This process repeats for LOS C, D, and E. If at any point during this process the v/c ratio exceeds 1.0 for the full hour, the calculation is stopped. If that condition is met, this volume becomes the service volume for whichever LOS letter grade was being evaluated at the time, as well as for the lower Q/LOS grades.

For the bicycle and pedestrian modes, again the analyses is started with a volume of 10 vph and then BLOS and PLOS scores are calculated based on the BLOS and PLOS models. Then, that score is checked against the LOS A criterion. If the score is below the LOS A threshold value, the volume is incremented by 10 vph. This process is repeated until the facility score is approximately equal to the LOS A threshold. The volume level at which this occurs is then the service volume for LOS A. The volume (i.e., LOS A service volume) is then incremented by 10 vph and incrementally increased until the average facility score is approximately equal to the LOS B threshold volume. This process repeats for LOS C, D, and E. If at any point during this process the vehicle v/c ratio exceeds 1.0 for the full hour, the calculation is stopped. If that condition is met, this volume becomes the service volume for whichever LOS letter grade was being evaluated at the time as well as for the lower Q/LOS grades.

For the bus mode, the LOS service frequency criteria that appear in the TCQSM is used, modified by PLOS, relative auto speed, bus stop amenities, and passenger load factors.

11.3.2. Freeway Facilities LOS

For freeways, the HCS7 freeway facilities module was used to obtain the service volume thresholds. The automobile volume is incrementally increased until the demand flow rate to the mean speed of the traffic stream produces an average facility density that is approximately equal to the LOS A threshold. The volume level at which this occurs is the service volume for LOS A. The volume (i.e., LOS A service volume) is then incrementally increased by 10 vph and until the average facility density is approximately equal to the LOS B threshold speed. This process repeats for LOS C, D, and E. If at any point during this process the v/c ratio exceeds 1.0 for the full hour, the calculation stops. If that condition is met, this volume becomes the service volume for whichever LOS letter grade was being evaluated at the time, as well as for the lower Q/LOS grades. The traffic factors and other inputs such as CAF and SAF used in the analyses are discussed in the previous sections of this handbook and listed at the back of the Generalized Service Volume Tables.

11.3.3. Highways LOS

For multilane uninterrupted flow highways, HCS7's multilane highways procedure starts with a volume of 10 vph and then calculates density. If the density is below the LOS A threshold density, the volume is incremented by 10 vph. This process is repeated until the average density is approximately equal to the LOS A threshold. The volume level at which this occurs is then the service volume for LOS A. The volume (i.e., LOS A service volume) is then increased by 10 vph until the average facility density is approximately equal to the LOS B threshold density. This process repeats for LOS C, D, and E. If at any point during this process the v/c ratio exceeds 1.0 for the full hour, the calculation stops. If that condition is met, this volume becomes the service volume for whichever LOS letter grade was being evaluated at the time, as well as for the lower Q/LOS grades. The traffic factors and other inputs such as CAF and SAF used in the analyses are discussed in the previous sections of this handbook and listed at the back of the Generalized Service Volume Tables. A different free flow speed is used in the analyses for multilane uninterrupted flow highways passing through undeveloped areas and developed areas.

For two-lane uninterrupted flow highways, the computational process is similar to the process followed for multilane uninterrupted flow highways. The HCS7's two-lane highways module is dependent on the highway class (I, II, or III). The traffic factors and other inputs used in the analyses are discussed in the previous sections of this handbook and listed at the back of the Generalized Service Volume Tables. A different free flow speed is used in the analyses for two-lane uninterrupted flow highways passing through undeveloped areas and developed areas.

Glossary

Acceleration lane	A freeway lane extending from the on-ramp gore to where its taper ends.
Accessibility	The dimension of mobility that addresses the ease in which travelers can engage in desired activities.
Actuated control	All approaches to the signalized intersection have vehicle detectors, with each phase subject to a minimum and maximum green time, and some phases may be skipped if no vehicle is detected. Same as <i>actuated</i> and <i>fully actuated control</i> .
Actuated-Coordinated control	The fixed-cycle signal control of an intersection in which the through movement on the designated main roadway gets the unused green time from side movements because of limited or no vehicle activation from side movements. Same as <i>coordinated-actuated</i> .
Add-on/drop-off lanes	The roadway lanes added before an intersection and dropped after the intersection. Same as <i>expanded intersections</i> .
Adjusted saturation flow rate	In this Q/LOS Handbook, the base saturation flow rate times the effect of many roadway variables and traffic variables.
Adjustment factor	In the Generalized Service Volume Tables: additive or multiplicative factors to adjust service volumes.
All-way stop control	An intersection with a stop sign at all approaches.
Annual average daily traffic	The volume passing a point or segment of a roadway in both directions for one year, divided by the number of days in the year.
Areawide analysis	An evaluation within a geographic boundary.
Arrival type	A general categorization of the quality of signal progression.
Arterial	A signalized roadway that primarily serves through traffic with average signalized intersection spacing of 2 miles or less; a type of roadway based on FDOT's functional classification.
Auxiliary lane	An additional lane on a freeway connecting an on-ramp of one interchange to the off-ramp of the downstream interchange.
Average daily traffic	The total traffic volume during a given time period (more than a day and less than a year) divided by the number of days in that time period.
Average travel speed	The facility length divided by the average travel time of all vehicles traversing the facility, including all stopped delay times.
Axle correction factors	The adjustment factors used to calculate the annual average daily traffic by compensating for an axle counter's tendency to count more vehicles than are present.
Base conditions	The best possible characteristic in terms of capacity for a given type of facility.

Base saturation flow rate	The maximum steady flow rate, expressed in passenger cars per hour per lane, at which passenger cars can cross a point on interrupted flow roadways.
Basic segment	In this Q/LOS Handbook, the length of a freeway in which operations are unaffected by interchanges. Same as <i>basic freeway segment</i> .
Basic two-lane highway	A highway segment upstream of the intersection influence area and
Segments	downstream of the affected downstream highway segment, and thus not affected by signalized intersections.
Bicycle lane	In this Q/LOS Handbook, a designated or undesignated portion of roadway for bicycles adjacent to vehicle lanes.
Bicycle level of service score	A numerical value calculated by the BLOS Model that corresponds to a BLOS.
Bus frequency	The number of buses per hour serving one direction of a roadway facility.
Bus stop	An area where bus passengers wait for, board, alight, and transfer.
Bus stop amenities	Enhancements for comfort or safety that can greatly influence the perceived QOS along a route. Four categories of bus stop amenities exist: excellent, good, fair, and poor.
Bus stop amenity factors	Factors used to determine the adjusted bus frequency value by applying a factor commensurate to the quality of bus stop amenities.
Bus stop type adjustment factors	Factors that adjust travel times along bus routes by adding 15 to 35 seconds of delay per route for typical and major bus stops, respectively.
Capacity	The maximum sustainable flow rate at which persons or vehicles reasonably can be expected to traverse a point or a uniform section of roadway during a given time period under prevailing conditions. As typically used in this Q/LOS Handbook, the maximum number of vehicles that can pass a point in one hour under prevailing roadway, traffic and control conditions.
Capacity adjustment factor	An adjustment factor used in the HCS7 freeways and multilane highways module to adjust the capacity of a facility for reduced capacity situations or to match field measurements. The capacity can be reduced to represent incident situations, such as construction and maintenance activities, adverse weather, traffic incidents, and vehicle breakdowns.
Capacity constrained	A condition in which traffic <i>demand</i> exceeds the capacity of a roadway.
Capacity utilization	The dimension of mobility that addresses the quantity of operations relative to capacity.
Captive rider	A transit rider who is limited by circumstances to use transit as a primary source of transportation.
Choice rider	A transit rider who chooses to take transit over other readily available transportation options.
Class I arterial	A roadway that has posted speeds of 40 mph or higher.

Class II arterial	A roadway that has posted speeds of 35 mph or less.
Collector	A roadway providing land access and traffic circulation with residential, commercial and industrial areas.
Concurrency	A systematic process utilized by local governments to ensure new development does not occur unless adequate infrastructure is in place to support growth.
Context classification	A classification assigned to a roadway that broadly identifies the various built environments in Florida, based on existing or future land use characteristics, development patterns, and the roadway connectivity of an area.
Control delay	The component of delay that results when a signal causes traffic to reduce speed or stop.
Control variables	The parameters associated with roadway controls.
Core freeways	The major, non-toll freeways going through the urbanized core areas of the largest metropolitan areas, such as Interstate 4 in Orlando. FDOT has adopted lower K values for these freeways to represent a peak period, as opposed to a peak hour analysis. The lower K values affect daily service volumes only in the Generalized Service Volume Tables.
Critical signalized intersection	The signalized intersection with the lowest volume-to-capacity ratio (v/c) , typically the one with the lowest effective green ratio (g/C) for the through movement. Same as <i>critical signalized intersection</i> .
Cycle length	The time it takes a traffic signal to go through one complete sequence of signal indications.
Deceleration lane	A freeway lane extending from the taper to the off-ramp gore.
Delay	The additional travel time experienced by a traveler.
Demand	The number of persons or vehicles desiring service on a roadway. Same as <i>demand traffic</i> .
Density	The number of vehicles, averaged over time, occupying a given length of lane or roadway; usually expressed as vehicles per mile or vehicles per mile per lane.
Developed areas	All areas not rural undeveloped. Same as rural developed areas.
Directional distribution factor	The proportion of an hour's total volume occurring in the higher volume direction.
Effective green ratio	Typically in this Q/LOS Handbook, the ratio of the effective green time (g) for the through movement at a signal intersection to its cycle length (C).
Effective green time	The time allocated for the through movement to proceed; calculated as the through movement green plus yellow plus all-red indication times less the lost time.
Exclusive left-turn storage length	The total amount of storage length, in feet, for exclusive left-turn lanes.
Exclusive right-turn lanes	A storage area designated to only accommodate right-turning vehicles.

Exclusive turn lane	A storage area designated to only accommodate left- or right-turning vehicles; in this Q/LOS Handbook, the turn lane must be long enough to accommodate enough turning vehicles to allow the free flow of the through movement.
Five-lane section	A roadway with four through lanes, two in each direction, separated by a two-way left turn lane; in the Generalized Service Volume Tables, a five-lane section is treated as a roadway with four lanes and a median.
Flow rate	In this Q/LOS Handbook, the equivalent hourly rate at which vehicles pass a point on a roadway for a 15-minute period.
Free flow speed	In this Q/LOS Handbook, the average speed of vehicles under low- flow traffic conditions and not under the influence of signals, stop signs, or other fixed causes of interruption, generally assumed to be 5 mph over the posted speed limit.
Freeway	A multilane, divided highway with at least two lanes for the exclusive use of traffic in each direction and full control of ingress and egress.
Freeway segment	In this Q/LOS Handbook, a basic segment, interchange or toll plaza.
FSUTMS	Florida Standard Urban Transportation Model Structure; Florida's software that forecasts travel demand.
Functional classification	The assignment of roads into systems according to the character of service they provide in relation to the total road network.
Generalized Service Volume Tables	Maximum service volumes based on areawide roadway, traffic, and control variables and presented in tabular form.
Generalized planning	A broad type of planning application that includes statewide analyses, initial problem identification, and future year analyses. In this Q/LOS Handbook, typically performed by using the Generalized Service Volume Tables.
Gore	The point located immediately between the left edge of a ramp pavement and the right edge of the roadway pavement at a merge or diverge area.
Headway	The time, in seconds, between two successive vehicles as they pass a point on a roadway.
Heavy vehicle	An FHWA vehicle classification of 4 or higher; essentially, vehicles with more than 4 wheels touching the pavement during normal operation.
Heavy vehicle factor	The adjustment factor for heavy vehicles.
Heavy vehicle percent	The percentage of heavy vehicles in the traffic stream.
Highway capacity analysis	An examination of the maximum of vehicles or persons that can reasonably be expected to pass a point on a roadway during a specified time period under prevailing roadway, traffic, and control conditions. Same as <i>capacity analysis</i> .
Highway Capacity Manual	The Transportation Research Board's document on highway capacity and QOS.
Highway Capacity Software 7	Software that replicates the HCM, Sixth Edition.

Interchange	In this Q/LOS Handbook, the influence area associated with the off- ramp influence area, overpass/underpass, and on-ramp influence area of a connection to a freeway. Same as <i>freeway interchange</i> <i>influence area</i> .
Interrupted flow	A category of roadways characterized by signals, stop signs, or other fixed causes of periodic delay or interruption to the traffic stream, with average spacing less than or equal to 2.0 miles.
Intersection influence area	In this Q/LOS Handbook, a segment of an uninterrupted flow highway influenced by an isolated intersection.
Interval	A period of time in which all traffic signal indications remain constant.
Isolated intersection	An intersection occurring along an uninterrupted flow highway.
Large urbanized area	A Metropolitan Planning Organization urbanized area greater than 1 million in population; in Florida, these seven areas consist of the following central cities: Fort Lauderdale, Jacksonville, Miami, Orlando, St. Petersburg, Tampa, and West Palm Beach.
Lateral clearance	Clearance distance from edges of outside lanes to fixed obstructions.
Level of service	A quantitative stratification of the QOS to a typical traveler of a service or facility into six letter-grade levels, with A describing the highest quality and F describing the lowest quality; a discrete stratification of a QOS continuum.
Level of service targets	The same as the statewide minimum LOS targets for the State Highway System.
Load factor	The ratio of passengers actually carried to the total passenger capacity of a bus.
Local adjustment factor	In the 2013 Q/LOS Handbook, an adjustment factor FDOT used to adjust base saturation flow rates or base capacities to better match actual Florida traffic volumes; mostly consisted of a driver population factor and an area type factor.
Maximum service volume	The highest number of vehicles for a given LOS.
Median	In this Q/LOS Handbook, areas at least 10 feet wide that are restrictive or non-restrictive, which separate opposing-direction mid- block traffic lanes and, on arterials, contain turn lanes that allow left- turning vehicles to exit from the through traffic lanes.
Median type	A classification of roadway medians as restrictive, non-restrictive, or no median.
Mid-block	In this Q/LOS Handbook, the part of a roadway between two signalized intersections.
Mobility	The movement of people and goods.
Mode	A method of travel; in this Q/LOS Handbook, either automobile, bus, bicycle, or pedestrian.
Motorized mode	A method of travel by automobile or bus.

MPO/TPO	Metropolitan/Transportation Planning Organization.
Multilane highway	A nonfreeway roadway with two or more lanes in each direction and, although occasional interruptions to flow at signalized intersections may exist, is generally uninterrupted flow.
Multimodal	In this Q/LOS Handbook, more than one mode.
Multimodal Transportation District	An area in which secondary priority is given to vehicle mobility, and primary priority is given to ensuring a safe, comfortable, and attractive pedestrian environment, with convenient interconnection to transit (F.S. 163.3180[15]).
No passing zone	In this Q/LOS Handbook, a segment of a two-lane highway along which passing is prohibited in the analysis direction.
Non-restrictive median	A painted, at-grade area separating opposing mid-block traffic lanes.
Non-State signalized roadway	A signalized roadway not on the State Highway System.
Number of effective lanes	In terms of capacity, the equivalent number of through lanes. Typically, the number is expressed as a fraction (e.g., 2.7) to reflect the partial beneficial effects of freeway auxiliary lanes or arterial add- on/drop-off lanes.
Number of through lanes	 The number of lanes relevant to an analysis of a roadway's LOS. FOR ARTERIALS Usually at the signalized intersection, not mid-block Usually through and shared right-turn lanes Maybe a fractional number reflecting add-on/drop-off lanes or other special lane utilization considerations Using the Generalized Service Volume Tables, the number at major signalized intersections FOR FREEWAYS AND UNINTERRUPTED FLOW HIGHWAYS Does not include auxiliary lanes between two points Usually the predominant number of through lanes between two points
Off-ramp influence area	The geographic limits affecting the capacity of a freeway associated with traffic exiting a freeway. Same as <i>diverge area</i> .
On-ramp influence area	The geographic limits affecting the capacity of a freeway associated with traffic entering a freeway. Same as <i>merge area</i> .
One-way	A type of roadway in which vehicles are allowed to move in only one direction.
Operational analysis	A detailed analysis of a roadway's present or future LOS, as opposed to a generalized planning.
Other urbanized area	A Metropolitan Planning Organization urbanized area with less than 1 million in population.
Oversaturated	A traffic condition in which demand exceeds capacity.
Passenger load factors	Factors used to determine the adjusted bus frequency value by applying a factor commensurate to the level of passenger crowding.

Passinglane	A lane added to provide passing opportunities in one direction of travel on a two-lane highway. Two-way left-turn lanes are not considered passing lanes.
Paved shoulder/bicycle lane	In this Q/LOS Handbook, pavement at least 3 feet in width separated by a solid pavement marking from the outside vehicle through lane to the edge of the pavement.
Peak direction	The course of the higher flow of traffic.
Peak hour	In this Q/LOS Handbook, a one-hour time period with high volume.
Peak hour factor	The ratio of the hourly volume to the peak 15-minute flow rate for that hour; specifically, hourly volume/(4 x peak 15-minute volume).
Peak period	A multi-hour analysis period with high volume; peak periods rather than peak hours are typically used for the analysis of core freeways or roadways within a Multimodal Transportation District.
Peak season	The 13 consecutive weeks with the highest daily volumes for an area.
Peak season weekday average daily traffic	The average daily traffic for Monday through Friday during the peak season.
Pedestrian	An individual traveling on foot and other non-motorized modes such as skateboards, scooters and both motorized and non-motorized wheelchairs.
Pedestrian accessibility	In this Q/LOS Handbook, the ease in which a pedestrian can reach a bus stop.
Pedestrian LOS Model	The operational methodology from which this Q/LOS Handbook's pedestrian Q/LOS analyses are based.
Pedestrian level of service score	A numerical value calculated by the PLOS Model that corresponds to a PLOS.
Pedestrian/sidewalk/roadway separation	The lateral distance, in feet, from the outer edge of the pavement to where a pedestrian walks on a sidewalk.
Percent time spent following	The average percent of total travel time that vehicles must travel in platoons behind slower vehicles because of the inability to pass on a two-lane highway.
Performance measure	A qualitative or quantitative factor used to evaluate a particular aspect of travel quality.
Person flow	The capacity on uninterrupted and interrupted flow facilities, defined in terms of persons per hour.
Phase	The part of a traffic signal's cycle allocated to any combination of traffic movements receiving the right of way simultaneously during one or more intervals.
Planning analysis hour factor	The ratio of the traffic volume in the study hour to the annual average daily traffic.
Planning horizon	A time period, typically 20 years, applicable to the analysis of a project, roadway or service.
Platoon	A group of vehicles traveling together as a group, either voluntarily or

	involuntarily because of signal control, geometrics, or other factors.
Point	A boundary between links. In this Q/LOS Handbook, usually a signalized intersection, but maybe other places where modal users enter, leave, or cross a facility, or roadway characteristics change.
Posted speed	The maximum speed at which vehicles are legally allowed to travel over a roadway segment.
Pretimed control	Traffic signal control in which the cycle length, phase plan, and phase times are preset and repeated continuously, according to a preset plan.
Prevailing conditions	Existing circumstances that primarily include roadway, traffic, and control conditions, but may also include weather, construction, incidents, lighting, and area type.
Principal arterial	A signalized roadway that primarily serves through traffic between centers of metropolitan areas and provides a high degree of mobility. In this Q/LOS Handbook, principal arterials have approximately one signal every half mile and a posted speed limit of 50 mph.
Quality of service	A traveler-based perception of how well a service or facility is operating.
Quality/level of service	A combination of the broad QOS and more detailed LOS concepts.
Queue spillback	When a link's queue of vehicles extends to upstream links.
Ramp overlap segment	The length for which the upstream on-ramp influence area and the downstream off-ramp influence area overlap.
Restrictive median	A raised or grassed area that restricts crossing movements.
Roadway	A general categorization of an open way for persons and vehicles to traverse; in this Q/LOS Handbook, it encompasses streets, arterials, freeways, highways, and other facilities.
Roadway class	The categories of two-lane highways; two-lane highways are primarily grouped by area type. Same as <i>class</i> .
Roadway variables	The parameters associated with roadways. Also known as <i>roadway</i> characteristics.
Rolling terrain	A combination of horizontal and vertical alignments causing heavy vehicles to reduce their running speeds substantially below that of passenger cars, but not to operate at crawl speeds for a significant amount of time.
Route	As used in the TCQSM, a designated, specified path to which a bus is assigned.
Route segment	As used in the TCQSM, a portion of a bus route ranging from two stops to the entire length of the route.
Running speed	The distance a vehicle travels divided by the travel time the vehicle is in motion.
Rural area	In the Generalized Service Volume Tables, areas that are not

	urbanized areas, transitioning areas, or urban areas.
Rural developed areas	The portions of rural areas that are along coastal roadways or in generally populated areas with a population of less than 5,000.
Rural undeveloped areas	Portions of rural areas with no or minimal population or development.
Scheduled fixed route	In this Q/LOS Handbook, bus service provided on a repetitive, fixed- schedule basis along a specific route, with buses stopping to pick up and deliver passengers to specific locations.
Seasonal adjustment factor	A factor used to adjust for the variation in traffic over the course of a year.
Section	A group of consecutive segments that have similar roadway characteristics, traffic characteristics and, as appropriate, control characteristics for a mode of travel. A characteristic describing laneage (e.g., three-lane section, five-lane section, seven-lane section).
Segment	A portion of a facility defined by two boundary points; usually the length of roadway from one signalized intersection to the next signalized intersection.
Service measure	A specific performance measure used to assign a LOS to a set of operating conditions for a transportation facility or service.
Service volume table	Maximum service volumes based on roadway, traffic and control variables and presented in tabular form.
Seven-lane section	A roadway with six through lanes, three in each direction separated by a two-way left-turn lane; in the Generalized Service Volume Tables, a seven-lane section is treated as a roadway with six lanes and a median.
Shared lane	A roadway lane shared by two or three traffic movements; in Florida, a shared lane usually serves through and right-turning traffic movements.
Sidewalk	A paved walkway for pedestrians at the side of a roadway.
Sidewalk/roadway protective barrier	Physical barriers separating pedestrians on sidewalks and vehicles.
Sidewalk/roadway separation	The lateral distance in feet from the outside edge of the pavement to the inside edge of the sidewalk.
Signal	In this Q/LOS Handbook, a traffic control device regulating the flow of traffic with green, yellow, and red indications. A traffic control device that routinely stops vehicles during the study period; excluded from this definition are flashing yellow lights, railroad crossings, draw bridges, yield signs, and other control devices.
Signal density	The number of signals intersections per mile.
Signal type	The kind of traffic signal (actuated, pretimed or coordinated- actuated) with respect to the way its cycle length, phase plan, and phase times are operated.

Signalized intersection	A place where two roadways cross and have a signal controlling traffic movements.
Signalized intersection spacing	The distance between signalized intersections.
Simple average	An average that gives equal weight to each component.
Speed	In this Q/LOS Handbook, the same as average travel speed, unless specifically noted.
Speed adjustment factor	An adjustment factor in HCS 7's freeways and multilane highways module, used to adjust the speed of a facility to account for the effects of adverse weather and construction work zones. The SAF also may be used to calibrate estimates of free-flow speed for local conditions or other effects that contribute to a reduction in free-flow speed.
Standard K	FDOT's standard peak hour to annual average daily traffic ratio (K), based on a roadway's characteristics (facility type) and location (area type). Values of less than 9 percent essentially represent a multi-hour peak period rather than a peak hour.
State Highway System	All roadways that FDOT operates and maintains; the State Highway System consists of the Florida Intrastate Highway System and other state roads.
Stochastic	A description of a type of model that incorporates variability and uncertainty into analysis.
Strategic Intermodal System	Florida's system of transportation facilities and services of statewide and interregional significance.
Termini	In this Q/LOS Handbook, the beginning and endpoints of a facility.
Three-lane section	A roadway with two through lanes separated by a two-way left-turn lane. In the Generalized Service Volume Tables, a three-lane section is treated as a roadway with two lanes and a median. An exclusive passing lane on a two-lane highway is not considered a three-lane section.
Threshold	The breakpoints between LOS differentiations.
Threshold delay	The additional travel time represented by the difference between the time associated with a roadway's generally accepted speed (LOS D threshold in urbanized areas and LOS C threshold in nonurbanized areas) and average travel speed. Same as LOS threshold delay.
Through movement	In this Q/LOS Handbook, the traffic stream with the greatest number of vehicles passing directly through a point. Typically, this is the straight-ahead movement, but occasionally it may be a turning movement.
Traffic demand	The number of vehicles with drivers who desire to traverse a particular highway during a specified time period.
Traffic volume	The number of vehicles passing a point on a highway during a specified time period.
Transit	In this Q/LOS Handbook, the same as bus.

Transit Capacity and Quality of Service Manual (TCQSM)	The document and operational methodology from which this Q/LOS Handbook's bus Q/LOS analyses are based.
Transitioning area	An area adjacent to an urbanized area that exhibits characteristics between rural and urbanized/urban, and will be urbanized in the next 20 years.
Transportation planning boundaries	Precisely defined lines that delineate geographic areas. These boundaries are used throughout transportation planning in Florida. Their mapping is described in <u>Urban Boundaries and Functional</u> <u>Classification of Roadways FDOT's Procedure Topic No. 525-020-311</u> .
Travel time	The average time spent by vehicles traversing a roadway.
Two-lane highway	A roadway with one lane in each direction on which passing maneuvers must be made in the opposing lane and, although occasional interruptions to flow at signalized intersections may exist, is generally uninterrupted flow.
Two-way	Movement allowed in either direction.
Two-way left-turn lane	A lane that simultaneously serves left-turning vehicles traveling in opposite directions. Same as continuous left-turn lane.
Two-way stop control	The type of traffic control at an intersection where drivers on the minor street, or a driver turning left from the major street, wait for a gap in major-street traffic to complete a maneuver.
Undesignated bicycle lane	A lane, usually 4 feet in width, that does not contain a bicycle logo.
Undivided	As used in the Generalized Service Volume Tables, a roadway with no median.
Uninterrupted flow	A category of roadway not characterized by signals, stop signs, or other fixed causes of periodic delay or interruption to traffic stream.
Uninterrupted flow highway	A nonfreeway roadway that generally has uninterrupted flow, with average signalized intersection spacing of greater than 2.0 miles; a two-lane highway or a multilane highway.
Urban area	A place with a population between 5,000 and 50,000 and not in an urbanized area. The applicable boundary includes the census' urban area and the surrounding geographical area agreed on by the FDOT, the local government, and the FHWA. The boundaries are commonly called FHWA Urban Area Boundaries and include areas expected to develop medium density before the next decennial census.

Urbanized area	An area within a Metropolitan Planning Organization's (MPO) designated urbanized area boundary. The minimum population for an urbanized area is 50,000 people. Based on the census, any area the U.S. Bureau of Census designates as urbanized, together with any surrounding geographical area agreed on by the FDOT, the relevant MPO, and the FHWA, commonly called the FHWA Urbanized Area Boundary.
Volume-to-capacity ratio	The ratio of demand flow rate to capacity of a signalized intersection, segment or facility.
Weaving distance	A length of freeway over which traffic streams across paths through lane-changing maneuvers. Same as <i>weaving segment</i> .
Weighted effective green ratio	In this Q/LOS Handbook, the average of the critical intersection's through effective green ratio and the average of all the other signalized intersections' through effective green ratios along the arterial facility.

Urbanized Areas

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BUS MODE (Scheduled Fixed Route) ³		BUS MOI	DE (Sched	luled Fixe	d Route) ³						
(Buses in peak hour in peak direction)		(Buses	in peak hou	r in peak dire	ction)						
Sidewalk Coverage B C D E	Sidewa	lk Coverage	В	С	D	Е					
$0-84\%$ >5 ≥ 4 ≥ 3 ≥ 2	0)-84%	> 5	≥ 4	≥3	≥ 2					
$85-100\% > 4 \geq 3 \geq 2 \geq 1$	85	5-100%	>4	\geq 3	≥ 2	≥ 1					

			FREE	WAYS		
			Core Ur	hanized		
	Lanes	В	C		D	Е
	4	47.600	66.4	00 83	3.200	87.300
	6	70,100	97.80	12^{-3}	3.600	131.200
	8	92,200	128.90	164	4.200	174.700
	10	115.300	158.90	20°	3.600	218.600
	12	136 500	192.4	200 - 246	5 200	272,900
	12	120,200	172,1	210	,200	272,200
		_	Urba	nized	_	_
	Lanes	В	C		D	E
	4	45,900	62,70	00 75	5,600	85,400
	6	68,900	93,90	0 113	3,600	128,100
0	8	91,900	125,20	0 151	,300	170,900
	10	115,000	156,80	00 189	9,300	213,600
		F	reeway A	djustment	5	
	D	Auxiliary Lan	es		Ramp	
	Prese	± 20.000	ections		⊥ 5%	
		+ 20,000			+ 570	
	τ	ININTERR	UPTED	FLOW H	IGHWA	YS
	Lanes	Median	B	С	D	E
	2	Undivided	11.700	18.000	24.200	32.600
	4	Divided	36.300	52.600	66.200	75.300
	6	Divided	54.600	78.800	99.400	113.100
	-		- ,		,	-)
		Uninterrupt	ed Flow H	Iighwav A	diustmen	its
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000	Lanes 2 Multi Multi ¹ Values s service ar does not o applicatio more spec not be uso Calculati and Quali ² Level of of vehicle ³ Buses pe flow. * Cannot	Uninterrupt Median Divided Undivided Undivided Undivided hown are presented ad are for the autom constitute a standard ons. The computer n cific planning applie ed for corridor or in ons are based on pla ity of Service Manu cost are based on pla ity of Service for the bicy es, not number of bi er hour shown are or be achieved using t	ed Flow H Exclusive Y Y N as two-way am obile/truck mod l and should be nodels from wh aations. The tab tersection desig mining applicati al. vcle and pedestr cyclists or pede ally for the peak	Highway A e left lanes es es lo nual average dai des unless specif used only for g ich this table is le and deriving (n, where more r ons of the HCM rian modes in th strians using the hour in the single e defaults.	djustmen Adjustm + -2 ily volumes for fically stated. 7 eneral planning derived should computer mod refined techniq I and the Trans is table is base e facility. e direction of th	ts ent factors 5% 5% 25% r levels of This table be used for els should ues exist. it Capacity d on number e higher traffic
000	Lanes 2 Multi ¹ Values s service ar does not o applicatio more spee not be uso Calculati and Quali ² Level of of vehicle ³ Buses pe flow. * Cannot ** Not ap	Uninterrupt Median Divided Undivided Undivided Undivided hown are presented da are for the autom constitute a standard ons. The computer n cific planning applie d for corridor or in ons are based on pla effor corridor or in ons are based on pla effort on the bicy is, not number of bi- er hour shown are or be achieved using t	ed Flow H Exclusive Y Y N as two-way am obile/truck moo l and should be nodels from wh rations. The tab tersection desig anning applicati al. vcle and pedesti cyclists or pede aly for the peak able input value tel of service le be	Highway A e left lanes es es lo nual average dai des unless speci used only for g ich this table is de and deriving m, where more r ons of the HCM rian modes in th istrians using the hour in the single e defaults.	djustmen Adjustm + -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	ts ent factors 5% 5% 25% r levels of This table g be used for els should ues exist. it Capacity d on number e higher traffic mode, volumes
000	Lanes 2 Multi ¹ Values s service ar does not of application more speed not be use Calculation and Qualit ² Level of of vehicle ³ Buses per flow. * Cannot ** Not ar greater th For the bi	Uninterrupt Median Divided Undivided Undivided Undivided dare for the autom constitute a standard ons. The computer n cific planning applie do for corridor or in ons are based on pla ed for corridor or most are based on pla ity of Service Manu service for the bicy set, not number of bi or hour shown are or be achieved using the plicable for that leve an level of service level	ed Flow H Exclusive Y Y N as two-way an obile/truck moo l and should be nodels from wh cations. The tab etersection desig nning applicati al. vcle and pedestu cyclists or pede able input value el of service le D become F bec rel of service le	Highway A e left lanes es es lo nual average dai des unless speci- used only for g ich this table is- ole and deriving n, where more r ons of the HCM ian modes in th istrians using the hour in the single e defaults. tter grade. For th cause intersection tter grade (inclu	djustmen Adjustm + -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	ts ent factors 5% 5% 25% r levels of This table g be used for els should ues exist. it Capacity d on number e higher traffic mode, volumes twe been reached achievable
000	Lanes 2 Multi Multi ¹ Values s service ar does not of application more speed not be use Calculation and Qualit ² Level of of vehicle ³ Buses pe flow. * Cannot ** Not appreate th For the bi because th	Uninterrupt Median Divided Undivided Undivided Undivided dare for the autom constitute a standard ons. The computer n cific planning applie d for corridor or in ons are based on pla ity of Service Manu service for the bicy ser, not number of bi er hour shown are or be achieved using t oplicable for that leve an level of service l icycle mode, the leve here is no maximum	ed Flow H Exclusive Y Y N as two-way an obile/truck moo l and should be nodels from wh cations. The tab cations. The tab ming applicati al. cle and pedestric cyclists or pede able input value el of service le D become F bec el of service le vehicle volum	Highway A e left lanes es es Io nual average dai des unless specir used only for g ich this table is- ole and deriving n, where more r ons of the HCM ian modes in th strians using the hour in the single e defaults. tter grade. For the cause intersection tter grade (inclu- e threshold usin	djustmen Adjustm + -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	ts ent factors 5% 5% 5% r levels of This table g be used for els should ues exist. it Capacity d on number e higher traffic mode, volumes twe been reached achievable alue defaults.
0000	Lanes 2 Multi Multi ¹ Values s service ar does not a applicatio more spect not be uss Calculatio and Qualit ² Level of of vehicle ³ Buses pe flow. * Cannot ** Not ap greater th For the bi because th <i>Source</i> :	Uninterrupt Median Divided Undivided Undivided Undivided hown are presented ad are for the autom constitute a standar ons. The computer m cific planning applie ed for corridor or in ons are based on pla ity of Service Manu service for the bicy es, not number of bi- er hour shown are or be achieved using the plicable for that leve an level of service 1 icycle mode, the leve here is no maximum	ed Flow F Exclusive Y Y N as two-way an obile/truck mou land should be nodels from wh cations. The tab tersection desig mning applicati al. cle and pedestr cyclists or pede ally for the peak able input value el of service le D become F bec el of service le vehicle volum	Highway A e left lanes es es lo nual average dai des unless specie used only for g ich this table is de and deriving m, where more r ons of the HCM ian modes in th strians using the hour in the single e defaults. tter grade. For the cause intersection tter grade (inclu- e threshold using	djustmen Adjustm + -2 ily volumes for fically stated. 7 eneral planning derived should computer mod refined techniqi (and the Trans is table is based e facility. e direction of the he automobile n capacities ha ding F) is not a g table input v	ts ent factors 5% 5% 5% r levels of fhis table g be used for els should ues exist. it Capacity d on number e higher traffic mode, volumes we been reached alue defaults.
0000	Lanes 2 Multi Multi ¹ Values s service ar does not a applicatio more spee not be use Calculatii and Quali ² Level of of vehicle ³ Buses pe flow. * Cannot ** Not ar greater th For the bi because ti	Uninterrupt Median Divided Undivided Undivided Undivided dare for the autom constitute a standarc ons. The computer m cific planning applie ed for corridor or in ons are based on pla ity of Service Manu 's service for the bicy es, not number of bi er hour shown are or be achieved using the oplicable for that leve an level of service licy cycle mode, the leve here is no maximum	ed Flow H Exclusive Y Y N as two-way an as two-way an as two-way an an an an an an an an an as two-way as two-way as two-way as two-	Highway A e left lanes es es lo nual average dai des unless specie used only for g ich this table is le and deriving m, where more r ons of the HCM tian modes in th estrians using the hour in the single e defaults. tter grade. For the cause intersection tter grade (inclu- e threshold using	djustmen Adjustm + -2 ily volumes for fically stated. 7 eneral planning derived should computer mod refined techniq i and the Trans is table is based e facility. e direction of the he automobile n capacities he ding F) is not a g table input v	ts ent factors 5% 5% 25% r levels of Chis table g be used for els should ues exist. it Capacity d on number e higher traffic mode, volumes twe been reached achievable alue defaults.
	Lanes 2 Multi Multi ¹ Values s service ar does not a applicatio more spee not be uss Calculati and Quali ² Level of of vehicle ³ Buses pe flow. * Cannot ** Not ap greater th For the bi because th Source: Florida D Systems I	Uninterrupt Median Divided Undivided Undivided Undivided dare for the autom constitute a standarc ms. The computer n cific planning applie ed for corridor or in ons are based on pla ity of Service Manu ser, not number of bi- er hour shown are or be achieved using t oplicable for that leve an level of service l there is no maximum	ed Flow H Exclusive Y Y N as two-way am obile/truck mod l and should be nodels from wh ations. The tab tersection desig mining applicati al. vcle and pedestr cyclists or pede able input value el of service le D become F bec el of service le D become F bec el of service le D become F bec vehicle volum portation ice //systems/	Highway A e left lanes es es lo nual average dai des unless specif used only for g ich this table is le and deriving m, where more r ons of the HCM rian modes in th strians using the hour in the single e defaults. Iter grade. For th ause intersectio tter grade (inclu	djustmen Adjustm + -2 -2 -2 	ts ent factors 5% 5% 25% r levels of This table be used for els should ues exist. it Capacity d on number e higher traffic mode, volumes twe been reached alue defaults.
0 0 0 0 0	Lanes 2 Multi Multi ¹ Values s service ar does not o applicatio more spee not be use Calculati and Quali ² Level of of vehicle ³ Buses pe flow. * Cannot ** Not ap greater th For the bi because th Source: Florida D Systems 1 https://www	Uninterrupt Median Divided Undivided Undivided Undivided dare for the autom constitute a standard ons. The computer n cific planning applie d for corridor or in ons are based on pla ity of Service Manu service for the bicy es, not number of bi r hour shown are or be achieved using t pplicable for that lev an level of service l cycle mode, the lev here is no maximum epartment of Trans implementation Off	ed Flow H Exclusive Y Y N as two-way am obile/truck mov l and should be nodels from wh rations. The tab tersection desig and should be nodels from wh rations. The tab tersection desig application al. vcle and pedestic cyclists or pede ally for the peak. able input value to become F bec el of service le vehicle volum portation ice /systems/	Highway A e left lanes es es lo nual average dai des unless speci used only for g ich this table is de and deriving m, where more r ons of the HCM rian modes in th istrians using the hour in the single e defaults. Itter grade. For th cause intersection there shold usin	djustmen Adjustm + -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	ts ent factors 5% 5% 25% r levels of This table g be used for els should ues exist. it Capacity d on number e higher traffic mode, volumes we been reached alue defaults.

(continued)

Generalized Annual Average Daily Volumes for Florida's

Urbanized Areas

lanuary	2020
January	2020

	Uninterrupted Flow Facilities				Interrupted Flow Facilities					
INPUT VALUE	Unin	terrupted	Flow Faci	lities		State A	Arterials		ass I	
ASSUMPTIONS	Freeways	Core Freeways	High	ways	Cla	ss I	Cla	ss II	Bicycle	Pedestrian
ROADWAY CHARACTERISTICS		•			•					
Area type (urban, rural)	urban	urban								
Number of through lanes (both dir.)	4-10	4-12	2	4-6	2	4-8	2	4-8	4	4
Posted speed (mph)	70	65	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	70	55	55	50	55	35	35	50	50
Auxiliary Lanes (n,y)	n	n								
Median (d, twlt, n, nr, r)				d	n	r	n	r	r	r
Terrain (l,r)	1	1	1	1	1	1	1	1	1	1
% no passing zone			80							
Exclusive left turn lane impact (n, y)			[n]	у	у	у	у	у	у	у
Exclusive right turn lanes (n, y)					n	n	n	n	n	n
Facility length (mi)	3	3	5	5	2	2	1.9	1.8	2	2
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.090	0.085	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.550	0.560	0.565	0.560	0.565	0.565
Peak hour factor (PHF)	0.95	0.95	0.95	0.95	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)	2,400	2,400	1,700	2,200	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0
Speed Adjustment Factor (SAF)	0.975	0.975		0.975						
Capacity Adjustment Factor (CAF)	0.968	0.968		0.968						
% left turns					12	12	12	12	12	12
% right turns					12	12	12	12	12	12
CONTROL CHARACTERISTICS		•			•					
Number of signals					4	4	10	10	4	6
Arrival type (1-6)					3	3	4	4	4	4
Signal type (a, c, p)					с	с	с	с	с	с
Cycle length (C)					120	150	120	120	120	120
Effective green ratio (g/C)					0.44	0.45	0.44	0.44	0.44	0.44
MULTIMODAL CHARACTERIST	TICS									
Paved shoulder/bicycle lane (n, y)									n. 50%. v	n
Outside lane width (n. t. w)									t	t
Pavement condition (d, t, u)									t	
On-street parking (n, y)										1
Sidewalk (n, y)										n, 50%, y
Sidewalk/roadway separation(a, t, w)										t
Sidewalk protective barrier (n, y)										n
		LEVEL	OF SERV	ICE THR	ESHOLD	S				1
	Freeways	High	wave		Arte	rials		Bicycle	Ped	Bus
Level of	1 ice ways	Two-Lane	Multilane	Cla	ISS I	Cla	ss II	Dicycle	itu	Dus
Service	Density	%ffs	Density		ts	210	ts	Score	Score	Buses/hr.
R	< 17	> 83.3	< 17	a	mph	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	mnh	< 2.75	< 2.75	< 6
	$\geq 1/$	> 75.0	$\geq 1/$	> 31	mph	> 17	mph	~ 2 50	22.13	
	≥ 24	> 15.0	≥ 24	> 23	прп	> 1 /	mpn	≥ 3.30	≥ 3.30	>4
D	≤ 31	> 66.7	≤ 31	> 18	mph	> 13	mph	≤ 4.25	≤ 4.25	< 3
E	\leq 39	> 58.3	\leq 35	> 15	mph	> 10	mph	≤ 5.00	≤ 5.00	< 2

Transitioning Areas and

Areas Over 5,000 Not In Urbanized Areas¹

	INTERR	RUPTED F	LOW FAC	ILITIES	, ver 3,000 i		UNINTEI	RRUPTED		CILITIES	January 2020
	STATE SI	GNALL	ZED ART	FERIAI	S			FREEV	VAYS		
						Lanes	В	C	AID	D	Е
Lanos	Class I (40 Modian	mph or hig	gher posted s	speed limit	i) F	4	45,100	59,00	0 70),300	72,600
	Undivided	Б *	14 400	16 200	**	6	65,300	86,60	0 104	,100	108,900
	Divided	*	34,000	35 500	**	8	85,900	114,50	0 138	3,100	145,300
6	Divided	*	52 100	53,500	**	10	101,600	135,60	0 161	,900	181,800
	Divided		52,100	55,500							
T	Class II (35	5 mph or slo	ower posted	speed limi	t)		F	'reeway Ad	justments	5	
Lanes	Median	В	C	D	E	Drog	Auxiliary Lan	es		Ramp Mataring	
	Divided	*	6,500	13,300	14,200	Pres	± 20.000	ections		± 5%	
4	Divided	*	9,900	20,000	31,000		1 20,000			1 570	
0	Divided	*	16,000	44,900	47,600						
	Non-State Si (Alte Non-State	gnalized 1 r correspond by the indica Signalized	Roadway A ing state volu ted percent.) Roadways	Adjustmo mes - 10%	ents						
	Median	& Turn L	ane Adju	stments							•10
		Exclusive	e Exclu	isive .	Adjustment	ι, ι	JNINTERK	UPTED I	CLOW H	IGHWA	YS
Lanes	Median	Left Lane	s Right l	Lanes	Factors	Lanes	Median	B 11 200	17 200	D 22 400	E 21 600
$\begin{vmatrix} 2\\ 2 \end{vmatrix}$	Divided Undivided	Yes	N	C	+5%		Divided	24,600	17,500	23,400 63,000	51,000 71,700
Multi	Undivided	Yes	N))	-20%	4	Divided	51,000	49,900	03,000	107.400
Multi	Undivided	No	N	5	-25%	0	Divided	51,700	74,800	94,000	107,400
-	_	-	Ye	s	+ 5%		Uninterrunt	ted Flow H	iahway A	diustmen	te
	One-V	Way Facil	ity Adjust	ment		Lanes 2	Median Divided	Exclusive Ye	left lanes	Adjustm +	ent factors 5%
	vo	lumes in thi	is table by 0	fectional 6		Multi	Undivided	Ye	es	-4	5%
			is tuble by 0.			Multi	Undivided	N	0	-2	5%
Shoul	B (Multiply v directional roadw Paved lder/Bicycle	BICYCLI wehicle volun yay lanes to d volur	E MODE nes shown be letermine two nes.)	2 low by num -way maxir	ber of num service	¹ Values s service ar does not o applicatio more spec not be uso Calculatio and Quali	hown are presented and are for the autom constitute a standard ons. The computer r cific planning applie ed for corridor or in ons are based on pla ity of Service Manu	as two-way ann nobile/truck mod d and should be 1 nodels from whi cations. The tabl ttersection design anning application tal.	ual average dai es unless specif used only for g ch this table is o e and deriving n, where more r ns of the HCM	ly volumes for fically stated. T eneral planning derived should computer mode refined techniqu I and the Trans	levels of Chis table be used for els should ues exist. it Capacity
Lane	e Coverage	B	C	D	E	² Level of	f service for the bic	vcle and pedestri	an modes in th	is table is based	l on number
	0-49%	*	2,600	6,100	19,500	of vehicle	es, not number of bi	icyclists or pedes	trians using the	e facility.	
	5 100%	1,900	3,300	10,400	>19,300	³ Buses pe	er hour shown are o	nly for the peak h	our in the single	direction of the	e higher traffic
0.	5-100%	7,500	19,300	>19,500		flow.					
	PE	DESTRL	AN MOD	E ²		* Cannot	be achieved using t	table input value	defaults.		
(M dire	ultiply vehicle vo ectional roadway l	lumes shown lanes to deten volur	n below by nı rmine two-wa nes.)	imber of y maximun	n service	** Not ap volumes	plicable le for that greater than level of bed. For the bicycle	level of service l f service D become mode, the level	etter grade. For ne F because in of service lett	r the automobil itersection caps er grade (inclus	le mode, acities have ding F) is
Sidewa	alk Coverage	В	С	D	Е	not achiev	vable because there	is no maximum	vehicle volume	threshold usir	ig table
	0-49%	*	*	2.800	9.400	input vart	le defaults.				
5	50-84%	*	1,600	8,600	15,600	Source:	enartment of Trans	portation			
8	5-100%	3,800	10,500	17,100	>19,500	Systems 1	Implementation Off	fice			
	BUS MOD	E (Sched	luled Fixe	ed Route	$e)^3$	https://ww	vw.fdot.gov/planning	g/systems/			
	(Buses	in peak hou	r in peak dire	ction)	,						
Sidews	alk Coverage	B	C	Ď	E						
	0-84%	> 5	> 4	> 3	> 2						
8	5-100%	> 4	≥ 3	≥ 2	≥ 1						

(continued)

Transitioning Areas **and** Areas Over 5,000 Not In Urbanized Areas

January 2020

	Uninterri	7 Facilities	es Interrupted Flow Facilities							
INPUT VALUE	Ommerre		racintics		S	tate A	rterials		Cla	ass I
ASSUMPTIONS	Freeways	High	iways	Cla	ass I		Cla	iss II	Bicycle	Pedestrian
ROADWAY CHARACTERISTICS										
Area type (urban, rural)	urban									
Number of through lanes (both dir.)	4-10	2	4-6	2	4-	6	2	4-6	4	4
Posted speed (mph)	70	50	50	45	50	0	30	30	45	45
Free flow speed (mph)	75	55	55	50	5	5	35	35	50	50
Auxiliary lanes (n,y)	n									
Median (d, n, nr, r)			d	n	У	7	n	у	r	r
Terrain (l,r)	1	1	1	1	1		1	1	1	1
% no passing zone		60								
Exclusive left turn lane impact (n, y)		[n]	у	у	У	/	У	у	У	у
Exclusive right turn lanes (n, y)				n	n	ı	n	n	n	n
Facility length (mi)	6	5	5	1.8	2	2	2	2	2	2
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.098	0.090	0.090	0.090	0.0	90	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.55	0.55	0.55	0.550	0.5	70	0.570	0.565	0.570	0.570
Peak hour factor (PHF)	0.92	0.92	0.92	1.000	1.0	00	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)	2,400	1,700	2,200	1,950	1,9	50	1,950	1,950	1,950	1,950
Heavy vehicle percent	9.0	4.0	4.0	2.0	3.	0	2.0	3.0	3.0	3.0
Speed Adjustment Factor (SAF)	0.975		0.975							
Capacity Adjustment Factor (CAF)	0.968		0.968							
% left turns				12	12	2	12	12	12	12
% right turns				12	12	2	12	12	12	12
CONTROL CHARACTERISTICS										
Number of signals				5	4	ŀ	10	10	4	6
Arrival type (1-6)				4	3	3	4	4	4	4
Signal type (a, c, p)				с	С	;	с	с	с	с
Cycle length (C)				120	15	50	120	150	120	120
Effective green ratio (g/C)				0.44	0.4	45	0.44	0.45	0.44	0.44
MULTIMODAL CHARACTERISTICS	5	•								
Paved shoulder/bicycle lane (n, y)									n, 50%, y	n
Outside lane width (n, t, w)									t	t
Pavement condition (d, t, u)									t	
On-street parking (n, y)									n	n
Sidewalk (n, v)										n. 50%, v
Sidewalk/roadway separation (a, t, w)										t
Sidewalk protective barrier (n, y)										n
	LEV	EL OF SE	RVICE T	HRESHOI	LDS					
	Freeways	High	wavs		Arte	rials		Bicvcle	Ped	Bus
Level of		Two-Lane	Multilane	Class	I	(Class II			
Service	Density	%ffs	Density	ats	-		ats	Score	Score	Buses/hr.
p	< 17	× 82.2	< 17	× 21 m	nh	~	22 mnh	< 2.75	< 2.75	< 6
	$\geq 1/$	> 03.3	$\geq 1/$	> 31 m	pii ph	>	22 mpn	≥ 2.73	≥ 2.73	≥ 0
	≥ 24	> 13.0	≥ 24	> 23 m	pii mb	>	12 mm	≥ 3.30	≥ 3.30	<u><u></u> 24</u>
	<u>≤ 31</u>	> 66./	≤ 31	> 18 mph		> 13 mph		≤ 4.25	≤ 4.25	< 3
E	\leq 39	> 58.3	≤ 35	>15 m	>15 mph		10 mph	≤ 5.00	≤ 5.00	< 2

Rural Undeveloped Areas and

Developed Areas Less Than 5,000 Population¹

INTERRUPTED FLOW FACILITIES UNINTERRUPTED FLOW FACILITIES FREEWAYS STATE SIGNALIZED ARTERIALS Lanes Median В С D Е Lanes В С D ** 2 Undivided * 12,900 14,200 34,800 48,000 56,700 4 * ** 4 Divided 29,300 30,400 6 48,900 69,000 82,600 * ** 6 Divided 45,200 45,800 8 62,900 90,400 108,400 Non-State Signalized Roadway Adjustments **Freeway Adjustments** (Alter corresponding state volumes Auxiliary Lanes by the indicated percent.) Present in Both Directions Non-State Signalized Roadways - 10% +20,000Median & Turn Lane Adjustments UNINTERRUPTED FLOW HIGHWAYS Exclusive Exclusive Adjustment Lanes Median Left Lanes **Right Lanes** Factors **Rural Undeveloped** 2 Divided Yes No +5% Median Lanes В С 2 Undivided No No -20% Undivided 4.600 2 8,600 -5% Multi Undivided Yes No 4 44,900 Divided 31,200 Multi Undivided No -25% No 6 Divided 46,800 67,600 Yes +5%**Developed** Areas **One-Way Facility Adjustment** Median Lanes В С Multiply the corresponding two-directional 2 Undivided 10,300 15,700 volumes in this table by 0.6 4 Divided 29,300 42,300 6 Divided 44,000 63,600 **Passing Lane Adjustments** Alter LOS B-D volumes in proportion to the passing lane length to **BICYCLE MODE²** the highway segment length (Multiply vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service **Uninterrupted Flow Highway Adjustments** volumes.) Median Exclusive left lanes Lanes Divided 2 Yes **Rural Undeveloped** Multi Undivided Yes Paved Multi Undivided No Shoulder/Bicycle С Lane Coverage В D E 0-49% * ¹Values shown are presented as two-way annual average daily volumes for levels of 1,300 2.0003,200 service and are for the automobile/truck modes unless specifically stated. This table 2,100 3,200 10,600 50-84% 1,000 does not constitute a standard and should be used only for general planning 85-100% 2,600 3,900 18,500 >18,500 applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should **Developed Areas** not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the HCM and the Transit Capacity Paved and Quality of Service Manual. Shoulder/Bicycle ² Level of service for the bicycle and pedestrian modes in this table is based on number Lane Coverage В С D E of vehicles, not number of bicyclists or pedestrians using the facility. 0-49% * 4,900 2,300 15,600 * Cannot be achieved using table input value defaults. 50-84% 1,700 4,500 18,500 13,300 ** 85-100% 5,900 18,500 >18,500 ** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have PEDESTRIAN MODE² been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table (Multiply vehicle volumes shown below by number of input value defaults. directional roadway lanes to determine two-way maximum service Source: volumes.) Florida Department of Transportation Systems Implementation Office С Sidewalk Coverage В D Е https://www.fdot.gov/planning/systems/ 0-49% * * 2,700 9,200 * 50-84% 1,500 8,400 14,900 85-100% 3.600 10.200 16,700 >19,200

January 2020

E

63,200

94,800

126,400

E

28.500

62,700

94,200

Е

28.500

61,600

92,400

D

14.000

55,700

83,500

D

21,300

54,000

81,200

Adjustment factors

+5%

-5%

-25%

Rural Undeveloped Areas and

Developed Areas Less Than 5,000 Population

January 2020

INPUT VALUE		Uninterrupted Flow Facilities				Interrupted Flow Facilities				
ASSUMPTIONS	Freeways		High	nways		Arte	erials	Bic	vcle	Pedestrian
DOADWAY CHADACTEDISTIC	S	Undev	veloped	Deve	loped				J	
Area type (urban rural)			1		1	1				
Number of through lanes (both dir.)		2	1.6	2	1.6	2	1.6	4	4	2
Posted speed (mph)	4-0 70		4-0	2 50	4-0 50	45	4-0	55	4	
Free flow speed (mph)	70	55	55 60	55	55	4J 50	4J 50	55	43 50	4J 50
Auxiliary lanes (n y)	75 n	00	00	- 55	55	50	50	00	50	
Median (d, n, nr, r)	11		d		d	n	r	r	r	n
Terrain $(1, n, m, 1)$	1	1	1	1	1	1	1	1	1	1
% no passing zone	1	20	1	60	1	1	1	1	1	1
Fxclusive left turn lanes (n_v)		[n]	V	[n]	V	V	V	V	V	V
Exclusive right turn lanes (n, y)		[11]	у	[11]	у	y n	y n	y n	y n	y n
Exclusive right turn failes (ii, y)	18	10	10	5	5	19	2.2	1	2	2
	10	10	10	5	5	1.9	2.2		2	2
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.105	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.55	0.550	0.550	0.570	0.570	0.550
Peak hour factor (PHF)	0.88	0.88	0.88	0.88	0.88	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)	2,400	1,700	2,200	1,700	2,200	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	12.0	5.0	12.0	5.0	8.0	3.0	3.0	6.0	3.5	3.0
Speed Adjustment Factor (SAF)	0.975		0.975		0.975					
Capacity Adjustment Factor (CAF)	0.968		0.968		0.968	10				10
% left turns						12	12		12	12
% right turns						12	12		12	12
CONTROL CHARACTERISTICS										
Number of signals						5	6	2	4	4
Arrival type (1-6)						3	3	3	3	3
Signal type (a, c, p)						с	с	а	а	а
Cycle length (C)						90	90	60	90	90
Effective green ratio (g/C)						0.44	0.44	0.37	0.44	0.44
MULTIMODAL CHARACTERIS	TICS									
Paved shoulder/bicycle lane (n, y)								n.50%.v	n.50%.v	n
Outside lane width (n, t, w)								t	t	t
Pavement condition (d, t, u)								t	t	-
Sidewalk (n, v)								, i		n.50%.v
Sidewalk/roadway separation(a, t,w)										t
Sidewalk protective barrier (n, y)										n
		LEVE	L OF SER	VICE TH	RESHOLI	DS				1
						Ligh	WOVE			
Level of	Free	ways	Two I	000 71	Two	Ingi [ono rd	Iways Multi	lono ru	Mult	lono rd
Service	Don	oitu	1 w0-1		1 w0-1	ffe	Do		De	neity
B	<	1511y 1 4	< 50		70	333	<	14	<	1 <u>4</u>
		1 4))	<u> </u>	<u>< 50</u>	> 0	55.5 15.0	<	1 1 22		1 1 22
	<u> </u>	22	≤ 0.5	<u>< 30</u>	>1	5.0	<u> </u>	20	<u> </u>	20
E	<u> </u>	29	≥ 80	≤ 43	>0	00.7 (8.3	<u> </u>	29	<u> </u>	29
L	2.	50	200	<u> </u>	/ / /	18.5	2	54		54
Lovel of	Artorials			Bic	vele		р	edestrian		
Service	M	aior City/C	o (ats)		S	ore		1	Score	
R	1016	> 31 mr	h		< 2	75			< 2.75	
C		> 23 mm	oh		<	3.50			< 3 50	
D	> 23 mph		n. Dh			4.25			< 4.25	
 E		> 18 mph > 15 mph		$\frac{1}{h}$				<u>≤ 5.00</u>		

%tsf = Percent time spent following %ffs = Percent of free flow speed ats = Average travel speed ru = Rural undeveloped rd = Rural developed

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III DE			Generaliz		Urbar	nized Area	as ¹			
	INTERR			ITIES					W FACILITIES	January 202
							UNINTER		WTACILITIL5	
	STATE SI	GNALIZ	LED ART	ERIALS	5			FREEWAY	7 S	
	Class I (40 n	nph or high	ner posted s	peed limi	t)			Core Urbaniz	zed	
Lanes	Median	В	С	D	Е	Lanes	В	С	D	Е
2	Undivided	*	1,510	1,600	**	4	4,050	5,640	6,800	7,420
4	Divided	*	3,420	3,580	**	6	5,960	8,310	10,220	11,150
6	Divided	*	5,250	5,390	**	8	7,840	10,960	13,620	14,850
8	Divided	*	7,090	7,210	ጥጥ	10	9,800	13,510	17,040	18,580
	Class II (35 r	nph or slov	wer posted	speed lim	it)	12	11,000	10,550	20,950	25,200
Lanes	Median	В	С	D	Е			Urbanized	l	
2	Undivided	*	660	1,330	1,410	Lanes	В	C	D	E
4	Divided	*	1,310	2,920	3,040	4	4,130	5,640	7,070	7,690
0	Divided	*	2,090	4,500	4,590	6	6,200 8,270	8,450	10,510	11,530
0	Divided	·	2,000	0,000	0,150	0 10	0,270 10,350	11,270	17,900	10,220
						10	10,550	14,110	17,510	19,220
	Non-State Si	gnalized R	Roadway A	djustmer	nts		Fı	eewav Adiust	ments	
	(Alte	r correspondi	ng state volun	nes			Auxiliary Lane	s	Ramp	
	l Non-State	by the indicate	ed percent.)	- 10%		Prese	ent in Both Dire	ections	Metering	g
	Non-State	Signanzeu i	xuauways	- 1070			+ 1,800		+ 5%	
	Median	& Turn La	ane Adjus	tments		т	ININTERRI	IPTED FLO	W HIGHW	AVS
Lanes	Median	Exclusive	Exclus Right I	ive A	djustment Factors	Lanes	Median	B	C D	Е
2	Divided	Yes	No No	anes	+5%	2	Undivided	1,050 1,6	20 2,180	2,930
2	Undivided	No	No		-20%	4	Divided	3,270 4,7	'30 5,960	6,780
Multi	Undivided	Yes	No		-5%	6	Divided	4,910 7,0	90 8,950	10,180
Multi	Undivided	No	No		-25%					
_	_	—	168		+ 3%	Ţ	Uninterrupt	ed Flow Highv	vay Adjustme	nts
	One-V	Vay Facili	ty Adjustn	nent		Lanes	Divided	Exclusive left I	anes Adjusti	ment factors ⊥5%
	Multiply t	he correspon	ding two-dire	ectional		 Multi	Undivided	Yes		-5%
	vo	lumes in this	s table by 0.6			Multi	Undivided	No		-25%
] (Multiply v directional roadw	BICYCLE vehicle volum ay lanes to de volum	MODE ² les shown belo etermine two- nes.)	ow by numb way maximi	er of 1m service	¹ Values s are for th constitute computer planning	shown are presented e automobile/truck r e a standard and sho r models from which applications. The ta	as peak hour directio nodes unless specific uld be used only for g this table is derived ble and deriving com	nal volumes for leve ally stated. This tabl general planning app should be used for m puter models should	ls of service and e does not lications. The lore specific not be used for
	Paved					corridor o based on	or intersection desig planning application	n, where more refined as of the HCM and th	l techniques exist. Ca e Transit Capacity a	alculations are nd Quality of
Shot	ilder/Bicycle	р	C	D	Б	Service N	Aanual.	alo and padactrian m	odos in this table is k	acad on
Lan	0-49%	D *	260	D 680	E 1 770	number o	of vehicles, not num	per of bicyclists or pe	destrians using the fa	acility.
	50-84%	190	600	1,770	>1,770	³ Buses pe	er hour shown are only	y for the peak hour in t	he single direction of	the higher traffic
8	35-100%	830	1,700	>1,770	**	flow.				
	PF	DESTRIA	N MODE	2		* Cannot	be achieved using t	able input value defau	ults.	
(N	Aultiply vehicle vo	lumes shown	below by nur	nber of		** Not ap	pplicable for that lev	el of service letter gra	ade. For the automot	oile mode,
dir	rectional roadway	anes to detern volum	mine two-way nes.)	maximum	service	been reac achievabl	ched. For the bicycle le because there is n caults.	mode, the level of se o maximum vehicle v	vrvice letter grade (in volume threshold using	cluding F) is not ng table input
Sidew	alk Coverage	В	C	D	E	Source				
1	0-49%	۰ *	*	250	850	Florida D	Department of Transj	portation		
	JU-84%	* 2.40	150	1.500	1,420	Systems https://ww	Implementation Off ww.fdot.gov/plannir	ice ig/systems/		
	55-100%	340	900	1,560	>1,//0					
	BUS MOI (Buses	DE (Sched) in peak hour	uled Fixed in peak direct	Route) ³						
Sidew	alk Coverage	B	C	D	E					
1	0-0+70	~ 5	<u> </u>	<u> </u>	<u> </u>					

> 4

 \geq 3

 ≥ 2

 ≥ 1

85-100%

Generalized $\ensuremath{\textbf{Peak}}$ Hour $\ensuremath{\textbf{Two-Way}}$ Volumes for Florida's

Urbanized Areas

						January 202					
	Unin	torrunted	Flow Foci	litios		Inte	errupted l	Flow Facil	ties		
INPUT VALUE		lei i upieu		nues		State A	rterials			Class I	
ASSUMPTIONS	Freeways	Core Freeways	High	ways	Cla	iss I	Cla	ss II	Bicycle	Pedestrian	
ROADWAY CHARACTERISTICS			1				1		1		
Area type (urban, rural)	urban	urban									
Number of through lanes (both dir.)	4-10	4-12	2	4-6	2	4-8	2	4-8	4	4	
Posted speed (mph)	70	65	50	50	45	50	30	30	45	45	
Free flow speed (mph)	75	70	55	55	50	55	35	35	50	50	
Auxiliary Lanes (n,y)	n	n									
Median (d, twlt, n, nr, r)				d	n	r	n	r	r	r	
Terrain (l,r)	1	1	1	1	1	1	1	1	1	1	
% no passing zone			80								
Exclusive left turn lane impact (n, y)			[n]	у	у	у	у	у	у	у	
Exclusive right turn lanes (n, y)				-	n	n	n	n	n	n	
Facility length (mi)	3	3	5	5	2	2	1.9	1.8	2	2	
TRAFFIC CHARACTERISTICS											
Planning analysis hour factor (K)	0.090	0.085	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.550	0.560	0.565	0.560	0.565	0.565	
Peak hour factor (PHF)	0.95	0.95	0.95	0.95	1.000	1.000	1.000	1.000	1.000	1.000	
Base saturation flow rate (pcphpl)	2,400	2,400	1,700	2,200	1,950	1,950	1,950	1,950	1,950	1,950	
Heavy vehicle percent	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0	
Speed Adjustment Factor (SAF)	0.975	0.975		0.975							
Capacity Adjustment Factor (CAF)	0.968	0.968		0.968							
% left turns					12	12	12	12	12	12	
% right turns					12	12	12	12	12	12	
CONTROL CHARACTERISTICS											
Number of signals					4	4	10	10	4	6	
Arrival type (1-6)					3	3	4	4	4	4	
Signal type (a, c, p)					с	с	с	с	с	с	
Cycle length (C)					120	150	120	120	120	120	
Effective green ratio (g/C)					0.44	0.45	0.44	0.44	0.44	0.44	
MULTIMODAL CHARACTERIST	ICS										
Paved shoulder/bicycle lane (n, y)									n, 50%, y	n	
Outside lane width (n, t, w)									t	t	
Pavement condition (d, t, u)									t		
On-street parking (n, y)											
Sidewalk (n, y)										n, 50%, y	
Sidewalk/roadway separation(a, t, w)										t	
Sidewalk protective barrier (n, y)										n	
		LEVEL	OF SERV	ICE THR	ESHOLD	S					
	Freeways	High	ways		Arte	rials		Bicycle	Ped	Bus	
Level of Somico	D ''	Two-Lane	Multilane	Cla	iss I	Clas	ss II	G	G	D /	
Service	Density	%ffs	Density	a	ts	a	ts	Score	Score	Buses/nr.	
В	≤17	> 83.3	≤17	> 31	mph	> 22	mph	≤ 2.75	≤ 2.75	≤6	
С	≤24	> 75.0	≤ 24	> 23	mph	> 17	mph	≤ 3.50	≤ 3.50	≤4	
D	≤ 31	> 66.7	≤ 31	> 18	mph	>13	mph	≤ 4.25	≤ 4.25	< 3	
Е	≤ 3 9	> 58.3	≤ 35	> 15 mph		> 10 mph		≤ 5.00	≤ 5.00	< 2	

Transitioning Areas and

Areas Over 5,000 Not In Urbanized Areas¹

					/ ii cus ·	0101 3,000		bullizeu / lie	us			January 2020
		INTERR		LOW FAC	ILITIES			UNINTER	RUPTED	FLOW F	ACILITIES	
ſ		STATE SI	GNALIZ	ZED ART	ſERIAI	LS			FREE	WAYS		
		Class I (40	mph or hig	her posted a	meed lim	it)	Lanes	В	(2	D	E
	Lanes	Median	R R	C	Speeu IIII D	F	4	4,420	5,7	80	6,890	7,110
	2	Undivided	*	1 300	1 46	D **	6	6,400	8,4	90 1	0,200	10,670
	2 1	Divided	*	3,060	3 20	0 **	8	8,420	11,2	20 1	3,530	14,240
	4	Divided	*	5,000	5,20	0 **	10	9,960	13,2	90 1	5,870	17,820
	6	Divided	*	4,690	4,82	0 **						
		Class II (35	mph or slo	wer posted	speed lim	nit)		F	reeway A	djustmen	its	
	Lanes	Median	В	С	D	E		Auxiliary Lane	es		Ramp	
	2	Undivided	*	580	1,20	0 1,280	Pres	ent in Both Dire	ections		Metering	
	4	Divided	*	890	2,59	0 2,850		+ 1,800			+ 5%	
	6	Divided	*	1,440	4,04	0 4,280						
		Non-State Si (Alter t Non-State	gnalized I r correspondi by the indicat Signalized 1	Roadway A ng state volu red percent.) Roadways	Adjustm mes - 10%	ients						
		Median	& Turn L	ane Adju	stments			ININTEDD	UPTFD	FLOW	нснул	vs
	Ŧ		Exclusive	Exclu	isive	Adjustment	Lanos	Median	B	rLUW I		F
	Lanes	Median	Left Lanes	S Right I	Lanes	Factors	Lanes 2	Undivided	1 020	1 560	2 1 1 0	2 840
	2	Undivided	res	INC N	0	+5%		Divided	3 1 1 0	1,300	2,110	2,840
	2 Multi	Undivided	Yes	N	0	-20%	6	Divided	3,110 4,650	6 730	5,070 8,510	0,450
	Multi	Undivided	No	N	0	-25%	0	Divided	4,050	0,750	0,510	9,070
	_	_	-	Ye	es	+ 5%		Uninterrunt	ed Flow	Highway	Adjustmen	ts
							Lanes	Median	Exclusiv	e left lanes	Adjustm	ent factors
		One-V	Vay Facili	ity Adjust	ment		2	Divided	1	Yes	+:	5%
		Multiply t	he correspor	nding two-di	rectional		Multi	Undivided		Yes	-4	5%
		vo	lumes in thi	s table by 0.	6		Multi	Undivided		No	-2	5%
	Shoul	B (Multiply v lirectional roadw Paved der/Bicvcle	vehicle volum ay lanes to d volum	E MODE nes shown be etermine two nes.)	2 low by nur -way maxi	nber of mum service	¹ Values s are for th constitut planning corridor based on Service 1	shown are presented the automobile/truck e a standard and sho r models from which applications. The te or intersection desig t planning application Manual.	as peak hour modes unless build be used of h this table is able and deriv gn, where mor ns of the HCl	directional vo specifically st nly for general derived should ing computer n e refined techn M and the Trar	lumes for levels ated. This table c l planning applic: l be used for mor models should no niques exist. Calc isit Capacity and	of service and loes not ations. The re specific ot be used for culations are Quality of
	Lane	Coverage	В	С	D	Е	21	6		- /		
		0-49%	*	140	550	1,760	number o	of vehicles, not num	ber of bicycli	strian modes in sts or pedestria	ans using the faci	lity.
		50-84%	170	500	1,650) >1,760	³ Buses p	er hour shown are on	ly for the neak	hour in the sing	ale direction of the	higher traffic
	85	5-100%	670	1,760	>1,760	**	flow.	er nour snown are on	ly for the peak	nour in the sing	cic uncedon or the	ingher traine
		DFI	DESTRI		\mathbf{F}^2		* Cannot	t be achieved using	table input va	lue defaults.		
	(Mu dire	ultiply vehicle vo ctional roadway l	lumes shown anes to deter volum	n below by nu mine two-wa nes.)	umber of ay maximu	m service	** Not a volumes been read achievab	pplicable for that lev greater than level of ched. For the bicycle ble because there is r	vel of service f service D be e mode, the le no maximum	letter grade. F come F becau evel of service vehicle volume	or the automobile se intersection ca letter grade (inclu- e threshold using	e mode, pacities have uding F) is not table input
	Sidewa	lk Coverage	В	С	D	E	value det	faults.				•
		0-49%	*	*	250	850	Source:					
		50-84%	*	150	780	1,410	Florida I	Department of Trans	portation			
	8	85-100%	340	950	1,540	>1,760	https://w	ww.fdot.gov/planni	ng/systems/			
		BUS MOD	E (Sched	uled Fix	ed Rout	$(e)^3$						
	C' 1	(Buses	m peak nour			F						
	Sidewa	uk Coverage	В			E						
ļ	(J-84%	> 5	<u>≥</u> 4	≥ 5	≥ 2						
	8.	5-100%	>4	>1	>2	~						

Transitioning Areas and

Areas Over 5,000 Not In Urbanized Areas

January 2020

	T I at the design	Interrupted Flow Facilities				ities				
INPUT VALUE	Uninterru	ipted Flow	Facilities		St	ate A	rterials		Cla	iss I
ASSUMPTIONS	Freeways	High	ways	Cla	ass I		Cla	ss II	Bicycle	Pedestrian
ROADWAY CHARACTERISTICS										
Area type (urban, rural)	urban									
Number of through lanes (both dir.)	4-10	2	4-6	2	4-6	5	2	4-6	4	4
Posted speed (mph)	70	50	50	45	50		30	30	45	45
Free flow speed (mph)	75	55	55	50	55		35	35	50	50
Auxiliary lanes (n,y)	n									
Median (d, n, nr, r)			d	n	у		n	у	r	r
Terrain (l,r)	1	1	1	1	1		1	1	1	1
% no passing zone		60								
Exclusive left turn lane impact (n, y)		[n]	у	у	У		у	У	у	у
Exclusive right turn lanes (n, y)				n	n n		n	n	n	n
Facility length (mi)	6	5	5	1.8	2		2	2	2	2
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.098	0.090	0.090	0.090	090 0.090		0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.55	0.55	0.55	0.550	0.57	0	0.570	0.565	0.570	0.570
Peak hour factor (PHF)	0.92	0.92	0.92	1.000	1.00	00	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)	2,400	1,700	2,200	1,950	1,95	50	1,950	1,950	1,950	1,950
Heavy vehicle percent	9.0	4.0	4.0	2.0	3.0)	2.0	3.0	3.0	3.0
Speed Adjustment Factor (SAF)	0.975		0.975							
Capacity Adjustment Factor (CAF)	0.968		0.968							
% left turns				12	12		12	12	12	12
% right turns				12	12		12	12	12	12
CONTROL CHARACTERISTICS										
Number of signals				5	4		10	10	4	6
Arrival type (1-6)				4	3		4	4	4	4
Signal type (a, c, p)				с	с		с	с	с	c
Cycle length (C)				120	150)	120	150	120	120
Effective green ratio (g/C)				0.44	0.4	5	0.44	0.45	0.44	0.44
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)									n, 50%, y	n
Outside lane width (n, t, w)									t	t
Pavement condition (d, t, u)									t	
On-street parking (n, y)									n	n
Sidewalk (n, y)										n, 50%, y
Sidewalk/roadway separation (a, t, w)										t
Sidewalk protective barrier (n, y)										n
	LEV	EL OF SE	RVICE T	HRESHOI	LDS				1	1
	Freeways	High	ways		Arter	ials		Bicycle	Ped	Bus
Level of Somioo	D. I.	Two-Lane	Multilane	Class I		(Class II			D 1
Service	Density	%ffs	Density	ats			ats	Score	Score	Buses/nr.
В	≤17	> 83.3	≤17	> 31 m	ph	>	22 mph	≤ 2.75	≤ 2.75	≤6
С	≤24	> 75.0	≤ 24	> 23 m	ph	>	17 mph	≤ 3.50	≤ 3.50	≤4
D	≤ 31	> 66.7	≤ 31	>18 m	ph	>	13 mph	≤4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph		> 10 mph		≤ 5.00	≤ 5.00	< 2

Rural Undeveloped Areas and

Developed Areas Less Than 5,000 Population¹

			L	reveloped			,000 i opula	tion			January 202
	INTERR	UPTED F	LOW FAC	ILITIES			UNINTER	RUPTED	FLOW F	ACILITIES	
	STATE SI	GNALIZ	ZED AR	FERIALS	5			FREE	WAYS		
Lanes	Median	В	С	D	E	Lanes	В	(2	D	E
2	Undivided	*	1,220	1,350	**	4	3,650	5,04	0	5,950	6,640
4	Divided	*	2,790	2,890	**	6	5,130	7,25	0	8,670	9,950
6	Divided	*	4,300	4,350	**	8	6,600	9,49	0 1	1,380	13,270
	Non-State Si	gnalized]	Roadway	Adjustme	nts		F	reewav A	djustmen	ts	
	(Alter	correspond	ing state volu	imes				Auxilia	ry Lanes		
	t Non-State	by the indica Signalized	ted percent.) Roadways	- 10%			Pr	esent in Bo + 1,	oth Directio ,800	ns	
	Median	& Turn I	Lane Adju	stments	diustmont	ι	UNINTERR	UPTED	FLOW I	HIGHWA	YS
Lanes	Median	Left Lane	s Right	Lanes A	Factors		1	Dunal II.			- 0
2	Divided	Yes	N	0	+5%	T	Mattan	Kural Un	developed		Б
2	Undivided	No	Ν	0	-20%	Lanes	Median	В	C	D	E
Multi	Undivided	Yes	Ν	0	-5%	2	Undivided	440	820	1,330	2,710
Multi	Undivided	No	N	0	-25%	4	Divided	2,960	4,270	5,290	5,960
-	-	-	Y	es	+ 5%	6	Divided	4,450	6,420	7,930	8,950
								Develop	ed Areas		
	One-V	Vay Facil	ity Adjust	ment		Lanes	Median	В	С	D	E
	Multiply the	he correspon	nding two-d	irectional		2	Undivided	980	1,490	2,020	2,710
	vo	lumes in thi	is table by 0.	.6		4	Divided	2.780	4.020	5,130	5.850
						6	Divided	4 180	6 040	7 710	8 780
						Alter I	Pass	sing Lane	Adjustm	ents	length to
	B (Multiply v	ehicle volum	E MODE nes shown be	2 elow by numb	er of	Alter L	the	highway s	egment len	gth	length to
(directional roadw	ay lanes to d	letermine two	o-way maxim	um service		Uninterrupt	ed Flow l	Highway A	Adjustmen	ts
		voiu	nes.)			Lanes	Median	Exclusiv	e left lanes	Adjustme	ent factors
	I	Rural Uno	developed			2	Divided	У	es	+:	5%
	Paved					Multi	Undivided	У	es	-5	5%
Shoul	der/Bicycle					Multi	Undivided	1	No	-2	5%
Lane	e Coverage	В	С	D	E						
	0-49%	*	120	190	300						
	50-84%	100	200	310	1.010	¹ Values	shown are presented	as peak hour	directional vol	umes for levels	of service and
9	85-100%	250	370	1 760	>1 760	constitut	e a standard and sho	uld be used or	nly for general	planning applica	ations. The
•	0.5 10070	230		1,700	/1,/00	compute	r models from which	h this table is	derived should	be used for mor	e specific
	_	Develope	ed Areas			corridor	or intersection desig	in, where more	e refined techn	iques exist. Calc	ulations are
	Paved					based on	planning applicatio	ns of the HCM	1 and the Tran	sit Capacity and	Quality of
Shoul	der/Bicycle					Service I	Manual.				
Lane	e Coverage	В	С	D	E	² Level o	of service for the bic	cle and pedes	strian modes ir	this table is bas	ed on number
	0-49%	*	220	460	1,480	of vehicl	es, not number of bi	cyclists or peo	destrians using	the facility.	
5	0-84%	170	430	1,270	>1,760	* Canno	t be achieved using t	able input val	ue defaults.		
8	5-100%	560	1,760	>1,760	**	** Not a	pplicable for that lev	vel of service	letter grade. Fo	or the automobile	e mode,
	PFI	DESTRI	AN MOI	$)E^2$		volumes	greater than level of	f service D be	come F becaus	e intersection ca	pacities have
(Mu dire	ultiply vehicle vo ctional roadway l	lumes shown anes to deten volut	n below by n rmine two-wa nes.)	umber of ay maximum	service	achievab value des	faults.	o maximum v	vehicle volume	threshold using	table input
a. 1	11.0	~	~~~~		_	Florida I	Department of Trans	portation			
Sidewa	alk Coverage	В	C	D	E	Systems	Implementation Off	ïce			
	0-49%	*	*	220	840	https://w	ww.fdot.gov/planni	ng/systems/			
	50-84%	*	120	780	1,390						
1	85-100%	320	940	1,560	>1.820						

Rural Undeveloped Areas and

Developed Areas Less Than 5,000 Population

INPUT VALUE		pted Flow	Facilities		Interrupted Flow Facilities						
ASSUMPTIONS	Г	Higł	iways		A .		D.	D 1 ()			
	Freeways	Undev	veloped	Deve	loped	Arte	erials	Віс	ycle	Pedestrian	
ROADWAY CHARACTERISTIC	S										
Area type (urban, rural)	rural										
Number of through lanes (both dir.)	4-8	2	4-6	2	4-6	2	4-6	4	4	2	
Posted speed (mph)	70	55	55	50	50	45	45	55	45	45	
Free flow speed (mph)	75	60	60	55	55	50	50	60	50	50	
Auxiliary lanes (n,y)	n										
Median (d, n, nr, r)			d		d	n	r	r	r	n	
Terrain (l,r)	1	1	1	1	1	1	1	1	1	1	
% no passing zone		20		60							
Exclusive left turn lanes (n, y)		[n]	у	[n]	у	у	у	у	У	у	
Exclusive right turn lanes (n, y)						n	n	n	n	n	
Facility length (mi)	18	10	10	5	5	1.9	2.2	4	2	2	
TRAFFIC CHARACTERISTICS											
Planning analysis hour factor (K)	0.105	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.55	0.550	0.550	0.570	0.570	0.550	
Peak hour factor (PHF)	0.88	0.88	0.88	0.88	0.88	1.000	1.000	1.000	1.000	1.000	
Base saturation flow rate (pcphpl)	2,400	1.700	2.200	1.700	2.200	1.950	1.950	1.950	1.950	1.950	
Heavy vehicle percent	12.0	5.0	12.0	5.0	8.0	3.0	3.0	6.0	3.5	3.0	
Speed Adjustment Factor (SAF)	0.975		0.975		0.975						
Capacity Adjustment Factor (CAF)	0.968		0.968		0.968						
% left turns						12	12		12	12	
% right turns						12	12		12	12	
CONTROL CHARACTERISTICS	<u> </u>										
Number of signals						5	6	2	4	4	
Arrival type (1.6)						3	0	2	4	4	
Signal type (1-0)						5	3	5	5	3	
Signal type (a, c, p)						C 00	C 00	a	a	a	
Effective green ratio (g/C)						90	90	0.27	90	90	
MULTIMODAL CHARACTERIS	TICS					0.44	0.44	0.37	0.44	0.44	
MULTIMODAL CHARACTERIS			1	1		1	1	500/	500/		
Paved shoulder/bicycle lane (n, y)								n,50%,y	n,50%,y	n	
Outside lane width (h, t, w)								t	t	t	
Pavement condition (d, t, u)								t	t	50.11	
Sidewalk (n, y)										n,50%,y	
Sidewalk/roadway separation(a, t,w)										t	
Sidewalk protective barrier (n, y)										n	
		LEVE	L OF SER	VICE TH	RESHOLI	DS					
Level of	Free	ways			[High	iways		r		
Service			Two-I	lane ru	Two-l	Lane rd	Multi	lane ru	Multi	lane rd	
	Den	sity	%tsf	ats	%	ffs	De	nsity	De	nsity	
B] 	4	≤ 50	<u>< 55</u>	> 8	3.3		14		14	
С	≤ 2	22	≤ 65	<u>< 50</u>	>7	5.0	≤	22		22	
D	≤2	29	≤ 80	<u>≤45</u>	> 6	6.7		29		29	
E	≤ 3	36	> 80	<u><</u> 40	> 5	8.3	\leq	34		34	
Lovelof		Artorio	le		Ria	vele		D	edestriar		
Level 01 Service	M	aior City/C	io (atc)			ore		1	Score		
R	1112	> 31 mm	h		< ^	0.75			< 2.75		
C		> 23 mr	h		<u> </u>	8 50			< 3 50		
		> 18 mr	h		<u> </u>	1.25			< 4.25		
E		$> 15 m_{\rm p}$	oh		 <	5.00		< 5 00			

%tsf = Percent time spent following %ffs = Percent of free flow speed ats = Average travel speed ru = Rural undeveloped rd = Rural developed

ary 2020

					Urbar	nized Are	as				January 202	
	INTERI	RUPTED F		LITIES			UNINTER	RUPTED	FLOW F	ACILITIES		
	STATE S	IGNALI	ZED ART	TERIALS	5	FREEWAYS						
	Class I (40 1	nph or hig	her posted	speed limi	t)	Core Urbanized						
Lanes	Median	В	C	D	Е	Lanes	B	C		D	E	
1	Undivided	*	830	880	**	2	2,230	3,10	00	3,740	4,080	
2	Divided	*	1,910	2,000	**	3	3,280	4,57	0	5,620	6,130	
3	Divided	*	2,940	3,020	**	4	4,310	6,03	0	7,490	8,170	
4	Divided	*	3,970	4,040	**	5	5,390	/,43	0	9,370	10,220	
	Class II (35	mph or slo	wer posted	speed limit	it)	0	0,380	8,99	. 0	11,510	12,700	
Lanes	Median	В	С	D	E			Urbar	nized			
1	Undivided	*	370	750	800	Lanes	В	C		D	E	
2	Divided	*	730	1,630	1,700	2	2,270	3,10	00	3,890	4,230	
3	Divided	*	1,170	2,520	2,560	3	3,410	4,65	50	5,780	6,340	
4	Divided	*	1,610	3,390	3,420	4	4,550	6,20	00	7,680	8,460	
						5	5,690	7,76	50	9,520	10,570	
	Non-State S	ignalized	Roadway A	Adjustmer	nts		F	reeway Ac	ljustmen	its		
	(Alte	er correspond	ing state volu	mes			Auxiliary			Ramp		
	Non-State	Signalized	Roadways	- 10%			Lane + 1,000			Metering + 5%		
	Median	& Turn I	Lane Adjus	stments			,					
		Exclusive	e Exclu	sive A	djustment	L I	JNINTERR	UPTED I	FLOW I	HIGHWA	AYS _	
Lanes	Median	Left Lane	s Right I	Lanes	Factors	Lanes	Median	B	С	D	E	
1	Divided	Yes	No)	+5%		Undivided	580	890	1,200	1,610	
l Multi	Undivided	NO Vos)	-20% 5%	2	Divided	1,800	2,600	3,280	3,/30 5,(00	
Multi	Undivided	No	N)	-25%	5	Divided	2,700	5,900	4,920	3,000	
—	_	-	Ye	S	+ 5%		Uninterrupt	ed Flow H	lighway .	Adjustmen	its	
	One-'	Way Facil	ity Adjust	ment		Lanes	Median	Exclusive	left lanes	Adjustm	ent factors	
	Multiply	the correspo	nding direction	onal			Divided	Ye	es	+	·5%	
	V	olumes in th	is table by 1.2	2		Multi	Undivided	Y C N	o		5% 25%	
		BICYCL	E MODE ²			¹ Values s	shown are presented	l as peak hour d	lirectional vo	lumes for levels	of service and	
	(Multiply	vehicle volu	nes shown be	low by number	er of .	are for th	e automobile/truck	modes unless s ould be used on	pecifically st	ated. This table	does not cations. The	
	directional roady	vay lanes to c	letermine two	-way maximu	im service	computer	models from which	h this table is d	erived should	be used for mo	re specific	
	Davad	voiu	ines.)			planning corridor of	applications. The ta or intersection desig	able and derivin n, where more	ig computer i refined techr	models should n niques exist. Cal	ot be used for culations are	
Shou	raveu Ider/Biovele					based on	planning applicatio	ons of the HCM	and the Tran	sit Capacity and	l Quality of	
Lane	e Coverage	В	C	D	Е	Service N	lanual.					
Lan	0-49%	*	150	390	1.000	² Level of	f service for the bic	ycle and pedest	rian modes in	n this table is ba	sed on	
4	50-84%	110	340	1.000	>1.000		or venicies, not num	idei of dicyclist	s or pedesura	ans using the rac	iiity.	
8	5-100%	470	1,000	>1,000	**	³ Buses pe flow.	er hour shown are on	ly for the peak h	our in the sing	gle direction of th	e higher traffic	
	Pl	EDESTRI	AN MODI	\mathbb{E}^2		* Cannot	be achieved using	table input valu	e defaults.			
(M	lultiply vehicle v	olumes show	n below by nu	mber of	ervice	** Not ap	pplicable for that le	vel of service le	etter grade. F	or the automobil	le mode,	
und		volu	mes.)	y maximum s	Service	been read	greater than level or ched. For the bicvel	f service D bec e mode, the lev	ome F becaus el of service	se intersection c letter grade (inc)	apacities have luding F) is not	
Sidew	alk Coverage	R	C	Л	F	achievabl	le because there is r	no maximum ve	chicle volume	e threshold using	g table input	
Slucw	0-49%	ы *	*	140	480	value del	auits.					
4	50-84%	*	80	440	800	Source: Florida D	Department of Trans	portation				
8	5-100%	200	540	880	>1,000	Systems https://ww	Implementation Off ww.fdot.gov/planni	fice ng/systems/				
	BUS MO	DE (Sched	luled Fixed	l Route) ³								
	(Buse	s in peak hou	r in peak dired	ction)								
Sidewa	alk Coverage	В	С	D	E							
	0-84%	> 5	≥ 4	\geq 3	≥ 2							
8	5-100%	>4	\geq 3	≥ 2	≥ 1							

Urbanized Areas

lanuary	/ 20	20
Januar	y ∠0	20

					Interrupted Flow Facilities						
INPUT VALUE	Unin	iterrupted	Flow Faci	lities	State Arterials Class I						
ASSUMPTIONS	Freeways	Core Freeways	High	ways	Cla	iss I	Cla	ss II	Bicycle	Pedestrian	
ROADWAY CHARACTERISTICS	1	1	1		8		1		1	1	
Area type (urban, rural)	urban	urban									
Number of through lanes (both dir.)	4-10	4-12	2	4-6	2	4-8	2	4-8	4	4	
Posted speed (mph)	70	65	50	50	45	50	30	30	45	45	
Free flow speed (mph)	75	70	55	55	50	55	35	35	50	50	
Auxiliary Lanes (n,y)	n	n									
Median (d, twlt, n, nr, r)				d	n	r	n	r	r	r	
Terrain (l,r)	1	1	1	1	1	1	1	1	1	1	
% no passing zone			80								
Exclusive left turn lane impact (n, y)			[n]	у	у	у	у	у	у	у	
Exclusive right turn lanes (n, y)					n	n	n	n	n	n	
Facility length (mi)	3	3	5	5	2	2	1.9	1.8	2	2	
TRAFFIC CHARACTERISTICS											
Planning analysis hour factor (K)	0.090	0.085	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.550	0.560	0.565	0.560	0.565	0.565	
Peak hour factor (PHF)	0.95	0.95	0.95	0.95	1.000	1.000	1.000	1.000	1.000	1.000	
Base saturation flow rate (pcphpl)	2,400	2,400	1,700	2,200	1,950	1,950	1,950	1,950	1,950	1,950	
Heavy vehicle percent	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0	
Speed Adjustment Factor (SAF)	0.975	0.975		0.975							
Capacity Adjustment Factor (CAF)	0.968	0.968		0.968							
% left turns					12	12	12	12	12	12	
% right turns					12	12	12	12	12	12	
CONTROL CHARACTERISTICS					•						
Number of signals					4	4	10	10	4	6	
Arrival type (1-6)					3	3	4	4	4	4	
Signal type (a, c, p)					с	с	с	с	с	с	
Cycle length (C)					120	150	120	120	120	120	
Effective green ratio (g/C)					0.44	0.45	0.44	0.44	0.44	0.44	
MULTIMODAL CHARACTERIST	ICS	I			8	1	1	I	1	1	
Paved shoulder/bicycle lane (n, y)									n, 50%, y	n	
Outside lane width (n, t, w)									t	t	
Pavement condition (d, t, u)									t		
On-street parking (n, y)											
Sidewalk (n, y)										n, 50%, y	
Sidewalk/roadway separation(a, t, w)										t	
Sidewalk protective barrier (n, y)										n	
	1	LEVEL	OF SERV	ICE THR	ESHOLD	S	1	I	1	1	
	Freeways	High	ways		Arte	rials		Bicycle	Ped	Bus	
Level of Sorvigo	Derrit	Two-Lane	Multilane	Cla	ass I	Cla	ss II	S	S	Du /1	
Service	Density	%ffs	Density	a	ts	a	ts	Score	Score	Buses/hr.	
В	≤ 17	> 83.3	≤17	> 31	mph	> 22	mph	≤ 2.75	≤ 2.75	≤ 6	
С	≤24	> 75.0	≤ 24	> 23	mph	> 17	mph	≤ 3.50	≤ 3.50	≤4	
D	≤ 31	> 66.7	≤ 3 1	> 18	mph	> 13	mph	≤ 4.25	≤ 4.25	< 3	
E	≤ 3 9	> 58.3	≤ 35	> 15	mph	> 10 mph		≤ 5.00	≤ 5.00	< 2	

Transitioning Areas and

Areas Over 5,000 Not In Urbanized Areas¹

				Ai cus c	VCI 5,000 I			45			January 2020	
	INTERR		LOW FAC	CILITIES		UNINTERRUPTED FLOW FACILITIES						
	STATE SI	GNALIZ	ZED AR	TERIAL	S	FREEWAYS						
	Class I (40	mph or hig	her nosted	speed limit		Lane	s B	(2	D	E	
Lanos	Median	nipii of ing R	nei posteu	D	F	2	2,430	3,1	80	3,790	3,910	
	Undivided	Б *	710	200	Е **	3	3,520	4,6	70	5,610	5,870	
	Divided	4. 4	1 7 4 0	1 820	**	4	4,630	6,1	70	7,440	7,830	
	Divided	т	1,740	1,820	**	5	5,480	7.3	10	8,730	9,800	
3	Divided	*	2,670	2,740	**		- ,	-)-		- ,	- ,	
	Class II (35	mph or slo	wer posted	l speed limi	t)		F	reewav A	djustme	nts		
Lanes	Median	B	Ċ	D	E		Auxiliary	·	0	Ramp		
1	Undivided	*	330	680	720		Lane			Metering		
2	Divided	*	500	1.460	1.600		+ 1,000			+ 5%		
3	Divided	*	810	2,280	2,420							
	Non-State Si	gnalized I	Roadway	Adjustme	ents							
	(Alter	r correspondi	ing state vol	umes								
		by the indical	ted percent.)	1.00/								
	Non-State	Signalized	Roadways	- 10%								
	Median	& Turn L	ane Adju	stments		L T	ININITEDD	UDTED	FLOW	шсцул	VS	
		Exclusive	e Excl	usive A	Adjustment	Lanac	Madian		FLUW			
Lanes	Median	Left Lane	s Right	Lanes	Factors	Lanes	Median	Б 5(0		D	E	
	Divided	Yes	N		+5%			500	800	1,100	1,560	
	Undivided	NO	N	10 T-	-20%	2	Divided	1,/10	2,470	3,120	3,550	
Multi	Undivided	res	IN N	NO To	-3% 25%	3	Divided	2,560	3,700	4,680	5,320	
Iviuiu	Ullalvidea	INO	r v		-2.3%							
_	—	-	1	63	+ 3 %		Uninterrupt	ed Flow 1	Highway	Adjustmen	ts	
	One-V	Vav Facili	ity Adius	tment		Lanes	Median	Exclusiv	e left lanes	s Adjustm	ent factors	
	Multiply f	he correspon	nding direct	ional		1	Divided)	les	+	5%	
	vo	dumes in thi	s table by 1	2		Multi	Undivided	Y	les	-	5%	
						Multi	Undivided	1	No	-2	.5%	
	В	ICYCLI	E MODE	2^{2}		¹ Values s	shown are presented	as peak hour	directional vo	olumes for levels	of service and	
	(Multiply v	vehicle volun	nes shown b	elow by num	ber of	are for th	e automobile/truck	modes unless ould be used o	specifically s	stated. This table	does not ations The	
	directional roadw	ay lanes to d	etermine two	o-way maxin	num service	computer	models from which	h this table is	derived shoul	d be used for mo	re specific	
		volur	nes.)			planning corridor	applications. The ta	able and deriv	ing computer	models should n	ot be used for	
	Paved					based on	planning applicatio	ns of the HCM	A and the Tra	nsit Capacity and	Quality of	
Shou	lder/Bicycle					Service N	Aanual.					
Lan	e Coverage	В	С	D	E	² Level of	f service for the bic	vcle and pede	strian modes i	in this table is ba	sed on	
	0-49%	*	140	320	1,000	number o	of vehicles, not num	ber of bicyclis	sts or pedestri	ians using the fac	ility.	
	50-84%	100	280	940	>1,000	³ Buses pe	er hour shown are on	lv for the peak	hour in the sin	gle direction of the	e higher traffic	
	85-100%	380	1,000	>1,000	**	flow.		-) 				
	PE	DESTRL	AN MOI	DE^2		* Cannot	be achieved using	table input val	ue defaults.			
(M	Iultiply vehicle vo	olumes shown	n below by r	umber of		** Not at	onlicable for that lev	vel of service	letter grade H	For the automobil	e mode	
dire	ectional roadway l	lanes to deter	mine two-w	ay maximun	n service	volumes	greater than level of	f service D be	come F becau	ise intersection c	apacities have	
		volur	nes.)			been read	ched. For the bicycle	e mode, the le	vel of service	e letter grade (incl	uding F) is not	
Sidew	alk Coverage	В	С	D	Е	value def	aults.		venicie voluin	ie unesnoid using	table input	
	0-49%	*	*	140	480	Source:						
	50-84%	*	80	440	800	Florida D	Department of Trans	portation				
	85-100%	200	540	880	>1,000	https://w	ww.fdot.gov/planni	ng/systems/				
	BUS MOD	E (Sched	luled Fix	ed Route	$e)^3$							
	(Buses	in peak hour	in peak dir	ection)	1							
Sidew	alk Coverage	R	C	Ď	F							
Sidew	0.84%	ی ۲	> 1	>3	> 2							
0	5_100%	> J \ 1	<u>~</u> + > 3	~ 5 > 7	>1							
0	5-10070	<u> </u>	<u> </u>	<u> </u>	<u> </u>							

TABLE 8 (continued)

Generalized Peak Hour Directional Volumes for Florida's

Transitioning Areas and

Areas Over 5,000 Not In Urbanized Areas

January 2020

	T T • 4		F !!	Interrupted Flow Facilities						
INPUT VALUE	Uninterru	ipted Flow	Facilities		State	Arterials	Class I			
ASSUMPTIONS	Freeways	Highways		Class I		Cla	Class II		Pedestrian	
ROADWAY CHARACTERISTICS										
Area type (urban, rural)	urban									
Number of through lanes (both dir.)	4-10	2	4-6	2	4-6	2	4-6	4	4	
Posted speed (mph)	70	50	50	45	50	30	30	45	45	
Free flow speed (mph)	75	55	55	50	55	35	35	50	50	
Auxiliary lanes (n,y)	n									
Median (d, n, nr, r)			d	n	у	n	у	r	r	
Terrain (l,r)	1	1	1	1	1	1	1	1	1	
% no passing zone		60								
Exclusive left turn lane impact (n, y)		[n]	у	у	у	у	у	у	у	
Exclusive right turn lanes (n, y)				n	n n		n	n	n	
Facility length (mi)	6	5	5	1.8	2	2	2	2	2	
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.098	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	
Directional distribution factor (D)	0.55	0.55	0.55	0.550	0.570	0.570	0.565	0.570	0.570	
Peak hour factor (PHF)	0.92	0.92	0.92	1.000	1.000	1.000	1.000	1.000	1.000	
Base saturation flow rate (pcphpl)	2,400	1,700	2,200	1,950	1,950	1,950	1,950	1,950	1,950	
Heavy vehicle percent	9.0	4.0	4.0	2.0	3.0	2.0	3.0	3.0	3.0	
Speed Adjustment Factor (SAF)	0.975		0.975							
Capacity Adjustment Factor (CAF)	0.968		0.968							
% left turns				12	12	12	12	12	12	
% right turns				12	12	12	12	12	12	
CONTROL CHARACTERISTICS	-									
Number of signals				5	4	10	10	4	6	
Arrival type (1-6)				4	3	4	4	4	4	
Signal type (a, c, p)				с	с	с	с	с	с	
Cycle length (C)				120	150	120	150	120	120	
Effective green ratio (g/C)				0.44	0.45	0.44	0.45	0.44	0.44	
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)								n, 50%, y	n	
Outside lane width (n, t, w)								t	t	
Pavement condition (d, t, u)								t		
On-street parking (n, y)								n	n	
Sidewalk (n, y)									n, 50%, y	
Sidewalk/roadway separation (a, t, w)									t	
Sidewalk protective barrier (n, y)									n	
	LEV	EL OF SE	RVICE T	HRESHOI	LDS			1		
	Freeways	High	wavs		Arteria	s	Bicvcle	Ped	Bus	
Level of		Two-Lane	Multilane	Class	I	Class II	1	1	1	
Service	Density	%ffs	Density	ats		ats	ats		Buses/hr.	
В	≤17	> 83.3	≤17 [°]	> 31 m	ph	> 22 mph	≤ 2.75	≤ 2.75	≤6	
С	 ≤24	>75.0	 ≤ 24	> 23 m	ph	> 17 mph	<u>≤</u> 3.50	<u>≤</u> 3.50	<u> </u>	
D		> 66.7	≤31	> 18 m	ph	> 13 mph	≤ 4.25	 ≤ 4.25	< 3	
E	< 39	> 58.3	< 35	> 15 m	ph	> 10 mph	< 5.00	< 5.00	< 2	

Rural Undeveloped Areas and

Developed Areas Less Than 5,000 Population¹

			L	Jeveloper	January 202								
	INTERR	UPTED F	LOW FAC	CILITIES		UNINTERRUPTED FLOW FACILITIES							
	STATE SI	GNALIZ	ZED AR'	TERIALS	S	FREEWAYS							
Lanes	Median	В	С	D	Е	Lanes	В	(2	D	Е		
1	Undivided	*	670	740	**	2	2,010	2,7	70	3,270	3,650		
2	Divided	*	1,530	1,580	**	3	2,820	3,9	90	4,770	5,470		
3	Divided	*	2,360	2,400	**	4	3,630	5,2	20	6,260	7,300		
	Non-State Signalized Roadway Adjustments (Alter corresponding state volumes by the indicated percent.) Non-State Signalized Roadways - 10%						Freeway Adjustments Auxiliary Lane + 1,000						
	Median	& Turn I Exclusive	istments usive A	djustment	UNINTERRUPTED FLOW HIGHWAYS								
Lanes	Median Divided	Left Lane	s Right	Lanes	Factors			Rural Un	develope	d			
1	Undivided	No	N	lo	-20%	Lanes	Median	В	Ĉ	D	E		
Multi	Undivided	Yes	Ň	lo	-5%	1	Undivided	240	450	730	1,490		
Multi	Undivided	No	N	lo	-25%	2	Divided	1,630	2,350	2,910	3,280		
-	—	_	Y	es	+ 5%	3	Divided	2,450	3,530	4,360	4,920		
	One-V	Vay Facil	ity Adjus	tment				Develop	ed Areas				
	Multiply t	lumes in thi	nung urect	2		Lanes	Median	В	С	D	E		
	vu		is table by 1	.2		1	Undivided	540	820	1,110	1,490		
						2	Divided	1,530	2,210	2,820	3,220		
						3	Divided	2,300	3,320	4,240	4,830		
	(Multiply v directional roadw	vehicle volur ay lanes to d volur	nes shown be letermine two mes.)	elow by numb o-way maxim	per of um service	Alter L	OS B-D volum	nes in propo e highway s	ortion to the segment ler	e passing lane	length to		
	j	Rural Un	developed	Į		Lanes	Median	Exclusiv	e left lanes	Adjustme	ent factors		
	Paved		r	-		1	Divided	Y	les	+4	5%		
Shou	Ilder/Bicycle					Multi	Undivided	У	les	-5	5%		
Lan	e Coverage	В	С	D	E	Multi	Undivided	1	No	-2.	5%		
	0-49%	*	70	110	170	¹ Values	shown are presented	d as neak hour	directional vo	lumes for levels	of service and		
	50-84%	60	120	180	580	are for th	e automobile/truck	modes unless	specifically st	tated. This table d	oes not		
	85-100%	140	210	1,000	>1,000	constitut compute	e a standard and she r models from whic	ould be used of this table is	nly for genera derived should	l planning applica d be used for mor	tions. The especific		
		Develop	ed Areas			planning	applications. The t	able and derive	ing computer	models should no	t be used for		
Chou	Paved	•				based on Service I	planning application Manual.	ons of the HCN	A and the Tra	nsit Capacity and	Quality of		
	e Coverage	R	C	Л	F	² Level o	f service for the big	vele and pade	strian modes i	n this table is bee	ed on number		
	0_10%	D *	120	D 260	E 8/0	of vehicl	es, not number of b	picyclists or pe	destrians using	g the facility.	a on number		
	50-84%	100	240	720	1,000	* Canno	t be achieved using	table input val	lue defaults.				
	85-100%	320	1,000	>1,000	**	** Not a	pplicable for that le	vel of service	letter grade F	or the automobile	mode.		
	PFI	DESTRI	ΔΝ ΜΟΙ	\mathbf{DE}^2		volumes	greater than level of	of service D be	come F becau	se intersection ca	pacities have		
(N dir	fultiply vehicle vo ectional roadway	lumes shown	n below by n rmine two-w	umber of ay maximum	service	achievab value de	le because there is faults.	no maximum v	vehicle volum	e threshold using	table input		
		volui	nes.)			Source: Florida I	Department of Tran	sportation					
Sidew	alk Coverage	В	С	D	E	Systems	Implementation Of	fice					
	0-49%	*	*	120	460	https://w	ww.fdot.gov/plann	ing/systems/					
	50-84%	*	80	430	770								
	85-100%	180	520	860	>1,000								

Rural Undeveloped Areas and

Developed Areas Less Than 5,000 Population

INPUT VALUE		upted Flow		Interrupted Flow Facilities							
ASSUMPTIONS	Freeways Undeveloped Developed				Arte	Arterials Bio			Pedestrian		
ROADWAY CHARACTERISTIC	S	Under	veloped	Deve	loped						
Area type (urban, rural)	rural										
Number of through lanes (both dir.)	4-8	2	4-6	2	4-6	2	4-6	4	4	2	
Posted speed (mph)	70	55	55	50	50	45	45	55	45	45	
Free flow speed (mph)	75	60	60	55	55	50	50	60	50	50	
Auxiliary lanes (n,y)	n										
Median (d, n, nr, r)			d		d	n	r	r	r	n	
Terrain (l,r)	1	1	1	1	1	1	1	1	1	1	
% no passing zone		20		60							
Exclusive left turn lanes (n, y)		[n]	у	[n]	у	у	у	у	у	у	
Exclusive right turn lanes (n, y)					-	n	n	n	n	n	
Facility length (mi)	18	10	10	5	5	1.9	2.2	4	2	2	
TRAFFIC CHARACTERISTICS										1	
Planning analysis hour factor (K)	0.105	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.55	0.550	0.550	0.570	0.570	0.550	
Peak hour factor (PHF)	0.88	0.88	0.88	0.88	0.88	1.000	1.000	1.000	1.000	1.000	
Base saturation flow rate (pcphpl)	2.400	1.700	2.200	1.700	2.200	1.950	1.950	1.950	1.950	1.950	
Heavy vehicle percent	12.0	5.0	12.0	5.0	8.0	3.0	3.0	6.0	3.5	3.0	
Speed Adjustment Factor (SAF)	0.975	5.0	0.975	5.0	0.975	5.0	5.0	0.0	5.5	5.0	
Capacity Adjustment Factor (CAF)	0.968		0.968		0.968						
% left turns	0.7 00					12	12		12	12	
% right turns						12	12		12	12	
CONTROL CHARACTERISTICS				1	1	12	12		12	12	
Number of signals						5	6	2	4	4	
Arrival type (1.6)						3	0	2	4	4	
Signal type (1-0)						3	3	3	3	3	
$\frac{\text{Signal type } (a, c, p)}{\text{Cycle length } (C)}$						00	00	a 60	a 00	a 00	
Effective green ratio (g/C)						90	90	0.37	90	90	
MULTIMODAL CHARACTERIS	TICS					0.44	0.44	0.57	0.44	0.44	
David should ar / historia lang (n. y)	1105		r			r	T		500/	1	
$\frac{1}{2} \frac{1}{2} \frac{1}$								n,30%,y	n,30%,y	11	
Decement and iting (d, t, w)								t	t	t	
Pavement condition (d, t, u)								t	t	500/	
Sidewalk (n, y)		-	-				-			n,50%,y	
Sidewalk/roadway separation(a, t,w)		-	-				-			t	
Sidewalk protective barrier (n, y)										n	
	ſ	LEVE	L OF SER	VICE TH	RESHOLI	DS					
Level of	Free	ways				High	iways	,			
Service		•	Two-I	Lane ru	Two-	Lane rd	Multi	lane ru	Multi	lane rd	
D	Den	Isity	%tsf	ats	%	tts	De	nsity	De		
В	<u></u>	14	≥ 50	<u>< 55</u>	>8	5.5	<u> </u>	14	<u></u>	14	
	<u></u>	22	≤ 65	<u>< 50</u>	> /	5.0	<u> </u>	22	<u> </u>	22	
	<u></u>	29	≥ 80	<u>< 45</u> < 40	> 6	10.7 18.3	<u> </u>	29 31	<u> </u>	29 34	
E	23	50	> 80	<u><</u> 40	> 3	8.3	2	34	2	34	
Level of		Arteria	ls		Bic	ycle		Р	edestrian		
Service	Ma	ajor City/C	Co.(ats)		Sc	ore			Score		
В		> 31 mr	oh .		< 2	2.75			≤2.75		
С		> 23 mm	oh			3.50			≤ 3.50		
D		> 18 mr	oh		<u></u>	1.25			≤4.25		
Е		> 15 mr	oh			≤ 5.00		≤ 5.00			

%tsf = Percent time spent following %ffs = Percent of free flow speed ats = Average travel speed ru = Rural undeveloped rd = Rural developed