

**APPENDIX M**

**YEAR 2013 TRAFFIC CONDITIONS INTERSECTION  
LEVEL OF SERVICE CALCULATION WORKSHEETS –  
CALTRANS FACILITIES ANALYSIS (HCM  
METHODOLOGY)**

*APPENDIX M-1*

**YEAR 2013 WITHOUT PROJECT TRAFFIC  
CONDITIONS – CALTRANS INTERSECTION ANALYSIS  
(HCM METHODOLOGY)**

HCM Signalized Intersection Capacity Analysis  
 1: Katella Avenue & Manchester Avenue

Year 2013 Without Project  
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NB1	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↘	↑↑↑		↘	↕	↗	↘	↑↑	↗
Volume (vph)	0	1128	647	228	1681	0	56	0	628	24	93	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.91	1.00	0.97	0.91		0.95	0.91	0.95	0.97	0.95	1.00
Fit		1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	1.00	0.85
Fit Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Fit Permitted		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1187	681	240	1769	0	59	0	661	25	98	17
RTOR Reduction (vph)	0	0	304	0	0	0	0	296	295	0	0	15
Lane Group Flow (vph)	0	1187	377	240	1769	0	53	41	35	25	98	2
Heavy Vehicles (%)	0%	6%	6%	6%	6%	0%	9%	0%	9%	6%	6%	6%
Turn Type			Perm	Prot			Split		Perm	Split		Perm
Protected Phases		2		1	6		8	8		4	4	
Permitted Phases			2						8			4
Actuated Green, G (s)		66.4	66.4	12.0	82.4		12.8	12.8	12.8	12.8	12.8	12.8
Effective Green, g (s)		66.4	66.4	12.0	82.4		12.8	12.8	12.8	12.8	12.8	12.8
Actuated g/C Ratio		0.55	0.55	0.10	0.69		0.11	0.11	0.11	0.11	0.11	0.11
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2707	843	330	3360		168	144	150	352	363	163
v/s Ratio Prot		0.24		c0.07	c0.36		c0.03	0.03		0.01	c0.03	
v/s Ratio Perm			0.25						0.03			0.00
v/c Ratio		0.44	0.45	0.73	0.53		0.32	0.29	0.23	0.07	0.27	0.01
Uniform Delay, d1		15.8	15.9	52.4	9.2		49.6	49.4	49.1	48.2	49.3	47.9
Progression Factor		0.51	2.26	0.87	0.76		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.4	1.4	7.1	0.5		1.1	1.1	0.8	0.1	0.4	0.0
Delay (s)		8.6	37.3	52.7	7.6		50.6	50.5	49.9	48.3	49.7	48.0
Level of Service		A	D	D	A		D	D	D	D	D	D
Approach Delay (s)		19.0			13.0			50.2			49.2	
Approach LOS		B			B			D			D	

Intersection Summary	
HCM Average Control Delay	22.1
HCM Volume to Capacity ratio	0.50
Actuated Cycle Length (s)	120.0
Intersection Capacity Utilization	61.1%
Analysis Period (min)	15
HCM Level of Service	C
Sum of lost time (s)	16.0
ICU Level of Service	B

c Critical Lane Group

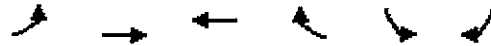
HCM Signalized Intersection Capacity Analysis  
 2: Katella Avenue & Anaheim Way

Year 2013 Without Project  
 AM Peak Hour

Movement	FBL	EBL	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑↑			↑↑↑	↖	↗	↑↑↑				
Volume (vph)	40	1733	0	0	1384	310	592	398	340	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lane Util. Factor	0.97	0.91			0.81	0.81	0.81	0.81				
Flt	1.00	1.00			1.00	0.85	1.00	0.95				
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99				
Satd. Flow (prot)	3303	4893			5788	1234	1341	5293				
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99				
Satd. Flow (perm)	3303	4893			5788	1234	1341	5293				
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	1824	0	0	1457	326	623	419	358	0	0	0
RTOR Reduction (vph)	0	0	0	0	2	132	0	7	0	0	0	0
Lane Group Flow (vph)	42	1824	0	0	1488	161	311	1082	0	0	0	0
Heavy Vehicles (%)	6%	6%	0%	0%	6%	6%	9%	9%	9%	0%	0%	0%
Turn Type	Prot					Perm	Split					
Protected Phases	5	2			6		8	8				
Permitted Phases						6						
Actuated Green, G (s)	4.8	73.8			65.0	65.0	38.2	38.2				
Effective Green, g (s)	4.8	73.8			65.0	65.0	38.2	38.2				
Actuated g/C Ratio	0.04	0.61			0.54	0.54	0.32	0.32				
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0				
Lane Grp Cap (vph)	132	3009			3135	668	427	1685				
v/s Ratio Prot	0.01	0.37			0.26		0.23	0.20				
v/s Ratio Perm						0.13						
v/c Ratio	0.32	0.61			0.47	0.24	0.73	0.64				
Uniform Delay, d1	56.0	14.2			17.0	14.5	36.3	35.0				
Progression Factor	0.82	0.46			0.15	0.17	1.00	1.00				
Incremental Delay, d2	1.2	0.8			0.4	0.7	6.1	0.8				
Delay (s)	47.1	7.3			3.0	3.2	42.4	35.9				
Level of Service	D	A			A	A	D	D				
Approach Delay (s)		8.2			3.0			37.3			0.0	
Approach LOS		A			A			D			A	
<b>Intersection Summary</b>												
HCM Average Control Delay		14.4			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.65										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		56.5%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
 7: Katella Avenue & SR-57 SB Ramps

Year 2013 Without Project  
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑		↓↓↓	↓
Volume (vph)	0	1274	1079	0	330	668
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.91	0.91		0.97	0.91
Fit		1.00	1.00		0.92	0.85
Fit Protected		1.00	1.00		0.98	1.00
Satd. Flow (prot)		4893	4893		3137	1386
Fit Permitted		1.00	1.00		0.98	1.00
Satd. Flow (perm)		4893	4893		3137	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1341	1136	0	347	703
RTOR Reduction (vph)	0	0	0	0	18	18
Lane Group Flow (vph)	0	1341	1136	0	681	333
Heavy Vehicles (%)	0%	6%	6%	0%	6%	6%
Turn Type						Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		27.9	27.9		19.1	19.1
Effective Green, g (s)		27.9	27.9		19.1	19.1
Actuated g/C Ratio		0.51	0.51		0.35	0.35
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2482	2482		1089	481
v/s Ratio Prot		c0.27	0.23		0.22	
v/s Ratio Perm						c0.24
v/c Ratio		0.54	0.46		0.63	0.69
Uniform Delay, d1		9.2	8.7		15.0	15.4
Progression Factor		0.97	0.91		1.00	1.00
Incremental Delay, d2		0.8	0.6		1.1	4.3
Delay (s)		9.7	8.5		16.1	19.7
Level of Service		A	A		B	B
Approach Delay (s)		9.7	8.5		17.3	
Approach LOS		A	A		B	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 8: Katella Avenue & SR-57 NB Ramps

Year 2013 Without Project  
 AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1038	0	0	1052	469	347
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.81			0.86	0.97	0.91
Flt	1.00			1.00	0.97	0.85
Flt Protected	1.00			1.00	0.96	1.00
Satd. Flow (prot)	7259			6166	3255	1386
Flt Permitted	1.00			1.00	0.96	1.00
Satd. Flow (perm)	7259			6166	3255	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1093	0	0	1107	494	365
RTOR Reduction (vph)	0	0	0	0	24	24
Lane Group Flow (vph)	1093	0	0	1107	569	242
Heavy Vehicles (%)	6%	0%	0%	6%	6%	6%
Turn Type						Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	74.7			74.7	27.3	27.3
Effective Green, g (s)	74.7			74.7	27.3	27.3
Actuated g/C Ratio	0.68			0.68	0.25	0.25
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	4930			4187	808	344
v/s Ratio Prot	0.15			c0.18	c0.17	
v/s Ratio Perm						0.17
v/c Ratio	0.22			0.26	0.70	0.70
Uniform Delay, d1	6.7			6.9	37.7	37.7
Progression Factor	0.65			0.22	1.00	1.00
Incremental Delay, d2	0.1			0.1	2.8	6.4
Delay (s)	4.4			1.7	40.5	44.1
Level of Service	A			A	D	D
Approach Delay (s)	4.4			1.7	41.6	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 1: Katella Avenue & Manchester Avenue

Year 2013 Without Project  
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑↑	↑↑↑		↑	↑↓	↑	↑↑	↑↑	↑
Volume (vph)	0	1430	702	436	2262	0	39	0	496	32	55	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.91	1.00	0.97	0.91		0.95	0.91	0.95	0.97	0.95	1.00
Frt		1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Flt Permitted		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1505	739	459	2381	0	41	0	522	34	58	2
RTOR Reduction (vph)	0	0	292	0	0	0	0	240	240	0	0	2
Lane Group Flow (vph)	0	1505	447	459	2381	0	37	25	21	34	58	0
Heavy Vehicles (%)	0%	6%	6%	6%	6%	0%	9%	0%	9%	6%	6%	6%
Turn Type			Perm	Prot			Split		Perm	Split		Perm
Protected Phases		2		1	6		8	8			4	4
Permitted Phases			2						8			4
Actuated Green, G (s)		64.7	64.7	19.0	87.7		9.6	9.6	9.6	10.7	10.7	10.7
Effective Green, g (s)		64.7	64.7	19.0	87.7		9.6	9.6	9.6	10.7	10.7	10.7
Actuated g/C Ratio		0.54	0.54	0.16	0.73		0.08	0.08	0.08	0.09	0.09	0.09
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2638	822	523	3576		126	108	113	295	304	136
v/s Ratio Prot		0.31		c0.14	c0.49		c0.02	0.02		0.01	c0.02	
v/s Ratio Perm			0.29						0.01			0.00
v/c Ratio		0.57	0.54	0.88	0.67		0.29	0.23	0.18	0.12	0.19	0.00
Uniform Delay, d1		18.4	18.0	49.4	8.5		52.0	51.7	51.5	50.3	50.6	49.8
Progression Factor		0.79	1.96	0.70	0.36		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8	2.3	9.8	0.6		1.3	1.1	0.8	0.2	0.3	0.0
Delay (s)		15.4	37.6	44.5	3.6		53.3	52.8	52.3	50.5	50.9	49.8
Level of Service		B	D	D	A		D	D	D	D	D	D
Approach Delay (s)		22.7			10.2			52.6				50.7
Approach LOS		C			B			D				D

Intersection Summary		
HCM Average Control Delay	19.9	HCM Level of Service B
HCM Volume to Capacity ratio	0.63	
Actuated Cycle Length (s)	120.0	Sum of lost time (s) 16.0
Intersection Capacity Utilization	69.2%	ICU Level of Service C
Analysis Period (min)	15	

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
 2: Katella Avenue & Anaheim Way

Year 2013 Without Project  
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖↗	↑↑↑			↑↑↑	↖	↖	↑↑↑					
Volume (vph)	41	1941	0	0	2022	338	809	1227	227	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0					
Lane Util. Factor	0.97	0.91			0.81	0.81	0.81	0.81					
Flt	1.00	1.00			1.00	0.85	1.00	0.98					
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99					
Satd. Flow (prot)	3303	4893			5793	1234	1341	5487					
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99					
Satd. Flow (perm)	3303	4893			5793	1234	1341	5487					
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	43	2043	0	0	2128	356	852	1292	239	0	0	0	
RTOR Reduction (vph)	0	0	0	0	2	31	0	2	0	0	0	0	
Lane Group Flow (vph)	43	2043	0	0	2162	289	469	1912	0	0	0	0	
Heavy Vehicles (%)	6%	6%	0%	0%	6%	6%	9%	9%	9%	0%	0%	0%	
Turn Type	Prot						Perm		Split				
Protected Phases	5	2					6	8	8				
Permitted Phases							6						
Actuated Green, G (s)	4.8	60.3					51.5	51.5	51.7	51.7			
Effective Green, g (s)	4.8	60.3					51.5	51.5	51.7	51.7			
Actuated g/C Ratio	0.04	0.50					0.43	0.43	0.43	0.43			
Clearance Time (s)	4.0	4.0					4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0					3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	132	2459					2486	530	578	2364			
v/s Ratio Prot	0.01	c0.42					c0.37		c0.35	0.35			
v/s Ratio Perm							0.23						
v/c Ratio	0.33	0.83					0.87	0.55	0.81	0.81			
Uniform Delay, d1	56.0	25.5					31.2	25.5	29.9	29.8			
Progression Factor	0.63	0.45					0.68	0.64	1.00	1.00			
Incremental Delay, d2	1.2	2.8					3.0	2.6	8.5	2.1			
Delay (s)	36.5	14.2					24.2	18.9	38.4	32.0			
Level of Service	D	B					C	B	D	C			
Approach Delay (s)	14.7						23.6		33.2		0.0		
Approach LOS	B						C		C		A		

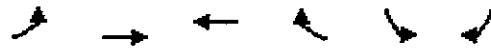
Intersection Summary			
HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
 7: Katella Avenue & SR-57 SB Ramps

Year 2013 Without Project  
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑		↑↑↑	↑
Volume (vph)	0	1488	1341	0	232	840
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.91	0.91		0.97	0.91
Frt		1.00	1.00		0.90	0.85
Flt Protected		1.00	1.00		0.98	1.00
Satd. Flow (prot)		4893	4893		3086	1386
Flt Permitted		1.00	1.00		0.98	1.00
Satd. Flow (perm)		4893	4893		3086	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1566	1412	0	244	884
RTOR Reduction (vph)	0	0	0	0	9	9
Lane Group Flow (vph)	0	1566	1412	0	677	433
Heavy Vehicles (%)	0%	6%	6%	0%	6%	6%
Turn Type						Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		59.8	59.8		42.2	42.2
Effective Green, g (s)		59.8	59.8		42.2	42.2
Actuated g/C Ratio		0.54	0.54		0.38	0.38
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2660	2660		1184	532
v/s Ratio Prot		c0.32	0.29		0.22	
v/s Ratio Perm						c0.31
v/c Ratio		0.59	0.53		0.57	0.81
Uniform Delay, d1		16.8	16.1		26.8	30.4
Progression Factor		0.48	0.63		1.00	1.00
Incremental Delay, d2		0.8	0.7		0.7	9.3
Delay (s)		8.9	10.8		27.4	39.7
Level of Service		A	B		C	D
Approach Delay (s)		8.9	10.8		32.2	
Approach LOS		A	B		C	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 8: Katella Avenue & SR-57 NB Ramps

Year 2013 Without Project  
 PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	TTTT			TTT	TTT	T
Volume (vph)	1010	0	0	1697	374	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.81			0.86	0.97	0.91
Frt	1.00			1.00	0.96	0.85
Frt Protected	1.00			1.00	0.96	1.00
Satd. Flow (prot)	7259			6166	3231	1386
Frt Permitted	1.00			1.00	0.96	1.00
Satd. Flow (perm)	7259			6166	3231	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1063	0	0	1786	394	358
RTOR Reduction (vph)	0	0	0	0	35	68
Lane Group Flow (vph)	1063	0	0	1786	481	168
Heavy Vehicles (%)	6%	0%	0%	6%	6%	6%
Turn Type						Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	79.4			79.4	22.6	22.6
Effective Green, g (s)	79.4			79.4	22.6	22.6
Actuated g/C Ratio	0.72			0.72	0.21	0.21
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	5240			4451	664	285
v/s Ratio Prot	0.15			0.29	0.15	
v/s Ratio Perm						0.12
v/c Ratio	0.20			0.40	0.72	0.59
Uniform Delay, d1	5.0			6.0	40.8	39.5
Progression Factor	0.38			0.42	1.00	1.00
Incremental Delay, d2	0.1			0.3	3.9	3.3
Delay (s)	2.0			2.8	44.7	42.8
Level of Service	A			A	D	D
Approach Delay (s)	2.0			2.8	44.1	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

*APPENDIX M-II*

**YEAR 2013 WITH PROJECT TRAFFIC CONDITIONS –  
CALTRANS INTERSECTION ANALYSIS (HCM  
METHODOLOGY)**

HCM Signalized Intersection Capacity Analysis  
 1: Katella Avenue & Manchester Avenue

Year 2013 With Project  
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↘	↑↑↑		↘	↕	↗	↘	↑↑	↗
Volume (vph)	0	1159	647	228	1687	0	56	0	649	24	93	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.91	1.00	0.97	0.91		0.95	0.91	0.95	0.97	0.95	1.00
Frt		1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Flt Permitted		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1220	681	240	1776	0	59	0	683	25	98	17
RTOR Reduction (vph)	0	0	312	0	0	0	0	305	304	0	0	15
Lane Group Flow (vph)	0	1220	369	240	1776	0	53	43	37	25	98	2
Heavy Vehicles (%)	0%	6%	6%	6%	6%	0%	9%	0%	9%	6%	6%	6%
Turn Type			Perm	Prot			Split		Perm	Split		Perm
Protected Phases		2		1	6		8	8		4	4	
Permitted Phases			2						8			4
Actuated Green, G (s)		59.6	59.6	10.0	73.6		11.8	11.8	11.8	12.6	12.6	12.6
Effective Green, g (s)		59.6	59.6	10.0	73.6		11.8	11.8	11.8	12.6	12.6	12.6
Actuated g/C Ratio		0.54	0.54	0.09	0.67		0.11	0.11	0.11	0.11	0.11	0.11
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2651	826	300	3274		169	145	151	378	390	175
v/s Ratio Prot		0.25		c0.07	c0.36		c0.03	0.03		0.01	c0.03	
v/s Ratio Perm			0.24						0.03			0.00
v/c Ratio		0.46	0.45	0.80	0.54		0.31	0.29	0.24	0.07	0.25	0.01
Uniform Delay, d1		15.4	15.2	49.0	9.5		45.4	45.3	45.0	43.5	44.4	43.2
Progression Factor		0.60	2.29	0.86	0.70		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.5	1.4	12.9	0.6		1.1	1.1	0.8	0.1	0.3	0.0
Delay (s)		9.7	36.3	55.1	7.2		46.4	46.4	45.8	43.5	44.7	43.2
Level of Service		A	D	E	A		D	D	D	D	D	D
Approach Delay (s)		19.2			12.9			46.1			44.3	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 2: Katella Avenue & Anaheim Way

Year 2013 With Project  
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1785	0	0	1394	310	592	398	340	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lane Util. Factor	0.97	0.91			0.81	0.81	0.81	0.81				
Frt	1.00	1.00			1.00	0.85	1.00	0.95				
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99				
Satd. Flow (prot)	3303	4893			5788	1234	1341	5293				
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99				
Satd. Flow (perm)	3303	4893			5788	1234	1341	5293				
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	1879	0	0	1467	326	623	419	358	0	0	0
RTOR Reduction (vph)	0	0	0	0	2	136	0	5	0	0	0	0
Lane Group Flow (vph)	42	1879	0	0	1498	157	311	1084	0	0	0	0
Heavy Vehicles (%)	6%	6%	0%	0%	6%	6%	9%	9%	9%	0%	0%	0%
Turn Type	Prot						Perm		Split			
Protected Phases	5	2					6	8	8			
Permitted Phases					6							
Actuated Green, G (s)	3.6	66.5					58.9	58.9	35.5	35.5		
Effective Green, g (s)	3.6	66.5					58.9	58.9	35.5	35.5		
Actuated g/C Ratio	0.03	0.60					0.54	0.54	0.32	0.32		
Clearance Time (s)	4.0	4.0					4.0	4.0	4.0	4.0		
Vehicle Extension (s)	3.0	3.0					3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	108	2958					3099	661	433	1708		
v/s Ratio Prot	0.01	c0.38					0.26		c0.23	0.20		
v/s Ratio Perm					0.13							
v/c Ratio	0.39	0.64					0.48	0.24	0.72	0.63		
Uniform Delay, d1	52.1	14.0					16.0	13.6	32.8	31.7		
Progression Factor	0.70	0.34					0.20	0.31	1.00	1.00		
Incremental Delay, d2	2.0	0.9					0.4	0.7	5.6	0.8		
Delay (s)	38.7	5.6					3.6	4.9	38.5	32.5		
Level of Service	D	A					A	A	D	C		
Approach Delay (s)	6.3						3.8		33.8		0.0	
Approach LOS	A						A		C		A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 7: Katella Avenue & SR-57 SB Ramps

Year 2013 With Project  
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBI	SBR
Lane Configurations		↑↑↑	↑↑↑		↑↑↑	↑
Volume (vph)	0	1340	1091	0	529	657
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.91	0.91		0.97	0.91
Frt		1.00	1.00		0.95	0.85
Flt Protected		1.00	1.00		0.97	1.00
Satd. Flow (prot)		4893	4893		3192	1386
Flt Permitted		1.00	1.00		0.97	1.00
Satd. Flow (perm)		4893	4893		3192	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1411	1148	0	557	692
RTOR Reduction (vph)	0	0	0	0	19	19
Lane Group Flow (vph)	0	1411	1148	0	836	375
Heavy Vehicles (%)	0%	6%	6%	0%	6%	6%
Turn Type						Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		29.6	29.6		22.4	22.4
Effective Green, g (s)		29.6	29.6		22.4	22.4
Actuated g/C Ratio		0.49	0.49		0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2414	2414		1192	517
v/s Ratio Prot		c0.29	0.23		0.26	
v/s Ratio Perm						c0.27
v/c Ratio		0.58	0.48		0.70	0.73
Uniform Delay, d1		10.8	10.1		16.0	16.2
Progression Factor		0.97	0.80		1.00	1.00
Incremental Delay, d2		0.9	0.6		1.9	5.0
Delay (s)		11.5	8.7		17.9	21.2
Level of Service		B	A		B	C
Approach Delay (s)		11.5	8.7		18.9	
Approach LOS		B	A		B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
 8: Katella Avenue & SR-57 NB Ramps

Year 2013 With Project  
 AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	TTTT			TTT	TTT	T
Volume (vph)	1317	0	0	1153	462	469
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.81			0.86	0.97	0.91
Frt	1.00			1.00	0.96	0.85
Frt Protected	1.00			1.00	0.96	1.00
Satd. Flow (prot)	7259			6166	3218	1386
Frt Permitted	1.00			1.00	0.96	1.00
Satd. Flow (perm)	7259			6166	3218	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1386	0	0	1214	486	494
RTOR Reduction (vph)	0	0	0	0	8	8
Lane Group Flow (vph)	1386	0	0	1214	661	303
Heavy Vehicles (%)	6%	0%	0%	6%	6%	6%
Turn Type						Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	77.1			77.1	34.9	34.9
Effective Green, g (s)	77.1			77.1	34.9	34.9
Actuated g/C Ratio	0.64			0.64	0.29	0.29
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	4664			3962	936	403
v/s Ratio Prot	0.19			c0.20	0.21	
v/s Ratio Perm						c0.22
v/c Ratio	0.30			0.31	0.71	0.75
Uniform Delay, d1	9.5			9.5	38.0	38.6
Progression Factor	0.77			0.30	1.00	1.00
Incremental Delay, d2	0.1			0.2	2.5	7.7
Delay (s)	7.4			3.0	40.4	46.4
Level of Service	A			A	D	D
Approach Delay (s)	7.4			3.0	42.3	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
 1: Katella Avenue & Manchester Avenue

Year 2013 With Project  
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑↑	↑↑↑		↑	↑	↑	↑↑	↑↑	↑
Volume (vph)	0	1433	702	436	2285	0	39	0	498	32	55	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.91	1.00	0.97	0.91		0.95	0.91	0.95	0.97	0.95	1.00
Frt		1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	1.00	0.85
Fit Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Fit Permitted		1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		4893	1524	3303	4893		1573	1351	1408	3303	3406	1524
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1508	739	459	2405	0	41	0	524	34	58	2
RTOR Reduction (vph)	0	0	292	0	0	0	0	241	241	0	0	2
Lane Group Flow (vph)	0	1508	447	459	2405	0	37	25	21	34	58	0
Heavy Vehicles (%)	0%	6%	6%	6%	6%	0%	9%	0%	9%	6%	6%	6%
Turn Type			Perm	Prot			Split		Perm	Split		Perm
Protected Phases		2		1	6		8	8		4	4	
Permitted Phases			2						8			4
Actuated Green, G (s)		64.7	64.7	19.0	87.7		9.6	9.6	9.6	10.7	10.7	10.7
Effective Green, g (s)		64.7	64.7	19.0	87.7		9.6	9.6	9.6	10.7	10.7	10.7
Actuated g/C Ratio		0.54	0.54	0.16	0.73		0.08	0.08	0.08	0.09	0.09	0.09
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2638	822	523	3576		126	108	113	295	304	136
v/s Ratio Prot		0.31		c0.14	c0.49		c0.02	0.02		0.01	c0.02	
v/s Ratio Perm			0.29						0.01			0.00
v/c Ratio		0.57	0.54	0.88	0.67		0.29	0.23	0.19	0.12	0.19	0.00
Uniform Delay, d1		18.4	18.0	49.4	8.5		52.0	51.7	51.5	50.3	50.6	49.8
Progression Factor		0.77	1.89	0.69	0.34		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8	2.3	9.6	0.6		1.3	1.1	0.8	0.2	0.3	0.0
Delay (s)		15.1	36.4	43.7	3.5		53.3	52.8	52.3	50.5	50.9	49.8
Level of Service		B	D	D	A		D	D	D	D	D	D
Approach Delay (s)		22.1			9.9			52.6			50.7	
Approach LOS		C			A			D			D	

Intersection Summary			
HCM Average Control Delay	19.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 2: Katella Avenue & Anaheim Way

Year 2013 With Project  
 PM Peak Hour



Movement	EBL	EBJ	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	1947	0	0	2060	338	809	1227	227	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lane Util. Factor	0.97	0.91			0.81	0.81	0.81	0.81				
Frt	1.00	1.00			1.00	0.85	1.00	0.98				
Flt Protected	0.95	1.00			1.00	1.00	0.95	0.99				
Satd. Flow (prot)	3303	4893			5793	1234	1341	5487				
Flt Permitted	0.95	1.00			1.00	1.00	0.95	0.99				
Satd. Flow (perm)	3303	4893			5793	1234	1341	5487				
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	43	2049	0	0	2168	356	852	1292	239	0	0	0
RTOR Reduction (vph)	0	0	0	0	2	31	0	2	0	0	0	0
Lane Group Flow (vph)	43	2049	0	0	2202	289	469	1912	0	0	0	0
Heavy Vehicles (%)	6%	6%	0%	0%	6%	6%	9%	9%	9%	0%	0%	0%
Turn Type	Prot					Perm	Split					
Protected Phases	5	2			6		8	8				
Permitted Phases						6						
Actuated Green, G (s)	4.8	60.3			51.5	51.5	51.7	51.7				
Effective Green, g (s)	4.8	60.3			51.5	51.5	51.7	51.7				
Actuated g/C Ratio	0.04	0.50			0.43	0.43	0.43	0.43				
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0				
Lane Grp Cap (vph)	132	2459			2486	530	578	2364				
v/s Ratio Prot	0.01	c0.42			c0.38		c0.35	0.35				
v/s Ratio Perm						0.23						
v/c Ratio	0.33	0.83			0.89	0.55	0.81	0.81				
Uniform Delay, d1	56.0	25.5			31.5	25.5	29.9	29.8				
Progression Factor	0.63	0.45			0.77	0.66	1.00	1.00				
Incremental Delay, d2	1.2	2.9			3.8	2.9	8.5	2.1				
Delay (s)	36.5	14.3			28.0	19.9	38.4	32.0				
Level of Service	D	B			C	B	D	C				
Approach Delay (s)		14.7			27.0			33.2			0.0	
Approach LOS		B			C			C			A	

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 7: Katella Avenue & SR-57 SB Ramps

Year 2013 With Project  
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑		↘↘	↗
Volume (vph)	0	1471	1383	0	277	816
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.91	0.91		0.97	0.91
Flt		1.00	1.00		0.91	0.85
Flt Protected		1.00	1.00		0.98	1.00
Satd. Flow (prot)		4893	4893		3104	1386
Flt Permitted		1.00	1.00		0.98	1.00
Satd. Flow (perm)		4893	4893		3104	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1548	1456	0	292	859
RTOR Reduction (vph)	0	0	0	0	9	9
Lane Group Flow (vph)	0	1548	1456	0	713	420
Heavy Vehicles (%)	0%	6%	6%	0%	6%	6%
Turn Type						Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		67.4	67.4		44.6	44.6
Effective Green, g (s)		67.4	67.4		44.6	44.6
Actuated g/C Ratio		0.56	0.56		0.37	0.37
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2748	2748		1154	515
v/s Ratio Prot		c0.32	0.30		0.23	
v/s Ratio Perm						c0.30
v/c Ratio		0.56	0.53		0.62	0.82
Uniform Delay, d1		16.9	16.4		30.8	34.0
Progression Factor		0.56	0.26		1.00	1.00
Incremental Delay, d2		0.7	0.7		1.0	9.7
Delay (s)		10.2	4.9		31.7	43.7
Level of Service		B	A		C	D
Approach Delay (s)		10.2	4.9		36.2	
Approach LOS		B	A		D	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
8: Katella Avenue & SR-57 NB Ramps

Year 2013 With Project  
PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1061	0	0	2013	359	367
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.81			0.86	0.97	0.91
Fit	1.00			1.00	0.96	0.85
Fit Protected	1.00			1.00	0.97	1.00
Satd. Flow (prot)	7259			6166	3216	1386
Fit Permitted	1.00			1.00	0.97	1.00
Satd. Flow (perm)	7259			6166	3216	1386
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1117	0	0	2119	378	386
RTOR Reduction (vph)	0	0	0	0	42	72
Lane Group Flow (vph)	1117	0	0	2119	483	167
Heavy Vehicles (%)	6%	0%	0%	6%	6%	6%
Turn Type						Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	86.3			86.3	25.7	25.7
Effective Green, g (s)	86.3			86.3	25.7	25.7
Actuated g/C Ratio	0.72			0.72	0.21	0.21
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	5220			4434	689	297
v/s Ratio Prot	0.15			c0.34	c0.15	
v/s Ratio Perm						0.12
v/c Ratio	0.21			0.48	0.70	0.56
Uniform Delay, d1	5.6			7.2	43.6	42.1
Progression Factor	0.45			0.63	1.00	1.00
Incremental Delay, d2	0.1			0.3	3.2	2.4
Delay (s)	2.6			4.8	46.8	44.5
Level of Service	A			A	D	D
Approach Delay (s)	2.6			4.8	46.1	
Approach LOS	A			A	D	

Intersection Summary

HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

*APPENDIX M-III*

**YEAR 2013 WITH PROJECT WITH MITIGATION  
TRAFFIC CONDITIONS – CALTRANS INTERSECTION  
ANALYSIS (HCM METHODOLOGY)**

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