DEPARTMENT OF TRANSPORTATION
DISTRICT 12
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Making Conservation a California Way of Life.

August 5, 2020

Sergio Klotz
City of San Juan Capistrano
32400 Paseo Adelanto
San Juan Capistrano, CA 92675

File: IGR/CEQA
SCH#: 2019049084
12-ORA-2020-01403
I-5, PM 9.564
SR 74, PM 0.0

Dear Mr. Klotz,

Thank you for including the California Department of Transportation (Caltrans) in the review of the Draft Environmental Impact Report for the Historic Town Center Master Plan Repeal, General Plan Amendment, and Ordinance Change Project in the City of San Juan Capistrano. The mission of Caltrans is to provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

The project proposes the repeal of the Historic Town Center Master Plan and Form Based Codes (FBC) as well as several revisions to replace the FBC by amending the Zoning Code and General Plan Land Use Element. Regional access to the plan area is provided by Interstate 5 (I-5) and State Route 74 (SR 74). Caltrans is a responsible agency for this project and upon review, we have the following comments:

Traffic Operations

1. Appendix E. Transportation Impact Analysis does not comply with Caltrans Traffic Impact Studies report. Please review the Guide For The Preparation of Traffic Impact Studies provided by Caltrans.

2. Traffic Operations Southwest does not concur with the Traffic Data presented. Please refer to the Tirador Report which was presented to the City of San Juan Capistrano in coordination with the Tirador Residential Development Project. The Tirador Report focuses on the intersections of SR 74/Rancho Viejo Road and SR 74 and I-5 Off Ramp.

Transportation Planning

3. Caltrans commends the City of San Juan Capistrano on the current transit services efforts. We encourage continued coordination with Orange County Transportation Authority (OCTA), for opportunities to enhance multimodal strategies and transit connectivity.

4. Please consider promoting and providing secure bicycle storage and parking in the HTCMP and HTC. This will encourage visitors to utilize Active Transportation to access the project site, thus reducing congestion, decreasing VMT, and improving air quality and public health.

5. Please consider constructing sidewalks along the roadways where sidewalks currently do not exist. Sidewalks improve accessibility and mobility, especially for ADA-reliant users.

6. Caltrans encourages strategies and measures to implement first- and last-mile connections to transit. There are several transit stops within the project area, including the San Juan Capistrano Station. Please consider developing and implementing strategies that would assist first- and last-mile connections. These strategies help decrease VMT and congestion.

7. Caltrans supports the development of Complete Streets facilities for bicycle, pedestrians, and transit. Please continue to promote and improve Complete Streets infrastructure in the project area.

Freight

8. Please consider incorporating designated areas/parking for freight delivery, package, and transportation network company's pickup and drop-off.

9. We recommend commercial and residential developments to offer pick-up point services or automated parcel systems to allow for deliveries that can be made with one truck stop instead of multiple stops to individual residences.

10. In order to reduce conflicts with traffic and bicycles, please consider directing deliveries to loading docks away from curbside. Please also consider redesigning outdated loading docks to accommodate new freight truck design. Utility alley space could be utilized if available, to take trucks off street curbs.

Encroachment Permit

11. Any project work proposed in the vicinity of the State Right-of-Way (ROW) would require an encroachment permit and all environmental concerns must be adequately addressed. If the environmental documentation for the project does not meet Caltrans's requirements for work done within State ROW, additional documentation would be required before approval of the encroachment permit. Please coordinate with Caltrans to meet requirements for any work within or near State ROW. For specific details for Encroachment Permits procedure, please refer to the Caltrans's Encroachment Permits Manual at: http://www.dot.ca.gov/hq/traffops/developserv/permits/

Please continue to keep us informed of this project and any future developments that could potentially impact State transportation facilities. If you have any questions or need to contact us, please do not hesitate to contact Joseph Jamoralin at (657) 328-6276 or Joseph.Jamoralin@dot.ca.gov

Sincerely,

SCOTT SHELLEY
Branch Chief, Regional-IGR-Transit Planning
District 12

Memorandum

Making Conservation a California Way of Life

To: SCOTT SHELLEY
BRANCH CHIEF REGIONAL-IGR-TRANSIT
DIVISION OF PLANNING DISTRICT 12

Date: May 8, 2020

File: 12-ORA-2019-01343
IGR - Tirador Residential Development Project DEIR

From: MICHAEL FLYNN
Traffic Operations Southwest
Area Engineer I-5, I-405

Subject: **SUPPORTING TRAFFIC ENGINEERING ANALYSIS FOR THE TRAFFIC OPERATIONS REVIEW COMMENTS TO THE TIRADOR RESIDENTIAL DEVELOPMENT PROJECT IGR**

The District Traffic Operations Southwest Branch provided comments to the IGR Review of the Tirador Residential Development Project on April 9, 2020. A Traffic Analysis made by Caltrans for Ortega Hwy (SR-74) between the intersections of Del Obispo St and Rancho Viejo Rd contradicts the analysis made in the report.

A Traffic Investigation was conducted by Caltrans over a two-year period between 2018 and 2019 that shows a higher Level of Service (LOS)at the intersections along SR-74 between the Del Obispo St. and Rancho Viejo Rd. and much longer queueing than indicated in the report. The investigation was conducted in response to complaints from the CHP and residents of San Juan Capistrano for sever queueing throughout the area causing backups onto the SB I-5 freeway and along EB Del Obispo St. The queueing on the SB I-5 Off-Ramp is also attributed to a high accident location (Table C) on the SB I-5 mainline prior to the off-ramp exit.

In our Traffic Analysis of the four intersections, we found that there is excessive queueing during the AM/PM Peak hours at the SB I-5/Ortega Hwy intersection. We have confirmed that both the reports from the CHP for traffic queueing onto the SB I-5 from the SB I-5/Ortega Hwy Intersection as well as the local resident complaints for queueing on Del Obispo St that extended several hundred feet prior to the intersection of Del Obispo St and Ortega Hwy (See photos Attachment 1).

The focus of our study was to analyze the SB I-5/Ortega Hwy intersection to determine the cause of the queueing and determine what mitigating

measures could be taken to reduce queueing onto the I-5 and reduce accidents.

We conducted traffic counts for the four intersections and did a Synchro analysis of each intersection. Since our primary concern for the impacts of this development is for the SB I-5 Off-Ramp, I've included only a few intersections that are of our primary concern (Attachment 2). Our data showed higher volumes than what was presented in the traffic analysis of the IGR. Signal timing data was used from field measurements. The data was also used to provide a Sim Traffic analysis to model field observations.

In comparing our data to that in the report, I reduced some of our data for some movements to show a more direct comparison as the results still had similar effects. Most of the data is within 5% of that shown in the report.

The conclusion from our findings show that the primary cause for the congestion on EB Ortega Hwy was a result of the queueing at the intersection of Rancho Viejo Rd and Ortega Hwy (Attachment 3). Field observations as well as modeling show that the two through lanes on EB Ortega Hwy at the intersection created a bottleneck that queues back to the I-5 SB Off-Ramp Intersection and well past the intersection Del Obispo St. This results in a restriction of vehicles being allowed to make a left turn during the green phase for the SB I-5 Off-Ramp as EB Traffic is queued from Rancho Viejo Rd to the intersection. This can be shown in a clip of the Sim Traffic model (Attachment 4). Note that the SB Off-Ramp traffic is not turning left during a green phase which is what was observed in the field.

Because the SB I-5 Off-Ramp traffic is restricted to turn onto EB Ortega Hwy during a green phase, the volume presented in the analysis is not representative of what the true volume would be given no restrictions on the left turning movement. The true demand can be more reflected by PeMS data that show a much greater volume (Attachment 5). This data was collected at the same time as our field investigation and represents the same peak hour interval. The analysis is limited to the PM peak hour as that has the greatest left turning movements.

In order to capture the true demand, an initial queue was entered in the Synchro analysis for the traffic that was restricted from making a left turn from the SB I-5 Off-Ramp. This is reflected in the Synchro analysis in Attachment 2. Our PeMS data indicates a differential of over 400 vehicles. I used 50 vehicles as an initial queue which equates to about half the distance of the Off-Ramp and just beyond the where the ramp widens to a second left turn pocket. I feel this is a conservative value based on field observations and Sim Traffic modeling.

This leave a LOS E at the SB I-5 Off-Ramp Intersection which I feel is also conservative but is more representative than the LOS value indicated in the report. Based on our analysis a LOS F is indicated for the intersection of Rancho Viejo Rd and Ortega Highway and this does not include an initial queue on EB Ortega which extends several hundred feet west of the intersection.

Caltrans is currently in the process of initiating operational improvement projects to address the queueing within the area.

For project related questions, please contact me at (657) 328-6407.

c: S. Sowers
J. Jamoralin
R. Hassas

ATTACHMENT 1

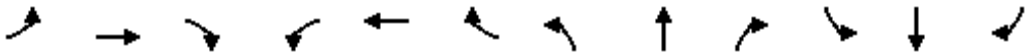
FIELD PHOTOS TAKEN DURNING THE INVESTIGATION

SB I-5 Off-Ramp to Ortega Hwy (PM Peak)

EB Ortega Hwy at Del Obispo St

ATTACHMENT 2

SYNCHRO ANALYSIS



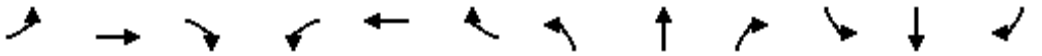
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	185	1450	433	90	1259	269	420	136	129	274	176	277
Future Volume (veh/h)	185	1450	433	90	1259	269	420	136	129	274	176	277
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	201	1576	471	98	1368	292	464	139	140	263	240	301
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	229	1097	794	215	1537	477	685	164	166	395	415	351
Arrive On Green	0.13	0.31	0.31	0.12	0.30	0.30	0.19	0.19	0.19	0.22	0.22	0.22
Sat Flow, veh/h	1781	3554	1585	1781	5106	1585	3563	855	861	1781	1870	1585
Grp Volume(v), veh/h	201	1576	471	98	1368	292	464	0	279	263	240	301
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1702	1585	1781	0	1715	1781	1870	1585
Q Serve(g_s), s	12.7	35.5	24.3	5.9	29.4	18.2	13.9	0.0	18.0	15.5	13.2	21.0
Cycle Q Clear(g_c), s	12.7	35.5	24.3	5.9	29.4	18.2	13.9	0.0	18.0	15.5	13.2	21.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.50	1.00		1.00
Lane Grp Cap(c), veh/h	229	1097	794	215	1537	477	685	0	330	395	415	351
V/C Ratio(X)	0.88	1.44	0.59	0.46	0.89	0.61	0.68	0.00	0.85	0.67	0.58	0.86
Avail Cap(c_a), veh/h	240	1097	794	240	1576	489	685	0	330	395	415	351
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)	0.74	0.74	0.74	0.78	0.78	0.78	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.2	39.8	20.4	47.0	38.4	34.4	43.1	0.0	44.8	40.9	40.0	43.0
Incr Delay (d2), s/veh	22.3	200.4	0.9	1.2	5.3	1.7	5.3	0.0	22.6	8.6	5.8	22.6
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	7.1	45.8	13.1	2.7	12.9	7.2	6.6	0.0	9.7	7.7	6.7	10.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.5	240.2	21.3	48.2	43.7	36.1	48.5	0.0	67.4	49.5	45.7	65.6
LnGrp LOS	E	F	C	D	D	D	D	A	E	D	D	E
Approach Vol, veh/h		2248			1758			743			804	
Approach Delay, s/veh		179.2			42.7			55.6			54.4	
Approach LOS		F			D			E			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		26.6	18.4	40.0		30.0	19.3	39.1				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		20.5	15.5	35.5		25.5	15.5	35.5				
Max Q Clear Time (g_c+I1), s		20.0	7.9	37.5		23.0	14.7	31.4				
Green Ext Time (p_c), s		0.2	0.1	0.0		1.1	0.0	3.2				

Intersection Summary												
HCM 6th Ctrl Delay			101.4									
HCM 6th LOS			F									

Notes

User approved volume balancing among the lanes for turning movement.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱	↰↰	↑↑					↰↰		↱↱
Traffic Volume (veh/h)	0	1058	166	490	708	0	0	0	0	1109	0	735
Future Volume (veh/h)	0	1058	166	490	708	0	0	0	0	1109	0	735
Initial Q (Qb), veh	0	30	0	0	0	0				50	0	0
Ped-Bike Adj(A_pbT)	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
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	0	1870
Adj Flow Rate, veh/h	0	1150	0	533	770	0				1205	0	799
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	0	2
Cap, veh/h	0	1444		545	1721	0				1511	0	1245
Arrive On Green	0.00	0.27	0.00	0.16	0.46	0.00				0.47	0.00	0.47
Sat Flow, veh/h	0	5274	1585	3456	3647	0				3456	0	2790
Grp Volume(v), veh/h	0	1150	0	533	770	0				1205	0	799
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1728	1777	0				1728	0	1395
Q Serve(g_s), s	0.0	27.5	0.0	20.0	19.3	0.0				37.1	0.0	27.8
Cycle Q Clear(g_c), s	0.0	27.5	0.0	20.0	19.3	0.0				37.1	0.0	27.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1444		545	1721	0				1511	0	1245
V/C Ratio(X)	0.00	0.80		0.98	0.45	0.00				0.80	0.00	0.64
Avail Cap(c_a), veh/h	0	1591		545	1791	0				1612	0	1301
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.95	0.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	44.5	0.0	54.5	22.1	0.0				35.0	0.0	28.0
Incr Delay (d2), s/veh	0.0	2.5	0.0	32.9	0.2	0.0				4.5	0.0	2.5
Initial Q Delay(d3),s/veh	0.0	15.3	0.0	0.0	0.0	0.0				39.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	15.4	0.0	11.2	7.8	0.0				30.0	0.0	10.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	62.3	0.0	87.4	22.3	0.0				78.4	0.0	30.5
LnGrp LOS	A	E		F	C	A				E	A	C
Approach Vol, veh/h		1150	A		1303						2004	
Approach Delay, s/veh		62.3			48.9						59.3	
Approach LOS		E			D						E	

Timer - Assigned Phs		3	4		6		8					
Phs Duration (G+Y+Rc), s		25.0	39.9		65.1		64.9					
Change Period (Y+Rc), s		4.5	4.5		4.5		4.5					
Max Green Setting (Gmax), s		20.5	40.5		55.5		65.5					
Max Q Clear Time (g_c+I1), s		22.0	29.5		39.1		21.3					
Green Ext Time (p_c), s		0.0	5.9		8.4		6.5					

Intersection Summary	
HCM 6th Ctrl Delay	57.0
HCM 6th LOS	E

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

ATTACHMENT 3

QUEUEING ANALYSIS

Intersection: 3: SB I-5 Off Ramp

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	L	T	T	L	L	R	R
Maximum Queue (ft)	292	342	325	225	232	245	414	376	425	610	572	425
Average Queue (ft)	279	284	296	192	167	196	204	190	421	578	413	199
95th Queue (ft)	312	328	314	318	242	272	411	337	436	597	729	443
Link Distance (ft)	282	282	282				322	322		501	501	
Upstream Blk Time (%)	38	39	55				4	0		61	18	
Queuing Penalty (veh)	156	158	226				22	2		0	0	
Storage Bay Dist (ft)				200	220	220			400			400
Storage Blk Time (%)			71	0	1	4	4		4	61	2	0
Queuing Penalty (veh)			118	1	2	15	21		25	336	6	2

Intersection: 3: SB I-5 Off Ramp

Movement	B4	B4
Directions Served	T	T
Maximum Queue (ft)	731	708
Average Queue (ft)	695	690
95th Queue (ft)	715	702
Link Distance (ft)	674	674
Upstream Blk Time (%)	64	55
Queuing Penalty (veh)	0	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 15: Rancho Viejo Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	R	L	T	T	T	R	L	LT	TR
Maximum Queue (ft)	205	719	776	757	174	368	375	382	176	331	345	366
Average Queue (ft)	161	695	726	651	88	216	243	219	67	164	197	118
95th Queue (ft)	256	714	771	896	170	311	331	306	115	257	284	253
Link Distance (ft)		677	677	677		1138	1138	1138		841	841	841
Upstream Blk Time (%)		34	45	16								
Queuing Penalty (veh)		237	313	114								
Storage Bay Dist (ft)	180				150				470			
Storage Blk Time (%)	9	60				16						
Queuing Penalty (veh)	68	110				14						

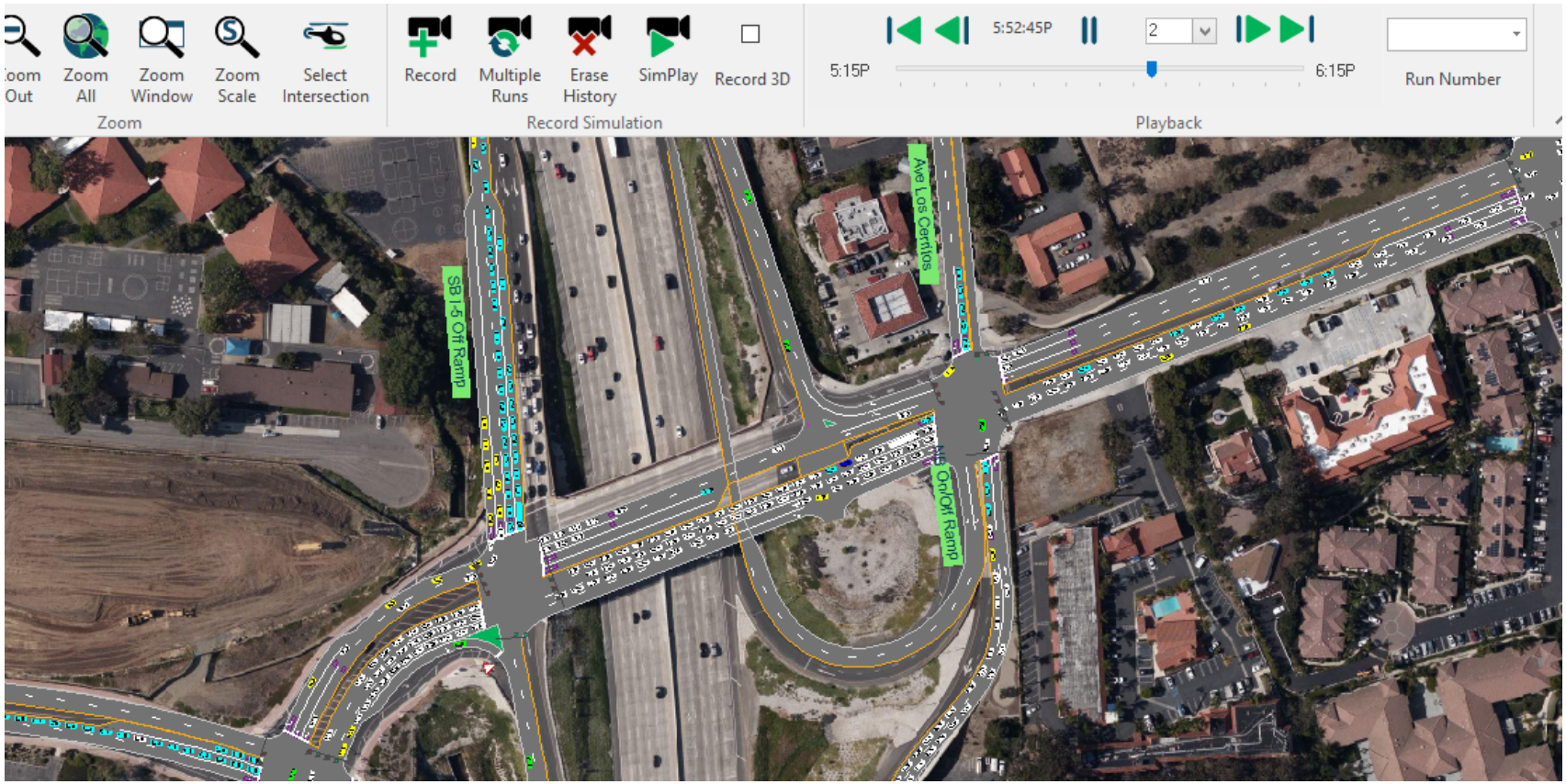
Intersection: 15: Rancho Viejo Rd

Movement	SB	SB	SB
Directions Served	L	LT	TR
Maximum Queue (ft)	265	324	348
Average Queue (ft)	141	222	202
95th Queue (ft)	237	296	307
Link Distance (ft)		506	506
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	0	3	
Queuing Penalty (veh)	0	4	

ATTACHMENT 4

SIM TRAFFIC MODELING

Sim Traffic Analysis showing no left turn movement is allowed from the SB I-5 Off-Ramp with green light due to queueing on EB Ortega from Rancho Viejo Rd. EB Ortega queues beyond Del Obispo



ATTACHMENT 5

PeMS Data

PeMS Data for the SB I-5 Off Ramp to Ortega Hwy

Hour	Flow (Veh/Hour)	# Lane Points	% Observed
2/26/2019 6:00	1008	24	100.00
2/26/2019 7:00	1738	24	100.00
2/26/2019 8:00	2217	24	100.00
2/26/2019 9:00	1802	24	100.00
2/26/2019 15:00	2352	24	100.00
2/26/2019 16:00	2747	24	100.00
2/26/2019 17:00	2305	24	100.00
2/26/2019 18:00	3173	24	100.00
2/27/2019 6:00	1047	24	100.00
2/27/2019 7:00	1834	24	100.00
2/27/2019 8:00	2619	24	100.00
2/27/2019 9:00	1365	24	100.00
2/27/2019 15:00	2338	24	100.00
2/27/2019 16:00	1745	22	100.00
2/27/2019 17:00	2317	24	100.00
2/27/2019 18:00	1884	24	100.00
2/28/2019 6:00	1176	24	100.00
2/28/2019 7:00	2021	24	100.00
2/28/2019 8:00	2285	24	100.00
2/28/2019 9:00	1248	24	100.00
2/28/2019 15:00	2232	24	100.00
2/28/2019 16:00	2008	24	100.00
2/28/2019 17:00	2311	24	100.00
2/28/2019 18:00	1837	24	100.00
2/28/2019 19:00	1258	24	100.00
2/28/2019 20:00	2417	24	100.00
2/28/2019 21:00	1205	24	100.00
2/28/2019 22:00	827	24	100.00
2/28/2019 23:00	448	24	100.00

GUIDE FOR THE PREPARATION

OF

TRAFFIC IMPACT STUDIES

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

December 2002

PREFACE

The California Department of Transportation (Caltrans) has developed this "Guide for the Preparation of Traffic Impact Studies" in response to a survey of cities and counties in California. The purpose of that survey was to improve the Caltrans local development review process (also known as the Intergovernmental Review/California Environmental Quality Act or IGR/CEQA process). The survey indicated that approximately 30 percent of the respondents were not aware of what Caltrans required in a traffic impact study (TIS).

In the early 1990s, the Caltrans District 6 office located in Fresno identified a need to provide better quality and consistency in the analysis of traffic impacts generated by local development and land use change proposals that effect State highway facilities. At that time, District 6 brought together both public and private sector expertise to develop a traffic impact study guide. The District 6 guide has proven to be successful at promoting consistency and uniformity in the identification and analysis of traffic impacts generated by local development and land use changes.

The guide developed in Fresno was adapted for statewide use by a team of Headquarters and district staff. The guide will provide consistent guidance for Caltrans staff who review local development and land use change proposals as well as inform local agencies of the information needed for Caltrans to analyze the traffic impacts to State highway facilities. The guide will also benefit local agencies and the development community by providing more expeditious review of local development proposals.

Even though sound planning and engineering practices were used to adapt the Fresno TIS guide, it is anticipated that changes will occur over time as new technologies and more efficient practices become available. To facilitate these changes, Caltrans encourages all those who use this guide to contact their nearest district office (i.e., IGR/CEQA Coordinator) to coordinate any changes with the development team.

ACKNOWLEDGEMENTS

The District 6 traffic impact study guide provided the impetus and a starting point for developing the statewide guide. Special thanks is given to Marc Birnbaum for recognizing the need for a TIS guide and for his valued experience and vast knowledge of land use planning to significantly enhance the effort to adapt the District 6 guide for statewide use. Randy Treece from District 6 provided many hours of coordination, research and development of the original guide and should be commended for his diligent efforts. Sharri Bender Ehlert of District 6 provided much of the technical expertise in the adaptation of the District 6 guide and her efforts are greatly appreciated.

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Appendix "A" Minimum Contents of Traffic Impact Study
Appendix "B" Methodology for Calculating Equitable Mitigation Measures
Appendix "C" Measures of Effectiveness by Facility Type

I. INTRODUCTION

Caltrans desires to provide a safe and efficient State transportation system for the citizens of California pursuant to various Sections of the California Streets and Highway Code. This is done in partnership with local and regional agencies through procedures established by the California Environmental Quality Act (CEQA) and other land use planning processes. The intent of this guide is to provide a starting point and a consistent basis in which Caltrans evaluates traffic impacts to State highway facilities. The applicability of this guide for local streets and roads (non-State highways) is at the discretion of the effected jurisdiction.

Caltrans reviews federal, State, and local agency development projects[1], and land use change proposals for their potential impact to State highway facilities. The primary objectives of this guide is to provide:

- guidance in determining if and when a traffic impact study (TIS) is needed,
- consistency and uniformity in the identification of traffic impacts generated by local land use proposals,
- consistency and equity in the identification of measures to mitigate the traffic impacts generated by land use proposals,
- lead agency[2] officials with the information necessary to make informed decisions regarding the existing and proposed transportation infrastructure (see Appendix A, Minimum Contents of a TIS)
- TIS requirements early in the planning phase of a project (i.e., initial study, notice of preparation, or earlier) to eliminate potential delays later,
- a quality TIS by agreeing to the assumptions, data requirements, study scenarios, and analysis methodologies prior to beginning the TIS, and
- early coordination during the planning phases of a project to reduce the time and cost of preparing a TIS.

II. WHEN A TRAFFIC IMPACT STUDY IS NEEDED

The level of service[3] (LOS) for operating State highway facilities is based upon measures of effectiveness (MOEs). These MOEs (see Appendix "C-2") describe the measures best suited for analyzing State highway facilities (i.e., freeway segments, signalized intersections, on- or off-ramps, etc.). Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" (see Appendix "C-3") on State highway facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than the appropriate target LOS, the existing MOE should be maintained.

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[1] "Project" refers to activities directly undertaken by government, financed by government, or requiring a permit or other approval from government as defined in Section 21065 of the Public Resources Code and Section 15378 of the California Code of Regulations.

[2] "Lead Agency" refers to the public agency that has the principal responsibility for carrying out or approving a project. Defined in Section 21165 of the Public Resources Code, the "California Environmental Quality Act, and Section 15367 of the California Code of Regulations.

[3] "Level of service" as defined in the latest edition of the Highway Capacity Manual, Transportation Research Board, National Research Council.

A. Trip Generation Thresholds

The following criterion is a starting point in determining when a TIS is needed. When a project:

1. Generates over 100 peak hour trips assigned to a State highway facility
2. Generates 50 to 100 peak hour trips assigned to a State highway facility – and, affected State highway facilities are experiencing noticeable delay; approaching unstable traffic flow conditions (LOS "C" or "D").
3. Generates 1 to 49 peak hour trips assigned to a State highway facility – the following are examples that may require a full TIS or some lesser analysis[4]:
    a. Affected State highway facilities experiencing significant delay; unstable or forced traffic flow conditions (LOS "E" or "F").
    b. The potential risk for a traffic incident is significantly increased (i.e., congestion related collisions, non-standard sight distance considerations, increase in traffic conflict points, etc.).
    c. Change in local circulation networks that impact a State highway facility (i.e., direct access to State highway facility, a non-standard highway geometric design, etc.).

Note: A traffic study may be as simple as providing a traffic count to as complex as a microscopic simulation. The appropriate level of study is determined by the particulars of a project, the prevailing highway conditions, and the forecasted traffic.

B. Exceptions

Exceptions require consultation between the lead agency, Caltrans, and those preparing the TIS. When a project's traffic impact to a State highway facility can clearly be anticipated without a study and all the parties involved (lead agency, developer, and the Caltrans district office) are able to negotiate appropriate mitigation, a TIS may not be necessary.

C. Updating An Existing Traffic Impact Study

A TIS requires updating when the amount or character of traffic is significantly different from an earlier study. Generally a TIS requires updating every two years. A TIS may require updating sooner in rapidly developing areas and not as often in slower developing areas. In these cases, consultation with Caltrans is strongly recommended.

III. SCOPE OF TRAFFIC IMPACT STUDY

Consultation between the lead agency, Caltrans, and those preparing the TIS is recommended before commencing work on the study to establish the appropriate scope. At a minimum, the TIS should include the following:

A. Boundaries of the Traffic Impact Study

All State highway facilities impacted in accordance with the criteria in Section II should be studied. Traffic impacts to local streets and roads can impact intersections with State highway facilities. In these cases, the TIS should include an analysis of adjacent local facilities, upstream and downstream, of the intersection (i.e., driveways, intersections, and interchanges) with the State highway.

[4] A "lesser analysis" may include obtaining traffic counts, preparing signal warrants, or a focused TIS, etc.

B. Traffic Analysis Scenarios

Caltrans is interested in the effects of general plan updates and amendments as well as the effects of specific project entitlements (i.e., site plans, conditional use permits, sub-divisions, rezoning, etc.) that have the potential to impact a State highway facility. The complexity or magnitude of the impacts of a project will normally dictate the scenarios necessary to analyze the project. Consultation between the lead agency, Caltrans, and those preparing the TIS is recommended to determine the appropriate scenarios for the analysis. The following scenarios should be addressed in the TIS when appropriate:

1. When only a general plan amendment or update is being sought, the following scenarios are required:
   a) Existing Conditions - Current year traffic volumes and peak hour LOS analysis of effected State highway facilities.
   b) Proposed Project Only with Select Zone[5] Analysis - Trip generation and assignment for build-out of general plan.
   c) General Plan Build-out Only - Trip assignment and peak hour LOS analysis. Include current land uses and other pending general plan amendments.
   d) General Plan Build-out Plus Proposed Project - Trip assignment and peak hour LOS analysis. Include proposed project and other pending general plan amendments.

2. When a general plan amendment is not proposed and a proposed project is seeking specific entitlements (i.e., site plans, conditional use permits, sub-division, rezoning, etc.), the following scenarios must be analyzed in the TIS:
   a) Existing Conditions - Current year traffic volumes and peak hour LOS analysis of effected State highway facilities.
   b) Proposed Project Only - Trip generation, distribution, and assignment in the year the project is anticipated to complete construction.
   c) Cumulative Conditions (Existing Conditions Plus Other Approved and Pending Projects Without Proposed Project) - Trip assignment and peak hour LOS analysis in the year the project is anticipated to complete construction.
   d) Cumulative Conditions Plus Proposed Project (Existing Conditions Plus Other Approved and Pending Projects Plus Proposed Project) - Trip assignment and peak hour LOS analysis in the year the project is anticipated to complete construction.
   e) Cumulative Conditions Plus Proposed Phases (Interim Years) - Trip assignment and peak hour LOS analysis in the years the project phases are anticipated to complete construction.
3. In cases where the circulation element of the general plan is not consistent with the land use element or the general plan is outdated and not representative of current or future forecasted conditions, all scenarios from Sections III. B. 1. and 2. should be utilized with the exception of duplicating of item 2.a.

[5] "Select zone" analysis represents a project only traffic model run, where the project's trips are distributed and assigned along a loaded highway network. This procedure isolates the specific impact on the State highway network.

IV. TRAFFIC DATA

Prior to any fieldwork, consultation between the lead agency, Caltrans, and those preparing the TIS is recommended to reach consensus on the data and assumptions necessary for the study. The following elements are a starting point in that consideration.

A. Trip Generation

The latest edition of the Institute of Transportation Engineers' (ITE) TRIP GENERATION report should be used for trip generation forecasts. Local trip generation rates are also acceptable if appropriate validation is provided to support them.

1. Trip Generation Rates – When the land use has a limited number of studies to support the trip generation rates or when the Coefficient of Determination (R^2) is below 0.75, consultation between the lead agency, Caltrans and those preparing the TIS is recommended.
2. Pass-by Trips[6] – Pass-by trips are only considered for retail oriented development. Reductions greater than 15% requires consultation and acceptance by Caltrans. The justification for exceeding a 15% reduction should be discussed in the TIS.
3. Captured Trips[7] – Captured trip reductions greater than 5% requires consultation and acceptance by Caltrans. The justification for exceeding a 5% reduction should be discussed in the TIS.
4. Transportation Demand Management (TDM) – Consultation between the lead agency and Caltrans is essential before applying trip reduction for TDM strategies.

NOTE: Reasonable reductions to trip generation rates are considered when adjacent State highway volumes are sufficient (at least 5000 ADT) to support reductions for the land use.

B. Traffic Counts

Prior to field traffic counts, consultation between the lead agency, Caltrans and those preparing the TIS is recommended to determine the level of detail (e.g., location, signal timing, travel speeds, turning movements, etc.) required at each traffic count site. All State highway facilities within the boundaries of the TIS should be considered. Common rules for counting vehicular traffic include but are not limited to:

1. Vehicle counts should be conducted on Tuesdays, Wednesdays, or Thursdays during weeks not containing a holiday and conducted in favorable weather conditions.
2. Vehicle counts should be conducted during the appropriate peak hours (see peak hour discussion below).
3. Seasonal and weekend variations in traffic should also be considered where appropriate (i.e., recreational routes, tourist attractions, harvest season, etc.).

C. Peak Hours

To eliminate unnecessary analysis, consultation between the lead agency, Caltrans and those preparing the TIS is recommended during the early planning stages of a project. In general, the TIS should include a morning (a.m.) and an evening (p.m.) peak hour analyses. Other peak hours (e.g., 11:30 a.m. to 1:30 p.m., weekend, holidays, etc.) may also be required to determine the significance of the traffic impacts generated by a project.

[6] "Pass-by" trips are made as intermediate stops between an origin and a primary trip destination (i.e., home to work, home to shopping, etc.).
[7] "Captured Trips" are trips that do not enter or leave the driveways of a project's boundary within a mixed-use development.

D. Travel Forecasting (Transportation Modeling)

The local or regional traffic model should reflect the most current land use and planned improvements (i.e., where programming or funding is secured). When a general plan build-out model is not available, the closest forecast model year to build-out should be used. If a traffic model is not available, historical growth rates and current trends can be used to project future traffic volumes. The TIS should clearly describe any changes made in the model to accommodate the analysis of a proposed project.

V. TRAFFIC IMPACT ANALYSIS METHODOLOGIES

Typically, the traffic analysis methodologies for the facility types indicated below are used by Caltrans and will be accepted without prior consultation. When a State highway has saturated flows, the use of a micro-simulation model is encouraged for the analysis (please note however, the micro-simulation model must be calibrated and validated for reliable results). Other analysis methods may be accepted, however, consultation between the lead agency, Caltrans and those preparing the TIS is recommended to agree on the data necessary for the analysis.

A. Freeway Segments – Highway Capacity Manual (HCM)*, operational analysis
B. Weaving Areas – Caltrans Highway Design Manual (HDM)
C. Ramps and Ramp Junctions – HCM*, operational analysis or Caltrans HDM, Caltrans Ramp Metering Guidelines (most recent edition)
D. Multi-Lane Highways – HCM*, operational analysis
E. Two-lane Highways – HCM*, operational analysis
F. Signalized Intersections[8] – HCM*, Highway Capacity Software**, operational analysis, TRAFFIX™**, Synchro**, see footnote 8
G. Unsignalized Intersections – HCM*, operational analysis, Caltrans Traffic Manual for signal warrants if a signal is being considered
H. Transit – HCM*, operational analysis
I. Pedestrians – HCM*
J. Bicycles – HCM*
K. Caltrans Criteria/Warrants – Caltrans Traffic Manual (stop signs, traffic signals, freeway lighting, conventional highway lighting, school crossings)
L. Channelization – Caltrans guidelines for Reconstruction of Intersections, August 1985, Ichiro Fukutome

*The most current edition of the Highway Capacity Manual, Transportation Research Board, National Research Council, should be used.

****NOTE**: Caltrans does not officially advocate the use of any special software. However, consistency with the HCM is advocated in most but not all cases. The Caltrans local development review units utilize the software mentioned above. If different software or analytical techniques are used for the TIS then consultation between the lead agency, Caltrans and those preparing the TIS is recommended. Results that are significantly different than those produced with the analytical techniques above should be challenged.

[8] The procedures in the Highway Capacity Manual "do not explicitly address operations of closely spaced signalized intersections. Under such conditions, several unique characteristics must be considered, including spill-back potential from the downstream intersection to the upstream intersection, effects of downstream queues on upstream saturation flow rate, and unusual platoon dispersion or compression between intersections. An example of such closely spaced operations is signalized ramp terminals at urban interchanges. Queue interactions between closely spaced intersections may seriously distort the procedures in" the HCM.

VI. MITIGATION MEASURES

The TIS should provide the nexus [Nollan v. California Coastal Commission, 1987, 483 U.S. 825 (108 S.Ct. 314)] between a project and the traffic impacts to State highway facilities. The TIS should also establish the rough proportionality [Dolan v. City of Tigard, 1994, 512 U.S. 374 (114 S. Ct. 2309)] between the mitigation measures and the traffic impacts. One method for establishing the rough proportionality or a project proponent's equitable responsibility for a project's impacts is provided in Appendix "B." Consultation between the lead agency, Caltrans and those preparing the TIS is recommended to reach consensus on the mitigation measures and who will be responsible.

Mitigation measures must be included in the traffic impact analysis. This determines if a project's impacts can be eliminated or reduced to a level of insignificance. Eliminating or reducing impacts to a level of insignificance is the standard pursuant to CEQA and the National Environmental Policy Act (NEPA). The lead agency is responsible for administering the CEQA review process and has the principal authority for approving a local development proposal or land use change. Caltrans, as a responsible agency, is responsible for reviewing the TIS for errors and omissions that pertain to State highway facilities. However, the authority vested in the lead agency under CEQA does not take precedence over other authorities in law.

If the mitigation measures require work in the State highway right-of-way an encroachment permit from Caltrans will be required. This work will also be subject to Caltrans standards and specifications. Consultation between the lead agency, Caltrans and those preparing the TIS early in the planning process is strongly recommended to expedite the review of local development proposals and to reduce conflicts and misunderstandings in both the local agency CEQA review process as well as the Caltrans encroachment permit process.

APPENDIX “A”

MINIMUM CONTENTS

OF A

TRAFFIC IMPACT STUDY

MINIMUM CONTENTS OF TRAFFIC IMPACT STUDY REPORT

I. EXECUTIVE SUMMARY

II. TABLE OF CONTENTS

A. List of Figures (Maps)
B. List of Tables

III. INTRODUCTION

A. Description of the proposed project
B. Location of project
C. Site plan including all access to State highways (site plan, map)
D. Circulation network including all access to State highways (vicinity map)
E. Land use and zoning
F. Phasing plan including proposed dates of project (phase) completion
G. Project sponsor and contact person(s)
H. References to other traffic impact studies

IV. TRAFFIC ANALYSIS

A. Clearly stated assumptions
B. Existing and projected traffic volumes (including turning movements), facility geometry (including storage lengths), and traffic controls (including signal phasing and multi-signal progression where appropriate) (figure)
C. Project trip generation including references (table)
D. Project generated trip distribution and assignment (figure)
E. LOS and warrant analyses - existing conditions, cumulative conditions, and full build of general plan conditions with and without project

V. CONCLUSIONS AND RECOMMENDATIONS

A. LOS and appropriate MOE quantities of impacted facilities with and without mitigation measures
B. Mitigation phasing plan including dates of proposed mitigation measures
C. Define responsibilities for implementing mitigation measures
D. Cost estimates for mitigation measures and financing plan

VI. APPENDICES

A. Description of traffic data and how data was collected
B. Description of methodologies and assumptions used in analyses
C. Worksheets used in analyses (i.e., signal warrant, LOS, traffic count information, etc.)

APPENDIX “B”

METHODOLOGY FOR

CALCULATING EQUITABLE

MITIGATION MEASURES

METHOD FOR CALCULATING EQUITABLE MITIGATION MEASURES

The methodology below is neither intended as, nor does it establish, a legal standard for determining equitable responsibility and cost of a project's traffic impact, the intent is to provide:

1. A starting point for early discussions to address traffic mitigation equitably.
2. A means for calculating the equitable share for mitigating traffic impacts.
3. A means for establishing rough proportionality [Dolan v. City of Tigard, 1994, 512 U.S. 374 (114 S. Ct. 2309)].

The formulas should be used when:

- A project has impacts that do not immediately warrant mitigation, but their cumulative effects are significant and will require mitigating in the future.
- A project has an immediate impact and the lead agency has assumed responsibility for addressing operational improvements

NOTE: This formula is not intended for circumstances where a project proponent will be receiving a substantial benefit from the identified mitigation measures. In these cases, (e.g., mid-block access and signalization to a shopping center) the project should take full responsibility to toward providing the necessary infrastructure.

EQUITABLE SHARE RESPONSIBILITY: **Equation C-1**

NOTE: $T_E < T_B$, see explanation for T_B below.

$$P = \frac{T}{T_B - T_E}$$

Where:

P = The equitable share for the proposed project's traffic impact.

T = The vehicle trips generated by the project during the peak hour of adjacent State highway facility in vehicles per hour, vph.

T_B = The forecasted traffic volume on an impacted State highway facility at the time of general plan build-out (e.g., 20 year model or the furthest future model date feasible), vph.

T_E = The traffic volume existing on the impacted State highway facility plus other approved projects that will generate traffic that has yet to be constructed/opened, vph.

EQUITABLE COST: **Equation C-2**

$$C = P\ (C_T)$$

Where:

C = The equitable cost of traffic mitigation for the proposed project, ($). (Rounded to nearest one thousand dollars)

P = The equitable share for the project being considered.

C_T = The total cost estimate for improvements necessary to mitigate the forecasted traffic demand on the impacted State highway facility in question at general plan build-out, ($).

NOTES

1. Once the equitable share responsibility and equitable cost has been established on a per trip basis, these values can be utilized for all projects on that State highway facility until the forecasted general plan build-out model is revised.
2. Truck traffic should be converted to passenger car equivalents before utilizing these equations (see the Highway Capacity Manual for converting to passenger car equivalents).

3. If the per trip cost is not used for all subsequent projects, then the equation below will be necessary to determine the costs for individual project impact and will require some additional accounting.

Equation C-2.A

$$C = P\,(C_T - C_C)$$

Where:

C = Same as equation C-2.

P = Same as equation C-2.

C_T = Same as equation C-2.

C_C = The combined dollar contributions paid and committed prior to current project's contribution. This is necessary to provide the appropriate cost proportionality. Example: For the first project to impact the State highway facility in question since the total cost (C_T) estimate for improvements necessary to mitigate the forecasted traffic demand, C_C would be equal to zero. For the second project however, C would equal $P_2(C_T - C_1)$ and for the third project to come along C would equal $P_3[C_T - (C_1 + C_2)]$ and so on until build-out or the general plan build-out was recalculated.

APPENDIX “C”

MEASURES OF EFFECTIVENESS

BY

FACILITY TYPE

MEASURES OF EFFECTIVENESS BY FACILITY TYPE

TYPE OF FACILITY	MEASURE OF EFFECTIVENESS (MOE)
Basic Freeway Segments	Density (pc/mi/ln)
Ramps	Density (pc/mi/ln)
Ramp Terminals	Delay (sec/veh)
Multi-Lane Highways	Density (pc/mi/ln)
Two-Lane Highways	Percent-Time-Following Average Travel Speed (mi/hr)
Signalized Intersections	Control Delay per Vehicle (sec/veh)
Unsignalized Intersections	Average Control Delay per Vehicle (sec/veh)
Urban Streets	Average Travel Speed (mi/hr)

Measures of effectiveness for level of service definitions located in the most recent version of the Highway Capacity Manual, Transportation Research Board, National Research Council.

Transition between LOS "C" and LOS "D" Criteria

(Reference Highway Capacity Manual)

BASIC FREEWAY SEGMENTS @ 65 mi/hr

LOS	Maximum Density (pc/mi/ln)	Minimum Speed (mph)	Maximum v/c	Maximum Service Flow Rate (pc/hr/ln)
A	11	65.0	0.30	710
B	18	65.0	0.50	1170
C	26	64.6	0.71	1680
D	35	59.7	0.89	2090
E	45	52.2	1.00	2350

SIGNALIZED INTERSECTIONS and RAMP TERMINALS

LOS	Control Delay per Vehicle (sec/veh)
A	**≤ 10**
B	**> 10 - 20**
C	**> 20 - 35**
D	**> 35 - 55**
E	**> 55 - 80**
F	**> 80**

MULTI-LANE HIGHWAYS @ 55 mi/hr

LOS	Maximum Density (pc/mi/ln)	Minimum Speed (mph)	Maximum v/c	Maximum Service Flow Rate (pc/hr/ln)
A	11	55.0	0.29	600
B	18	55.0	0.47	990
C	26	54.9	0.68	1430
D	35	52.9	0.88	1850
E	41	51.2	1.00	2100

Dotted line represents the transition between LOS "C" and LOS "D"

TWO-LANE HIGHWAYS

LOS	Percent Time-Spent-Following	Average Travel Speed (mi/hr)
A	35	> 55
B	> 35 - 50	> 50 - 55
C	> 50 - 65	> 45 - 50
D	> 65 - 80	> 40 - 45
E	> 80	40

URBAN STREETS

Urban Street Class	I	II	III	IV
Range of FFS	55 to 45 mi/hr	45 to 35 mi/hr	35 to 30 mi/hr	35 to 25 mi/hr
Typical FFS	50 mi/hr	40 mi/hr	35 mi/hr	30 mi/hr
LOS	Average Travel Speed (mi/hr)			
A	> 42	> 35	> 30	> 25
B	> 34 - 42	> 28 - 35	> 24 - 30	> 19 - 25
C	> 27 - 34	> 22 - 28	> 18 - 24	> 13 - 19
D	> 21 - 27	> 17 - 22	> 14 - 18	> 9 - 13
E	> 16 - 21	> 13 - 17	> 10 - 14	> 7 - 9
F	16	13	10	7

Dotted line represents the transition between LOS "C" and LOS "D"

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