1. Other Area Projects

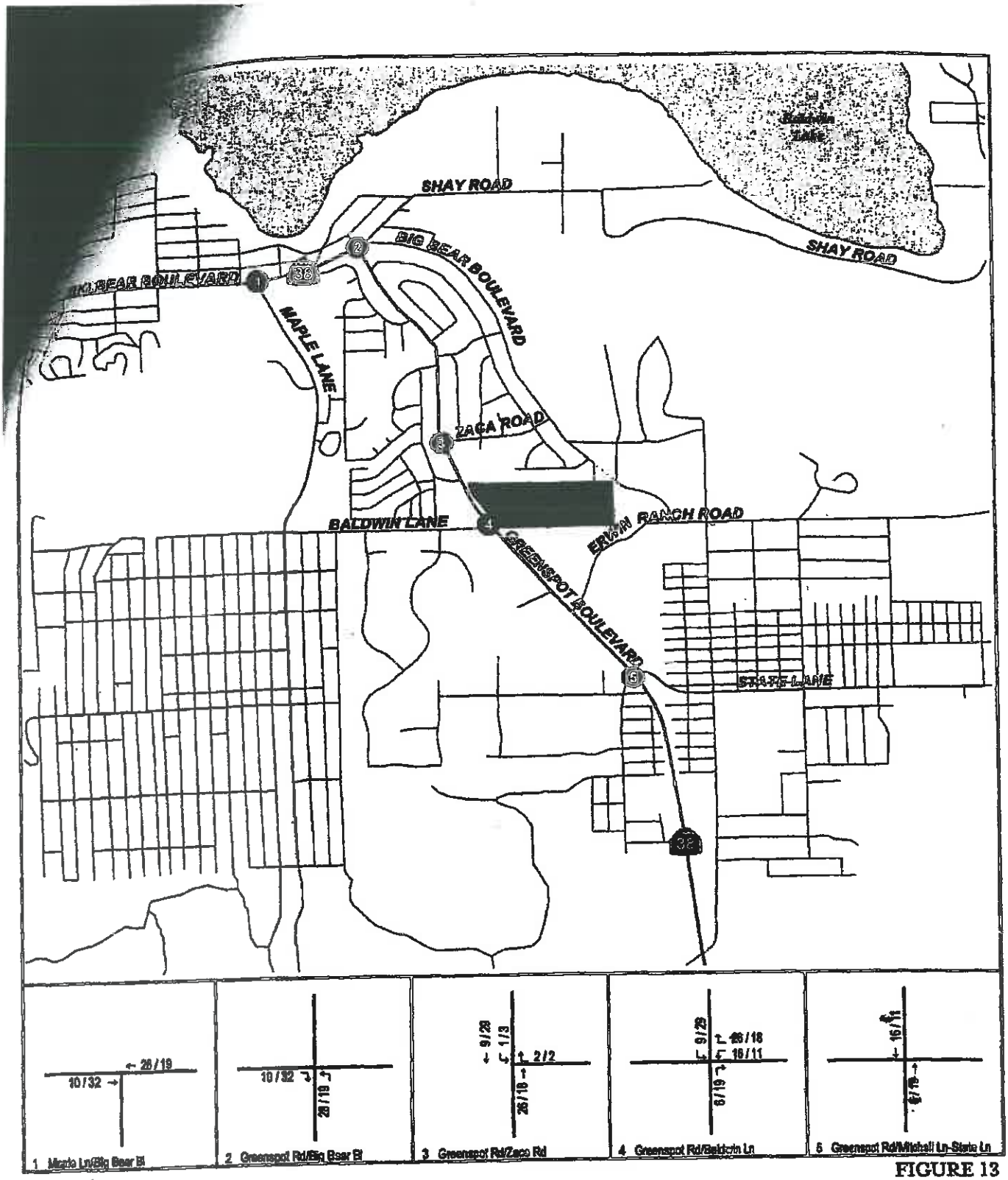


FIGURE 13

LSA

12 / 34 AM / PM Trips

Tentative Tract 16749

Project Trip Assignment

R:\CDJ530\Traffic\g30s\g30_13_trip_assign (7/29/2005)

2. Intersection Capacity Analysis Calculations

Hall & Foreman, Inc.

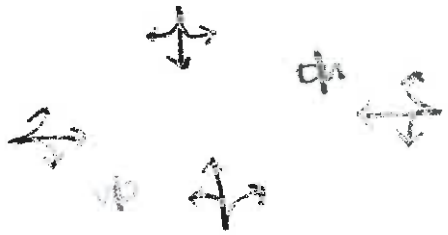
Engineering - Surveying - Planning - Landscape Architecture

SUBJECT	BY	DATE	JOB NO.	SHEET OF
SUMMARY	TM	22-Apr-13	VV.130048.0000	1 OF 2

E/W STREET : STATE LANE DRIVE
N/S STREET : HIGHWAY 38
CONDITION : AM PEAK HOUR

PROJECT YEAR : 2014
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS



EXISTING GEOMETRICS **PROPOSED GEOMETRICS** **FUTURE GEOMETRICS**

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	BACKGROUND TRAFFIC	EXISTING + BACKGROUND TRAFFIC	PROJECT TRIPS	EXISTING + BACKGROUND + PROJECT	YEAR 2035 WITHOUT PROJECT	YEAR 2035 WITH PROJECT
SCENERIO #							

STATE LANE DRIVE

EB LEFT	35	0	35	0	35	50	50
EB THRU	5	0	5	15	20	5	20
EB RIGHT	5	0	5	0	5	5	5
WB LEFT	10	0	10	10	20	15	25
WB THRU	5	0	5	15	20	5	20
WB RIGHT	190	0	200	25	225	280	305

HIGHWAY 38

NB LEFT	5	0	5	0	5	5	5
NB THRU	50	5	55	-5	50	75	70
NB RIGHT	5	0	5	10	15	5	15
SB LEFT	70	0	75	25	100	105	130
SB THRU	45	15	60	-5	55	80	75
SB RIGHT	10	0	10	0	10	15	15
TOTALS	**435**	**20**	**470**	**90**	**560**	**645**	**735**

Hall & Foreman, Inc.

Engineering • Surveying • Planning • Landscape Architecture

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN VOLUME SUMMARY	TM	22-Apr-13	VV.130048.0000	2 OF 2

E/W STREET : STATE LANE DRIVE N/S STREET : HIGHWAY 38

CONDITION : AM PEAK HOUR

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
1	0	2	0	0	0	0	1	0
0	2	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	1	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	12	19	2	12	0	53	1	3	0	0	8
3	12	11	0	8	0	32	0	1	1	1	5
3	8	20	1	16	0	50	1	2	0	1	12
1	11	19	0	10	0	50	1	4	2	1	9

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	ROUNDED TOTALS	TRUCK PERCENTAGE	
STATE LANE DRIVE						
EB LEFT	0	34	34	35	0	
EB THRU	0	3	3	5	0	2
EB RIGHT	1	3	4	5	25	
WB LEFT	0	10	10	10	0	
WB THRU	0	3	3	5	0	1
WB RIGHT	3	185	188	190	2	
HIGHWAY 38						
NB LEFT	0	0	0	5	0	
NB THRU	2	46	48	50	4	6
NB RIGHT	1	3	4	5	25	
SB LEFT	2	69	71	70	3	
SB THRU	4	43	47	45	9	6
SB RIGHT	1	8	9	10	11	

Irvine Office: 714.665.4500 Tel/ 714.665.4501 Fax

Santa Clarita Office: 661.284.7400 Tel/ 661.284.7401 Fax

Victorville Office: 760.241.0595 Tel/ 760.241.1937 Fax

Temecula Office: 951.294.9300 Tel/ 951.294.9301 Fax

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: HWY 38
EAST-WEST STREET: STATE LANE
JURISDICTION: BIG BEAR

DATE: 12-06-12

PEAK HOUR: 07:45AM

NORTH LEG

TOTAL: 127

	Rt	Thru	Lt
Total	9	47	71
1st	1	12	19
2nd	4	13	13
3rd	3	10	20
4th	1	12	19

EAST LEG TOTAL: 201

	1st	2nd	3rd	4th	Total
Rt	53	32	53	50	188
Thru	1	0	1	1	3
Lt	3	1	2	4	10

WEST LEG TOTAL: 41

	Total	1st	2nd	3rd	4th
Lt	34	8	5	12	9
Thru	3	0	1	1	1
Rt	4	1	1	0	2

SOUTH LEG

	Lt	Thru	Rt
1st	0	12	2
2nd	0	8	0
3rd	0	16	2
4th	0	12	0
Total		48	4

TOTAL: 52

PEAK HOUR FACTORS

NORTH LEG = 0.96
SOUTH LEG = 0.72
EAST LEG = 0.88
WEST LEG = 0.79

ALL LEGS = 0.88

HOUR TOTAL: 421

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: HWY 38

EAST-WEST STREET: STATE LANE

TIME: 07:00AM-08:00AM DATE: 12-06-12

NORTH LEG

Rt	Thru	Lt	
5	43	55	Total
2	10	18	1st
1	12	11	2nd
1	9	7	3rd
1	12	19	4th

	1st	2nd	3rd	4th	Total
Rt	28	35	39	53	155
Thru	0	0	1	1	2
Lt	3	2	2	3	10

Total	1st	2nd	3rd	4th	
21	7	2	4	8	Lt
2	0	0	2	0	Thru
2	0	1	0	1	Rt

	Lt	Thru	Rt
1st	0	9	0
2nd	0	4	0
3rd	0	10	0
4th	0	12	2
Total	0	35	2

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: HWY 38

EAST-WEST STREET: STATE LANE

TIME: 08:00AM-09:00AM DATE: 12-06-12

NORTH LEG

Rt	Thru	Lt	
10	56	68	Total
4	13	13	1st
3	10	20	2nd
1	12	19	3rd
2	21	16	4th

	1st	2nd	3rd	4th	Total
Rt	32	53	50	41	176
Thru	0	1	1	0	2
Lt	1	2	4	1	8

Total	1st	2nd	3rd	4th	
32	5	12	9	6	Lt
3	1	1	1	0	Thru
3	1	0	2	0	Rt

	Lt	Thru	Rt
1st	0	8	0
2nd	0	16	2
3rd	0	12	0
4th	0	8	1
Total	0	44	3

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : HWY 38
EAST-WEST STREET : STATE LANE

BIG BEAR
12-06-12

BEGINNING TIME : 07:00AM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
						NORTH LEG						
2	10	17	0	0	1	0	0	0	0	0	0	30
1	12	11	0	0	0	0	0	0	0	0	0	24
1	9	7	0	0	0	0	0	0	0	0	0	17
1	12	19	0	0	0	0	0	0	0	0	0	32
3	12	11	1	0	2	0	0	0	0	1	0	30
3	8	20	0	2	0	0	0	0	0	0	0	33
1	11	19	0	0	0	0	1	0	0	0	0	32
2	20	16	0	1	0	0	0	0	0	0	0	39
14	94	120	1	3	3	0	1	0	0	1	0	237
						SOUTH LEG						
0	9	0	0	0	0	0	0	0	0	0	0	9
0	4	0	0	0	0	0	0	0	0	0	0	4
0	9	0	0	0	0	0	1	0	0	0	0	10
2	12	0	0	0	0	0	0	0	0	0	0	14
0	8	0	0	0	0	0	0	0	0	0	0	8
1	16	0	1	0	0	0	0	0	0	0	0	18
0	10	0	0	0	0	0	1	0	0	1	0	12
1	8	0	0	0	0	0	0	0	0	0	0	9
4	76	0	1	0	0	0	2	0	0	1	0	84
						EAST LEG						
26	0	3	2	0	0	0	0	0	0	0	0	31
34	0	2	1	0	0	0	0	0	0	0	0	37
38	1	2	1	0	0	0	0	0	0	0	0	42
53	1	3	0	0	0	0	0	0	0	0	0	57
32	0	1	0	0	0	0	0	0	0	0	0	33
50	1	2	3	0	0	0	0	0	0	0	0	56
50	1	4	0	0	0	0	0	0	0	0	0	55
41	0	1	0	0	0	0	0	0	0	0	0	42
324	4	18	7	0	0	0	0	0	0	0	0	353
						WEST LEG						
0	0	7	0	0	0	0	0	0	0	0	0	7
1	0	2	0	0	0	0	0	0	0	0	0	3
0	2	4	0	0	0	0	0	0	0	0	0	6
0	0	8	1	0	0	0	0	0	0	0	0	9
1	1	5	0	0	0	0	0	0	0	0	0	7
0	1	12	0	0	0	0	0	0	0	0	0	13
2	1	9	0	0	0	0	0	0	0	0	0	12
0	0	6	0	0	0	0	0	0	0	0	0	6
4	5	53	1	0	0	0	0	0	0	0	0	63

Prepared by Newport Traffic Studies

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing Conditions
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	50	5	70	45	10
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	5	56	5	79	51	11
Percent Heavy Vehicles	6	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	5	190	35	5	5
Peak Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	11	5	215	39	5	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	79		231			49	
C(m) (vph)	1516	1536		966			466	
v/c	0.00	0.05		0.24			0.11	
95% queue length	0.01	0.16		0.94			0.35	
Control Delay	7.4	7.5		9.9			13.6	
LOS	A	A		A			B	
Approach Delay				9.9			13.6	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing Conditions
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	50	5	70	45	10
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Peak-15 Minute Volume	1	14	1	20	13	3
Hourly Flow Rate, HFR	5	56	5	79	51	11
Percent Heavy Vehicles	6	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	10	5	190	35	5	5
Peak Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Peak-15 Minute Volume	3	1	54	10	1	1
Hourly Flow Rate, HFR	11	5	215	39	5	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	56	51
Shared ln volume, major rt vehicles:	5	11
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		6		0	0	2	0	0	25
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2	4.1	7.1	6.5	6.2	7.1	6.5	6.4
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	6		0	0	2	0	0	25
t(f)	2.3	2.2	3.5	4.0	3.3	3.5	4.0	3.5

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	62	61	288	288	58	392	285	56
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	58	56
Potential Capacity	1008	949
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1008	949
Probability of Queue free St.	0.79	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows	61	62
Potential Capacity	1536	1516
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1536	1516
Probability of Queue free St.	0.95	1.00
Maj L-Shared Prob Q free St.	0.95	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	288	285
Potential Capacity	625	628
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	590	592
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	288	392
Potential Capacity	668	571
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	0.94
Maj. L, Min T Adj. Imp Factor.	0.95	0.95
Cap. Adj. factor due to Impeding mvmnt	0.95	0.75
Movement Capacity	632	427

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	288	285
Potential Capacity	625	628
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	590	592
Result for 2 stage process:		
a		
y		
C t	590	592
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	288	392
Potential Capacity	668	571
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	0.94
Maj. L, Min T Adj. Imp Factor.	0.95	0.95
Cap. Adj. factor due to Impeding mvmnt	0.95	0.75
Movement Capacity	632	427
Results for Two-stage process:		
a		
y		
C t	632	427

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	11	5	215	39	5	5
Movement Capacity (vph)	632	590	1008	427	592	949
Shared Lane Capacity (vph)		966			466	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	632	590	1008	427	592	949
Volume	11	5	215	39	5	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		966			466	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	79		231			49	
C(m) (vph)	1516	1536		966			466	
v/c	0.00	0.05		0.24			0.11	
95% queue length	0.01	0.16		0.94			0.35	
Control Delay	7.4	7.5		9.9			13.6	
LOS	A	A		A			B	
Approach Delay				9.9			13.6	
Approach LOS				A			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.95
v(i1), Volume for stream 2 or 5	56	51
v(i2), Volume for stream 3 or 6	5	11
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.95
d(M,LT), Delay for stream 1 or 4	7.4	7.5
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.4

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Background
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	55	5	75	60	10
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	5	62	5	85	68	11
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	5	200	35	5	5
Peak Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	11	5	227	39	5	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	85		243			49	
C(m) (vph)	1494	1509		955			431	
v/c	0.00	0.06		0.25			0.11	
95% queue length	0.01	0.18		1.02			0.38	
Control Delay	7.4	7.5		10.1			14.4	
LOS	A	A		B			B	
Approach Delay				10.1			14.4	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Background
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	55	5	75	60	10
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Peak-15 Minute Volume	1	16	1	21	17	3
Hourly Flow Rate, HFR	5	62	5	85	68	11
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	10	5	200	35	5	5
Peak Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Peak-15 Minute Volume	3	1	57	10	1	1
Hourly Flow Rate, HFR	11	5	227	39	5	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	62	68
Shared ln volume, major rt vehicles:	5	11
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		6	6	0	0	2	0	0	25
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2	4.2	7.1	6.5	6.2	7.1	6.5	6.4
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	6	6	0	0	2	0	0	25
t(f)	2.3	2.3	3.5	4.0	3.3	3.5	4.0	3.5

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	79	67	322	323	64	434	321	74
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	64	74
Potential Capacity	1000	927
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1000	927
Probability of Queue free St.	0.77	0.99
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	67	79
Potential Capacity	1509	1494
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1509	1494
Probability of Queue free St.	0.94	1.00
Maj L-Shared Prob Q free St.	0.94	1.00
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	323	321
Potential Capacity	598	599
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	561	562
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	322	434
Potential Capacity	635	536
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.93
Maj. L, Min T Adj. Imp Factor.	0.95	0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.73
Movement Capacity	597	392

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	323	321
Potential Capacity	598	599
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	561	562
Result for 2 stage process:		
a		
y		
C t	561	562
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	322	434
Potential Capacity	635	536
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.93
Maj. L, Min T Adj. Imp Factor.	0.95	0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.73
Movement Capacity	597	392
Results for Two-stage process:		
a		
y		
C t	597	392

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	11	5	227	39	5	5
Movement Capacity (vph)	597	561	1000	392	562	927
Shared Lane Capacity (vph)		955			431	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	597	561	1000	392	562	927
Volume	11	5	227	39	5	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		955			431	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	85		243			49	
C(m) (vph)	1494	1509		955			431	
v/c	0.00	0.06		0.25			0.11	
95% queue length	0.01	0.18		1.02			0.38	
Control Delay	7.4	7.5		10.1			14.4	
LOS	A	A		B			B	
Approach Delay				10.1			14.4	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.94
v(i1), Volume for stream 2 or 5	62	68
v(i2), Volume for stream 3 or 6	5	11
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.94
d(M,LT), Delay for stream 1 or 4	7.4	7.5
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.4

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	50	15	100	55	10
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	55	16	111	61	11
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	20	20	225	35	20	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	22	22	250	38	22	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	111		294			65	
C(m) (vph)	1503	1504		882			401	
v/c	0.00	0.07		0.33			0.16	
95% queue length	0.01	0.24		1.49			0.58	
Control Delay	7.4	7.6		11.1			15.7	
LOS	A	A		B			C	
Approach Delay				11.1			15.7	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	50	15	100	55	10
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	14	4	28	15	3
Hourly Flow Rate, HFR	5	55	16	111	61	11
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	20	20	225	35	20	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	6	6	62	10	6	1
Hourly Flow Rate, HFR	22	22	250	38	22	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	55	61
Shared ln volume, major rt vehicles:	16	11
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		6	6	0	0	2	0	0	25
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2	4.2	7.1	6.5	6.2	7.1	6.5	6.4
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	6	6	0	0	2	0	0	25
t(f)	2.3	2.3	3.5	4.0	3.3	3.5	4.0	3.5

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	72	71	375	367	63	497	369	66
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	63	66
Potential Capacity	1002	937
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1002	937
Probability of Queue free St.	0.75	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows	71	72
Potential Capacity	1504	1503
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1504	1503
Probability of Queue free St.	0.93	1.00
Maj L-Shared Prob Q free St.	0.92	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	367	369
Potential Capacity	565	563
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	520	518
Probability of Queue free St.	0.96	0.96

Step 4: LT from Minor St.	7	10
Conflicting Flows	375	497
Potential Capacity	586	487
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.88	0.88
Maj. L, Min T Adj. Imp Factor.	0.91	0.91
Cap. Adj. factor due to Impeding mvmnt	0.90	0.68
Movement Capacity	530	332

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	367	369
Potential Capacity	565	563
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	520	518
Result for 2 stage process:		
a		
y		
C t	520	518
Probability of Queue free St.	0.96	0.96
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	375	497
Potential Capacity	586	487
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.88	0.88
Maj. L, Min T Adj. Imp Factor.	0.91	0.91
Cap. Adj. factor due to Impeding mvmnt	0.90	0.68
Movement Capacity	530	332
Results for Two-stage process:		
a		
y		
C t	530	332

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	22	22	250	38	22	5
Movement Capacity (vph)	530	520	1002	332	518	937
Shared Lane Capacity (vph)		882			401	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	530	520	1002	332	518	937
Volume	22	22	250	38	22	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		882			401	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	111		294			65	
C(m) (vph)	1503	1504		882			401	
v/c	0.00	0.07		0.33			0.16	
95% queue length	0.01	0.24		1.49			0.58	
Control Delay	7.4	7.6		11.1			15.7	
LOS	A	A		B			C	
Approach Delay				11.1			15.7	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.93
v(i1), Volume for stream 2 or 5	55	61
v(i2), Volume for stream 3 or 6	16	11
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.92
d(M,LT), Delay for stream 1 or 4	7.4	7.6
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.6

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	75	5	105	80	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	78	5	110	84	15
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	5	280	50	5	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	15	5	294	52	5	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	110		314			62	
C(m) (vph)	1469	1489		926			319	
v/c	0.00	0.07		0.34			0.19	
95% queue length	0.01	0.24		1.53			0.72	
Control Delay	7.5	7.6		10.9			19.0	
LOS	A	A		B			C	
Approach Delay				10.9			19.0	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	75	5	105	80	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	1	20	1	28	21	4
Hourly Flow Rate, HFR	5	78	5	110	84	15
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	5	280	50	5	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	4	1	74	13	1	1
Hourly Flow Rate, HFR	15	5	294	52	5	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	78	84
Shared ln volume, major rt vehicles:	5	15
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	6	6	0	0	2	0	0	25
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.2	4.2	7.1	6.5	6.2	7.1	6.5	6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	6	6	0	0	2	0	0	25
t(f)	2.3	2.3	3.5	4.0	3.3	3.5	4.0	3.5

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	99	83	406	409	80	552	405	92
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	80	92
Potential Capacity	980	906
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	980	906
Probability of Queue free St.	0.70	0.99
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	83	99
Potential Capacity	1489	1469
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1489	1469
Probability of Queue free St.	0.93	1.00
Maj L-Shared Prob Q free St.	0.92	1.00
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	409	405
Potential Capacity	535	538
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	491	494
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	406	552
Potential Capacity	559	447
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.91
Maj. L, Min T Adj. Imp Factor.	0.93	0.93
Cap. Adj. factor due to Impeding mvmnt	0.93	0.65
Movement Capacity	517	291

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	409	405
Potential Capacity	535	538
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	491	494
Result for 2 stage process:		
a		
y		
C t	491	494
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	406	552
Potential Capacity	559	447
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.91
Maj. L, Min T Adj. Imp Factor.	0.93	0.93
Cap. Adj. factor due to Impeding mvmnt	0.93	0.65
Movement Capacity	517	291
Results for Two-stage process:		
a		
y		
C t	517	291

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	15	5	294	52	5	5
Movement Capacity (vph)	517	491	980	291	494	906
Shared Lane Capacity (vph)		926			319	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	517	491	980	291	494	906
Volume	15	5	294	52	5	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		926			319	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	110		314			62	
C(m) (vph)	1469	1489		926			319	
v/c	0.00	0.07		0.34			0.19	
95% queue length	0.01	0.24		1.53			0.72	
Control Delay	7.5	7.6		10.9			19.0	
LOS	A	A		B			C	
Approach Delay				10.9			19.0	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.93
v(il), Volume for stream 2 or 5	78	84
v(i2), Volume for stream 3 or 6	5	15
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.92
d(M,LT), Delay for stream 1 or 4	7.5	7.6
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.6

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	70	15	130	75	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	73	15	136	78	15
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	25	20	305	50	20	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	26	21	321	52	21	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	136		368			78	
C(m) (vph)	1477	1483		854			291	
v/c	0.00	0.09		0.43			0.27	
95% queue length	0.01	0.30		2.25			1.09	
Control Delay	7.4	7.7		12.4			21.9	
LOS	A	A		B			C	
Approach Delay				12.4			21.9	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	70	15	130	75	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	1	18	4	34	20	4
Hourly Flow Rate, HFR	5	73	15	136	78	15
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	25	20	305	50	20	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	7	5	80	13	5	1
Hourly Flow Rate, HFR	26	21	321	52	21	5
Percent Heavy Vehicles	0	0	2	0	0	25
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	73	78
Shared ln volume, major rt vehicles:	15	15
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		6	6	0	0	2	0	0	25
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.2	4.2	7.1	6.5	6.2	7.1	6.5	6.4
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	6	6	0	0	2	0	0	25
t(f)	2.3	2.3	3.5	4.0	3.3	3.5	4.0	3.5

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	93	88	460	455	80	620	456	86
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	80	86
Potential Capacity	980	913
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	980	913
Probability of Queue free St.	0.67	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows	88	93
Potential Capacity	1483	1477
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1483	1477
Probability of Queue free St.	0.91	1.00
Maj L-Shared Prob Q free St.	0.90	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	455	456
Potential Capacity	504	504
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.90	0.90
Movement Capacity	453	453
Probability of Queue free St.	0.95	0.95

Step 4: LT from Minor St.	7	10
Conflicting Flows	460	620
Potential Capacity	515	403
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.86	0.86
Maj. L, Min T Adj. Imp Factor.	0.89	0.89
Cap. Adj. factor due to Impeding mvmnt	0.89	0.60
Movement Capacity	456	241

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	455	456
Potential Capacity	504	504
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.90	0.90
Movement Capacity	453	453
Result for 2 stage process:		
a		
y		
C t	453	453
Probability of Queue free St.	0.95	0.95
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	460	620
Potential Capacity	515	403
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.86	0.86
Maj. L, Min T Adj. Imp Factor.	0.89	0.89
Cap. Adj. factor due to Impeding mvmnt	0.89	0.60
Movement Capacity	456	241
Results for Two-stage process:		
a		
y		
C t	456	241

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	26	21	321	52	21	5
Movement Capacity (vph)	456	453	980	241	453	913
Shared Lane Capacity (vph)		854			291	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	456	453	980	241	453	913
Volume	26	21	321	52	21	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		854			291	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	136		368			78	
C(m) (vph)	1477	1483		854			291	
v/c	0.00	0.09		0.43			0.27	
95% queue length	0.01	0.30		2.25			1.09	
Control Delay	7.4	7.7		12.4			21.9	
LOS	A	A		B			C	
Approach Delay				12.4			21.9	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.91
v(il), Volume for stream 2 or 5	73	78
v(i2), Volume for stream 3 or 6	15	15
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.90
d(M,LT), Delay for stream 1 or 4	7.4	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.7

Hall & Foreman, Inc.

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
SUMMARY	TM	22-Apr-13	VV.130048.0000	2 OF 2

E/W STREET : STATE LANE DRIVE
N/S STREET : HIGHWAY 38
CONDITION : PM PEAK HOUR

PROJECT YEAR : 2014
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS **PROPOSED GEOMETRICS** **FUTURE GEOMETRICS**

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	BACKGROUND TRAFFIC	EXISTING + BACKGROUND TRAFFIC	PROJECT TRIPS	EXISTING + BACKGROUND + PROJECT	YEAR 2035 WITHOUT PROJECT	YEAR 2035 WITH PROJECT
SCENERIO #							
STATE LANE DRIVE							
EB LEFT	15	0	15	0	15	20	20
EB THRU	5	0	5	15	20	5	20
EB RIGHT	5	0	5	0	5	5	5
WB LEFT	5	0	5	10	15	5	15
WB THRU	5	0	5	15	20	5	20
WB RIGHT	100	0	105	30	135	145	175
HIGHWAY 38							
NB LEFT	5	0	5	0	5	5	5
NB THRU	60	20	80	-5	75	105	100
NB RIGHT	10	0	10	10	20	15	25
SB LEFT	180	0	185	30	215	260	290
SB THRU	55	10	65	-5	60	90	85
SB RIGHT	30	0	30	0	30	45	45
TOTALS	**475**	**30**	**515**	**100**	**615**	**705**	**805**

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Santa Clarita Office: 661.284.7400 Tel/ 661.284.7401 Fax
Victorville Office: 760.524.9100 Tel/ 760.524.9101 Fax
Temecula Office: 951.294.9300 Tel/ 951.294.9301 Fax

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SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Apr-13	VV.130048.0000	2	OF 2

E/W STREET : STATE LANE DRIVE

N/S STREET : HIGHWAY 38

CONDITION : PM PEAK HOUR

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
8	14	28	3	22	0	31	1	1	1	2	6
11	9	46	2	16	2	22	0	1	0	1	0
4	17	49	3	10	0	20	0	0	0	1	3
9	16	57	4	10	0	24	0	1	1	0	4

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	ROUNDED TOTALS	TRUCK PERCENTAGE	
STATE LANE DRIVE						
EB LEFT	1	13	14	15	7	
EB THRU	0	4	4	5	0	5
EB RIGHT	0	2	2	5	0	
WB LEFT	0	3	3	5	0	
WB THRU	0	1	1	5	0	2
WB RIGHT	2	97	99	100	2	
HIGHWAY 38						
NB LEFT	0	2	2	5	0	
NB THRU	0	58	58	60	0	0
NB RIGHT	0	12	12	10	0	
SB LEFT	1	180	181	180	1	
SB THRU	0	56	56	55	0	0
SB RIGHT	0	32	32	30	0	

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Temecula Office: 951.294.9300 Tel/ 951.294.9301 Fax

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: HWY 38
EAST-WEST STREET: STATE LANE
JURISDICTION: BIG BEAR

DATE: 12-06-12

PEAK HOUR: 04:30PM

NORTH LEG

TOTAL: 269

	Rt	Thru	Lt
Total	32	56	181
1st	8	14	28
2nd	11	9	46
3rd	4	17	49
4th	9	16	58

EAST LEG TOTAL: 103

	1st	2nd	3rd	4th	Total
Rt	32	22	20	25	99
Thru	1	0	0	0	1
Lt	1	1	0	1	3

WEST LEG TOTAL: 19

	Total	1st	2nd	3rd	4th
Lt	13	6	0	3	4
Thru	4	2	1	1	0
Rt	2	1	0	0	1

SOUTH LEG

TOTAL: 72

	Lt	Thru	Rt
1st	0	22	3
2nd	2	16	2
3rd	0	10	3
4th	0	10	4
Total	2	58	12

PEAK HOUR FACTORS

NORTH LEG = 0.81
SOUTH LEG = 0.72
EAST LEG = 0.76
WEST LEG = 0.53

ALL LEGS = 0.90

HOUR TOTAL: 463

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: HWY 38

EAST-WEST STREET: STATE LANE

TIME: 04:00PM-05:00PM DATE: 12-06-12

NORTH LEG

Rt	Thru	Lt	
31	59	160	Total
7	20	42	1st
5	16	44	2nd
8	14	28	3rd
11	9	46	4th

	1st	2nd	3rd	4th	Total
Rt	29	18	32	22	101
Thru	0	0	1	0	1
Lt	1	1	1	1	4

Total	1st	2nd	3rd	4th	
15	6	3	6	0	Lt
4	1	0	2	1	Thru
1	0	0	1	0	Rt

	Lt	Thru	Rt
1st	1	14	2
2nd	1	14	5
3rd	0	22	3
4th	2	16	2
Total	4	66	12

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: HWY 38

EAST-WEST STREET: STATE LANE

TIME: 05:00PM-06:00PM DATE: 12-06-12

NORTH LEG

Rt	Thru	Lt	
25	52	173	Total
4	17	49	1st
9	16	58	2nd
6	9	38	3rd
6	10	28	4th

	1st	2nd	3rd	4th	Total
Rt	20	25	16	21	82
Thru	0	0	0	0	0
Lt	0	1	0	0	1

Total	1st	2nd	3rd	4th	
13	3	4	2	4	Lt
3	1	0	2	0	Thru
2	0	1	1	0	Rt

	Lt	Thru	Rt
1st	0	10	3
2nd	0	10	4
3rd	2	16	1
4th	2	18	1
Total	4	54	9

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : HWY 38 BIG BEAR

EAST-WEST STREET : STATE LANE 12-06-12

BEGINNING TIME : 04:00PM

AUTOS			LARGE 2 AXLE			3 AXLE			4(+) AXLE			TOTALS
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	
						NORTH LEG						
7	20	42	0	0	0	0	0	0	0	0	0	69
5	16	43	0	0	1	0	0	0	0	0	0	65
8	14	28	0	0	0	0	0	0	0	0	0	50
11	9	46	0	0	0	0	0	0	0	0	0	66
4	17	49	0	0	0	0	0	0	0	0	0	70
9	16	57	0	0	1	0	0	0	0	0	0	83
6	9	38	0	0	0	0	0	0	0	0	0	53
6	10	28	0	0	0	0	0	0	0	0	0	44
56	111	331	0	0	2	0	0	0	0	0	0	500
						SOUTH LEG						
2	13	1	0	0	0	0	0	0	0	1	0	17
5	14	1	0	0	0	0	0	0	0	0	0	20
3	22	0	0	0	0	0	0	0	0	0	0	25
2	16	2	0	0	0	0	0	0	0	0	0	20
3	10	0	0	0	0	0	0	0	0	0	0	13
4	10	0	0	0	0	0	0	0	0	0	0	14
1	15	2	0	1	0	0	0	0	0	0	0	19
1	18	2	0	0	0	0	0	0	0	0	0	21
21	118	8	0	1	0	0	0	0	0	1	0	149
						EAST LEG						
29	0	1	0	0	0	0	0	0	0	0	0	30
18	0	1	0	0	0	0	0	0	0	0	0	19
31	1	1	1	0	0	0	0	0	0	0	0	34
22	0	1	0	0	0	0	0	0	0	0	0	23
20	0	0	0	0	0	0	0	0	0	0	0	20
24	0	1	1	0	0	0	0	0	0	0	0	26
16	0	0	0	0	0	0	0	0	0	0	0	16
21	0	0	0	0	0	0	0	0	0	0	0	21
181	1	5	2	0	0	0	0	0	0	0	0	189
						WEST LEG						
0	1	6	0	0	0	0	0	0	0	0	0	7
0	0	2	0	0	1	0	0	0	0	0	0	3
1	2	6	0	0	0	0	0	0	0	0	0	9
0	1	0	0	0	0	0	0	0	0	0	0	1
0	1	3	0	0	0	0	0	0	0	0	0	4
1	0	4	0	0	0	0	0	0	0	0	0	5
1	2	2	0	0	0	0	0	0	0	0	0	5
0	0	4	0	0	0	0	0	0	0	0	0	4
3	7	27	0	0	1	0	0	0	0	0	0	38

Prepared by Newport Traffic Studies

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing Condition
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	60	10	180	55	30
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	66	11	200	61	33
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	100	15	5	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	5	111	16	5	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	200		121			26	
C(m) (vph)	1513	1535		873			371	
v/c	0.00	0.13		0.14			0.07	
95% queue length	0.01	0.45		0.48			0.23	
Control Delay	7.4	7.7		9.8			15.4	
LOS	A	A		A			C	
Approach Delay				9.8			15.4	
Approach LOS				A			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing Condition
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	60	10	180	55	30
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	17	3	50	15	8
Hourly Flow Rate, HFR	5	66	11	200	61	33
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	100	15	5	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	1	28	4	1	1
Hourly Flow Rate, HFR	5	5	111	16	5	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	66	61
Shared ln volume, major rt vehicles:	11	33
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0	0	0	2	7	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	7.1	6.5	6.2	7.2	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	2	7	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.6	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	94	77	564	576	72	618	565	78
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	72	78
Potential Capacity	990	988
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	990	988
Probability of Queue free St.	0.89	0.99
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	77	94
Potential Capacity	1535	1513
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1535	1513
Probability of Queue free St.	0.87	1.00
Maj L-Shared Prob Q free St.	0.86	1.00
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	576	565
Potential Capacity	431	437
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.86	0.86
Movement Capacity	370	375
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	564	618
Potential Capacity	439	394
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.85	0.85
Maj. L, Min T Adj. Imp Factor.	0.88	0.88
Cap. Adj. factor due to Impeding mvmnt	0.88	0.78
Movement Capacity	386	309

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	576	565
Potential Capacity	431	437
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.86	0.86
Movement Capacity	370	375
Result for 2 stage process:		
a		
y		
C t	370	375
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	564	618
Potential Capacity	439	394
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.85	0.85
Maj. L, Min T Adj. Imp Factor.	0.88	0.88
Cap. Adj. factor due to Impeding mvmnt	0.88	0.78
Movement Capacity	386	309
Results for Two-stage process:		
a		
y		
C t	386	309

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5	5	111	16	5	5
Movement Capacity (vph)	386	370	990	309	375	988
Shared Lane Capacity (vph)		873			371	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	386	370	990	309	375	988
Volume	5	5	111	16	5	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		873			371	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	200		121			26	
C(m) (vph)	1513	1535		873			371	
v/c	0.00	0.13		0.14			0.07	
95% queue length	0.01	0.45		0.48			0.23	
Control Delay	7.4	7.7		9.8			15.4	
LOS	A	A		A			C	
Approach Delay				9.8			15.4	
Approach LOS				A			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.87
v(il), Volume for stream 2 or 5	66	61
v(i2), Volume for stream 3 or 6	11	33
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.86
d(M,LT), Delay for stream 1 or 4	7.4	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	1.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Background
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	80	10	185	65	30
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	88	11	205	72	33
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	105	15	5	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	5	116	16	5	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	205		126			26	
C(m) (vph)	1499	1507		847			344	
v/c	0.00	0.14		0.15			0.08	
95% queue length	0.01	0.47		0.52			0.24	
Control Delay	7.4	7.8		10.0-			16.3	
LOS	A	A		A			C	
Approach Delay				10.0-			16.3	
Approach LOS				A			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Background
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	80	10	185	65	30
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	22	3	51	18	8
Hourly Flow Rate, HFR	5	88	11	205	72	33
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	105	15	5	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	1	29	4	1	1
Hourly Flow Rate, HFR	5	5	116	16	5	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	88	72
Shared ln volume, major rt vehicles:	11	33
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	2	7	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.2	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	2	7	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.6	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	105	99	608	619	94	662	607	88
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	94	88
Potential Capacity	963	976
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	963	976
Probability of Queue free St.	0.88	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows	99	105
Potential Capacity	1507	1499
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1507	1499
Probability of Queue free St.	0.86	1.00
Maj L-Shared Prob Q free St.	0.86	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	619	607
Potential Capacity	407	414
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.85	0.85
Movement Capacity	347	353
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	608	662
Potential Capacity	411	368
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.84	0.84
Maj. L, Min T Adj. Imp Factor.	0.88	0.88
Cap. Adj. factor due to Impeding mvmnt	0.87	0.77
Movement Capacity	359	284

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	619	607
Potential Capacity	407	414
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.85	0.85
Movement Capacity	347	353
Result for 2 stage process:		
a		
y		
C t	347	353
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	608	662
Potential Capacity	411	368
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.84	0.84
Maj. L, Min T Adj. Imp Factor.	0.88	0.88
Cap. Adj. factor due to Impeding mvmnt	0.87	0.77
Movement Capacity	359	284
Results for Two-stage process:		
a		
y		
C t	359	284

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	5	5	116	16	5	5
Movement Capacity (vph)	359	347	963	284	353	976
Shared Lane Capacity (vph)		847			344	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	359	347	963	284	353	976
Volume	5	5	116	16	5	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		847			344	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	205		126			26	
C(m) (vph)	1499	1507		847			344	
v/c	0.00	0.14		0.15			0.08	
95% queue length	0.01	0.47		0.52			0.24	
Control Delay	7.4	7.8		10.0-			16.3	
LOS	A	A		A			C	
Approach Delay				10.0-			16.3	
Approach LOS				A			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.86
v(il), Volume for stream 2 or 5	88	72
v(i2), Volume for stream 3 or 6	11	33
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.86
d(M,LT), Delay for stream 1 or 4	7.4	7.8
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	1.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	75	20	215	60	30
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	83	22	238	66	33
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	20	135	15	20	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	16	22	150	16	22	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	238		188			43	
C(m) (vph)	1507	1499		674			293	
v/c	0.00	0.16		0.28			0.15	
95% queue length	0.01	0.57		1.16			0.51	
Control Delay	7.4	7.9		12.4			19.4	
LOS	A	A		B			C	
Approach Delay				12.4			19.4	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	75	20	215	60	30
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	21	6	60	17	8
Hourly Flow Rate, HFR	5	83	22	238	66	33
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	15	20	135	15	20	5
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	4	6	38	4	6	1
Hourly Flow Rate, HFR	16	22	150	16	22	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	83	66
Shared ln volume, major rt vehicles:	22	33
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	2	7	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.2	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	2	7	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.6	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	99	105	676	679	94	748	673	82
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	94	82
Potential Capacity	963	983
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	963	983
Probability of Queue free St.	0.84	0.99
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	105	99
Potential Capacity	1499	1507
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1499	1507
Probability of Queue free St.	0.84	1.00
Maj L-Shared Prob Q free St.	0.83	1.00
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	679	673
Potential Capacity	376	379
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.83	0.83
Movement Capacity	312	314
Probability of Queue free St.	0.93	0.93
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	676	748
Potential Capacity	370	322
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.77	0.77
Maj. L, Min T Adj. Imp Factor.	0.82	0.82
Cap. Adj. factor due to Impeding mvmnt	0.82	0.69
Movement Capacity	303	224

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	679	673
Potential Capacity	376	379
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.83	0.83
Movement Capacity	312	314
Result for 2 stage process:		
a		
y		
C t	312	314
Probability of Queue free St.	0.93	0.93
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	676	748
Potential Capacity	370	322
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.77	0.77
Maj. L, Min T Adj. Imp Factor.	0.82	0.82
Cap. Adj. factor due to Impeding mvmnt	0.82	0.69
Movement Capacity	303	224
Results for Two-stage process:		
a		
y		
C t	303	224

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	16	22	150	16	22	5
Movement Capacity (vph)	303	312	963	224	314	983
Shared Lane Capacity (vph)		674			293	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	303	312	963	224	314	983
Volume	16	22	150	16	22	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		674			293	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	238		188			43	
C(m) (vph)	1507	1499		674			293	
v/c	0.00	0.16		0.28			0.15	
95% queue length	0.01	0.57		1.16			0.51	
Control Delay	7.4	7.9		12.4			19.4	
LOS	A	A		B			C	
Approach Delay				12.4			19.4	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.84
v(i1), Volume for stream 2 or 5	83	66
v(i2), Volume for stream 3 or 6	22	33
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.83
d(M,LT), Delay for stream 1 or 4	7.4	7.9
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	1.3

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	105	15	260	90	45
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	110	15	273	94	47
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	145	20	5	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	5	152	21	5	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	273		162			31	
C(m) (vph)	1455	1474		800			224	
v/c	0.00	0.19		0.20			0.14	
95% queue length	0.01	0.68		0.76			0.48	
Control Delay	7.5	8.0		10.6			23.6	
LOS	A	A		B			C	
Approach Delay				10.6			23.6	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 12/10/2012
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	105	15	260	90	45
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	1	28	4	68	24	12
Hourly Flow Rate, HFR	5	110	15	273	94	47
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	145	20	5	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	1	1	38	5	1	1
Hourly Flow Rate, HFR	5	5	152	21	5	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	110	94
Shared ln volume, major rt vehicles:	15	47
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	2	7	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.2	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	2	7	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.6	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	141	125	796	815	118	870	799	118
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	118	118
Potential Capacity	934	939
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	934	939
Probability of Queue free St.	0.84	0.99
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	125	141
Potential Capacity	1474	1455
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1474	1455
Probability of Queue free St.	0.81	1.00
Maj L-Shared Prob Q free St.	0.80	1.00
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	815	799
Potential Capacity	314	321
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.80	0.80
Movement Capacity	250	255
Probability of Queue free St.	0.98	0.98
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	796	870
Potential Capacity	307	266
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.78	0.78
Maj. L, Min T Adj. Imp Factor.	0.83	0.83
Cap. Adj. factor due to Impeding mvmnt	0.83	0.69
Movement Capacity	254	185

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	815	799
Potential Capacity	314	321
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.80	0.80
Movement Capacity	250	255
Result for 2 stage process:		
a		
y		
C t	250	255
Probability of Queue free St.	0.98	0.98
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	796	870
Potential Capacity	307	266
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.78	0.78
Maj. L, Min T Adj. Imp Factor.	0.83	0.83
Cap. Adj. factor due to Impeding mvmnt	0.83	0.69
Movement Capacity	254	185
Results for Two-stage process:		
a		
y		
C t	254	185

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5	5	152	21	5	5
Movement Capacity (vph)	254	250	934	185	255	939
Shared Lane Capacity (vph)		800			224	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	254	250	934	185	255	939
Volume	5	5	152	21	5	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		800			224	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	273		162			31	
C(m) (vph)	1455	1474		800			224	
v/c	0.00	0.19		0.20			0.14	
95% queue length	0.01	0.68		0.76			0.48	
Control Delay	7.5	8.0		10.6			23.6	
LOS	A	A		B			C	
Approach Delay				10.6			23.6	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.81
v(i1), Volume for stream 2 or 5	110	94
v(i2), Volume for stream 3 or 6	15	47
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.80
d(M,LT), Delay for stream 1 or 4	7.5	8.0
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	1.6

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	100	25	290	85	45
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	105	26	305	89	47
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	20	175	20	20	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	15	21	184	21	21	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	305		220			47	
C(m) (vph)	1461	1467		609			193	
v/c	0.00	0.21		0.36			0.24	
95% queue length	0.01	0.79		1.68			0.95	
Control Delay	7.5	8.1		14.2			29.6	
LOS	A	A		B			D	
Approach Delay				14.2			29.6	
Approach LOS				B			D	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Highway 38/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: State Lane Drive
North/South Street: Highway 38
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	100	25	290	85	45
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	1	26	7	76	22	12
Hourly Flow Rate, HFR	5	105	26	305	89	47
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	15	20	175	20	20	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	4	5	46	5	5	1
Hourly Flow Rate, HFR	15	21	184	21	21	5
Percent Heavy Vehicles	0	0	2	7	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	105	89
Shared ln volume, major rt vehicles:	26	47
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	2	7	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.2	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	2	7	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.6	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	136	131	864	874	118	952	863	112
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	118	112
Potential Capacity	934	947
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	934	947
Probability of Queue free St.	0.80	0.99
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	131	136
Potential Capacity	1467	1461
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1467	1461
Probability of Queue free St.	0.79	1.00
Maj L-Shared Prob Q free St.	0.77	1.00
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	874	863
Potential Capacity	290	295
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.77	0.77
Movement Capacity	224	227
Probability of Queue free St.	0.91	0.91
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	864	952
Potential Capacity	277	234
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.70	0.70
Maj. L, Min T Adj. Imp Factor.	0.77	0.77
Cap. Adj. factor due to Impeding mvmnt	0.76	0.62
Movement Capacity	212	144

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	874	863
Potential Capacity	290	295
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.77	0.77
Movement Capacity	224	227
Result for 2 stage process:		
a		
y		
C t	224	227
Probability of Queue free St.	0.91	0.91
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	864	952
Potential Capacity	277	234
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.70	0.70
Maj. L, Min T Adj. Imp Factor.	0.77	0.77
Cap. Adj. factor due to Impeding mvmnt	0.76	0.62
Movement Capacity	212	144
Results for Two-stage process:		
a		
y		
C t	212	144

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	15	21	184	21	21	5
Movement Capacity (vph)	212	224	934	144	227	947
Shared Lane Capacity (vph)		609			193	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	212	224	934	144	227	947
Volume	15	21	184	21	21	5
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		609			193	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	5	305		220			47	
C(m) (vph)	1461	1467		609			193	
v/c	0.00	0.21		0.36			0.24	
95% queue length	0.01	0.79		1.68			0.95	
Control Delay	7.5	8.1		14.2			29.6	
LOS	A	A		B			D	
Approach Delay				14.2			29.6	
Approach LOS				B			D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.79
v(i1), Volume for stream 2 or 5	105	89
v(i2), Volume for stream 3 or 6	26	47
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.77
d(M,LT), Delay for stream 1 or 4	7.5	8.1
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	1.8

Hall & Foreman, Inc.

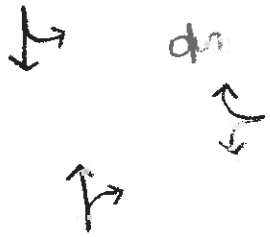
Engineering • Surveying • Planning • Landscape Architecture

SUBJECT	BY	DATE	JOB NO.	SHEET OF
SUMMARY	TM	22-Apr-13	VV.130048.0000	1 OF 2

E/W STREET : PROJECT DRIVEWAY
N/S STREET : STATE LANE DRIVE
CONDITION : AM PEAK HOUR

PROJECT YEAR : 2014
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS



EXISTING GEOMETRICS

PROPOSED GEOMETRICS

FUTURE GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	BACKGROUND TRAFFIC	EXISTING + BACKGROUND TRAFFIC	PROJECT TRIPS	EXISTING + BACKGROUND + PROJECT	YEAR 2035 WITHOUT PROJECT	YEAR 2035 WITH PROJECT
SCENERIO #							

PROJECT DRIVEWAY

EB LEFT	0	0	0	50	50	0	50
EB THRU	0	0	0	5	5	0	5
EB RIGHT	0	0	0	15	15	0	15
WB LEFT	5	0	5	0	5	5	5
WB THRU	0	0	0	5	5	0	5
WB RIGHT	5	0	5	0	5	5	5

STATE LANE DRIVE

NB LEFT	0	0	0	15	15	0	15
NB THRU	200	0	210	0	210	295	295
NB RIGHT	5	0	5	0	5	5	5
SB LEFT	5	0	5	0	5	5	5
SB THRU	80	0	85	0	85	120	120
SB RIGHT	0	0	0	5	5	0	5
TOTALS	**300**	**0**	**315**	**95**	**410**	**435**	**530**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN VOLUME SUMMARY	TM	22-Apr-13	VV.130048.0000	2 OF 2

E/W STREET : PROJECT DRIVEWAY

N/S STREET : STATE LANE DRIVE

CONDITION : AM PEAK HOUR

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
1	0	2	0	0	0	0	1	0
0	2	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	1	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	12	19	2	12	0	53	1	3	0	0	8
3	12	11	0	8	0	32	0	1	1	1	5
3	8	20	1	16	0	50	1	2	0	1	12
1	11	19	0	10	0	50	1	4	2	1	9

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	ROUNDED TOTALS	TRUCK PERCENTAGE	
PROJECT DRIVEWAY						
EB LEFT	0	0	0	0	0	
EB THRU	0	0	0	0	0	0
EB RIGHT	0	0	0	0	0	
WB LEFT	0	0	5	5	0	
WB THRU	0	0	0	0	0	0
WB RIGHT	0	0	5	5	0	
STATE LANE DRIVE						
NB LEFT	0	0	0	0	0	
NB THRU	3	198	201	200	0	1
NB RIGHT	0	0	5	5	0	
SB LEFT	0	0	5	5	0	
SB THRU	3	75	78	80	5	4
SB RIGHT	0	0	0	0	0	

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Santa Clarita Office: 661.284.7400 Tel/ 661.284.7401 Fax

Victorville Office: 760.241.0595 Tel/ 760.241.1937 Fax

Temecula Office: 951.294.9300 Tel/ 951.294.9301 Fax

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		200	5	5	80	
Peak-Hour Factor, PHF		0.88	0.88	0.88	0.88	
Hourly Flow Rate, HFR		227	5	5	90	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.88		0.88			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1348		733				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.7		10.0-				
LOS		A		A				
Approach Delay				10.0-				
Approach LOS				A				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		200	5	5	80	
Peak-Hour Factor, PHF		0.88	0.88	0.88	0.88	
Peak-15 Minute Volume		57	1	1	23	
Hourly Flow Rate, HFR		227	5	5	90	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.88		0.88			
Peak-15 Minute Volume	1		1			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		90
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.4		6.2			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		232	330		230			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	230	
Potential Capacity	814	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	814	
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	232	
Potential Capacity	1348	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1348	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	330	
Potential Capacity	669	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	667	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	330	
Potential Capacity	669	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	667	
Results for Two-stage process:		
a		
y		
C t	667	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5		5			
Movement Capacity (vph)	667		814			
Shared Lane Capacity (vph)		733				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	667		814			
Volume	5		5			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		733				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1348		733				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.7		10.0-				
LOS		A		A				
Approach Delay				10.0-				
Approach LOS				A				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		90
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.7
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed:
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Background
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		210	5	5	85	
Peak-Hour Factor, PHF		0.88	0.88	0.88	0.88	
Hourly Flow Rate, HFR		238	5	5	96	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.88		0.88			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0	0				
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1335		721				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.7		10.1				
LOS		A		B				
Approach Delay				10.1				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed:
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Background
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		210	5	5	85	
Peak-Hour Factor, PHF		0.88	0.88	0.88	0.88	
Peak-15 Minute Volume		60	1	1	24	
Hourly Flow Rate, HFR		238	5	5	96	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.88		0.88			
Peak-15 Minute Volume	1		1			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0	0				
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		96
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			0	0		0			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.1	6.4		6.2			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		243	346		240			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	240	
Potential Capacity	804	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	804	
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	243	
Potential Capacity	1335	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1335	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	346	
Potential Capacity	655	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	653	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	346	
Potential Capacity	655	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	653	
Results for Two-stage process:		
a		
y		
C t	653	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5		5			
Movement Capacity (vph)	653		804			
Shared Lane Capacity (vph)		721				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	653		804			
Volume	5		5			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		721				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1335		721				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.7		10.1				
LOS		A		B				
Approach Delay				10.1				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5		96
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.7
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	15	210	5	5	85	5
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	16	233	5	5	94	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	5	50	5	15
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	5	5	55	5	16
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	16	5		15			76	
C(m) (vph)	1507	1341		618			620	
v/c	0.01	0.00		0.02			0.12	
95% queue length	0.03	0.01		0.07			0.42	
Control Delay	7.4	7.7		11.0			11.6	
LOS	A	A		B			B	
Approach Delay				11.0			11.6	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	15	210	5	5	85	5
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	4	58	1	1	24	1
Hourly Flow Rate, HFR	16	233	5	5	94	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	5	50	5	15
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	1	1	14	1	4
Hourly Flow Rate, HFR	5	5	5	55	5	16
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	233	94
Shared ln volume, major rt vehicles:	5	5
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	99	238	385	377	236	378	376	96
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	236	96
Potential Capacity	808	966
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	808	966
Probability of Queue free St.	0.99	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows	238	99
Potential Capacity	1341	1507
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1341	1507
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.	1.00	0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	377	376
Potential Capacity	558	558
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	549	549
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	385	378
Potential Capacity	577	583
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.97
Movement Capacity	557	568

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	377	376
Potential Capacity	558	558
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	549	549
Result for 2 stage process:		
a		
y		
C t	549	549
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	385	378
Potential Capacity	577	583
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.97
Movement Capacity	557	568
Results for Two-stage process:		
a		
y		
C t	557	568

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5	5	5	55	5	16
Movement Capacity (vph)	557	549	808	568	549	966
Shared Lane Capacity (vph)		618			620	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	557	549	808	568	549	966
Volume	5	5	5	55	5	16
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		618			620	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	16	5		15			76	
C(m) (vph)	1507	1341		618			620	
v/c	0.01	0.00		0.02			0.12	
95% queue length	0.03	0.01		0.07			0.42	
Control Delay	7.4	7.7		11.0			11.6	
LOS	A	A		B			B	
Approach Delay				11.0			11.6	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(i1), Volume for stream 2 or 5	233	94
v(i2), Volume for stream 3 or 6	5	5
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	1.00
d(M,LT), Delay for stream 1 or 4	7.4	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		295	5	5	120	
Peak-Hour Factor, PHF		0.95	0.95	0.95	0.95	
Hourly Flow Rate, HFR		310	5	5	126	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.95		0.95			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1257		641				
v/c		0.00		0.02				
95% queue length		0.01		0.05				
Control Delay		7.9		10.7				
LOS		A		B				
Approach Delay				10.7				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		295	5	5	120	
Peak-Hour Factor, PHF		0.95	0.95	0.95	0.95	
Peak-15 Minute Volume		78	1	1	32	
Hourly Flow Rate, HFR		310	5	5	126	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.95		0.95			
Peak-15 Minute Volume	1		1			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		126
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	6.4		6.2			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(1,prot)	V(t)	V(1,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		315	448		312			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	312	
Potential Capacity	733	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	733	
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	315	
Potential Capacity	1257	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1257	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	448	
Potential Capacity	572	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	570	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	448	
Potential Capacity	572	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	570	
Results for Two-stage process:		
a		
y		
C t	570	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5		5			
Movement Capacity (vph)	570		733			
Shared Lane Capacity (vph)		641				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	570		733			
Volume	5		5			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		641				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1257		641				
v/c		0.00		0.02				
95% queue length		0.01		0.05				
Control Delay		7.9		10.7				
LOS		A		B				
Approach Delay				10.7				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5		126
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.9
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	15	295	5	5	120	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	15	310	5	5	126	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	5	50	5	15
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	5	5	52	5	15
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	15	5		15			72	
C(m) (vph)	1467	1257		539			534	
v/c	0.01	0.00		0.03			0.13	
95% queue length	0.03	0.01		0.09			0.47	
Control Delay	7.5	7.9		11.9			12.8	
LOS	A	A		B			B	
Approach Delay				11.9			12.8	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: AM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	15	295	5	5	120	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	4	78	1	1	32	1
Hourly Flow Rate, HFR	15	310	5	5	126	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	5	50	5	15
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	1	1	1	13	1	4
Hourly Flow Rate, HFR	5	5	5	52	5	15
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	310	126
Shared ln volume, major rt vehicles:	5	5
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	131	315	490	483	312	486	483	128
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	312	128
Potential Capacity	733	927
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	733	927
Probability of Queue free St.	0.99	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows	315	131
Potential Capacity	1257	1467
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1257	1467
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.	1.00	0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	483	483
Potential Capacity	486	486
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	478	478
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	490	486
Potential Capacity	492	495
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.97
Movement Capacity	474	481

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	483	483
Potential Capacity	486	486
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	478	478
Result for 2 stage process:		
a		
y		
C t	478	478
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	490	486
Potential Capacity	492	495
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.97
Movement Capacity	474	481
Results for Two-stage process:		
a		
y		
C t	474	481

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5	5	5	52	5	15
Movement Capacity (vph)	474	478	733	481	478	927
Shared Lane Capacity (vph)		539			534	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	474	478	733	481	478	927
Volume	5	5	5	52	5	15
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		539			534	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	15	5		15			72	
C(m) (vph)	1467	1257		539			534	
v/c	0.01	0.00		0.03			0.13	
95% queue length	0.03	0.01		0.09			0.47	
Control Delay	7.5	7.9		11.9			12.8	
LOS	A	A		B			B	
Approach Delay				11.9			12.8	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(i1), Volume for stream 2 or 5	310	126
v(i2), Volume for stream 3 or 6	5	5
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	1.00
d(M,LT), Delay for stream 1 or 4	7.5	7.9
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	0.0

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
SUMMARY	TM	22-Apr-13	VV.130048.0000	2 OF 2

E/W STREET : PROJECT DRIVEWAY
N/S STREET : STATE LANE DRIVE
CONDITION : PM PEAK HOUR

PROJECT YEAR : 2014
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS **PROPOSED GEOMETRICS** **FUTURE GEOMETRICS**

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	BACKGROUND TRAFFIC	EXISTING + BACKGROUND TRAFFIC	PROJECT TRIPS	EXISTING + BACKGROUND + PROJECT	YEAR 2035 WITHOUT PROJECT	YEAR 2035 WITH PROJECT
SCENERIO #							
PROJECT DRIVEWAY							
EB LEFT	0	0	0	55	55	0	55
EB THRU	0	0	0	5	5	0	5
EB RIGHT	0	0	0	20	20	0	20
WB LEFT	5	0	5	0	5	5	5
WB THRU	0	0	0	5	5	0	5
WB RIGHT	5	0	5	0	5	5	5
STATE LANE DRIVE							
NB LEFT	0	0	0	20	20	0	20
NB THRU	105	0	110	0	110	155	155
NB RIGHT	5	0	5	0	5	5	5
SB LEFT	5	0	5	0	5	5	5
SB THRU	195	0	205	0	205	285	285
SB RIGHT	0	0	0	10	10	0	10
TOTALS	**320**	**0**	**335**	**115**	**450**	**460**	**575**

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SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Apr-13	VV.130048.0000	2	OF 2

E/W STREET : PROJECT DRIVEWAY

N/S STREET : STATE LANE DRIVE

CONDITION : PM PEAK HOUR

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
8	14	28	3	22	0	31	1	1	1	2	6
11	9	46	2	16	2	22	0	1	0	1	0
4	17	49	3	10	0	20	0	0	0	1	3
9	16	57	4	10	0	24	0	1	1	0	4

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	ROUNDED TOTALS	TRUCK PERCENTAGE	
PROJECT DRIVEWAY						
EB LEFT	0	0	0	0	0	
EB THRU	0	0	0	0	0	0
EB RIGHT	0	0	0	0	0	
WB LEFT	0	0	5	5	0	
WB THRU	0	0	0	0	0	0
WB RIGHT	0	0	5	5	0	
STATE LANE DRIVE						
NB LEFT	0	0	0	0	0	
NB THRU	2	101	103	105	0	2
NB RIGHT	0	0	5	5	0	
SB LEFT	0	0	5	5	0	
SB THRU	1	196	197	195	0	0
SB RIGHT	0	0	0	0	0	

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Temecula Office: 951.294.9300 Tel/ 951.294.9301 Fax

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		105	5	5	195	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		116	5	5	216	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0	0				
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1479		772				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.4		9.7				
LOS		A		A				
Approach Delay				9.7				
Approach LOS				A				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		105	5	5	195	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Peak-15 Minute Volume		29	1	1	54	
Hourly Flow Rate, HFR		116	5	5	216	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.90		0.90			
Peak-15 Minute Volume	1		1			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		216
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			0	0		0			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.1	6.4		6.2			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		121	344		118			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	118	
Potential Capacity	939	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	939	
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	121	
Potential Capacity	1479	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1479	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	344	
Potential Capacity	657	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	655	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	344	
Potential Capacity	657	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	655	
Results for Two-stage process:		
a		
y		
C t	655	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5		5			
Movement Capacity (vph)	655		939			
Shared Lane Capacity (vph)		772				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	655		939			
Volume	5		5			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		772				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1479		772				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.4		9.7				
LOS		A		A				
Approach Delay				9.7				
Approach LOS				A				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5		216
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.4
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		110	5	5	205	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		122	5	5	227	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1472		759				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.5		9.8				
LOS		A		A				
Approach Delay				9.8				
Approach LOS				A				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/13
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Existing plus Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		110	5	5	205	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Peak-15 Minute Volume		31	1	1	57	
Hourly Flow Rate, HFR		122	5	5	227	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.90		0.90			
Peak-15 Minute Volume	1		1			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0	0				
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		227
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			0	0		0			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.1	6.4		6.2			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		127	361		124			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	124	
Potential Capacity	932	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	932	
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	127	
Potential Capacity	1472	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1472	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	361	
Potential Capacity	642	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	640	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	361	
Potential Capacity	642	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	640	
Results for Two-stage process:		
a		
y		
C t	640	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5		5			
Movement Capacity (vph)	640		932			
Shared Lane Capacity (vph)		759				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	640		932			
Volume	5		5			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		759				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1472		759				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.5		9.8				
LOS		A		A				
Approach Delay				9.8				
Approach LOS				A				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5		227
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.5
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	20	110	5	5	205	10
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	22	122	5	5	227	11
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	5	55	5	20
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	5	5	5	61	5	22
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	22	5		15			88	
C(m) (vph)	1341	1472		608			584	
v/c	0.02	0.00		0.02			0.15	
95% queue length	0.05	0.01		0.08			0.53	
Control Delay	7.7	7.5		11.1			12.3	
LOS	A	A		B			B	
Approach Delay				11.1			12.3	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Project Year 2014
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	20	110	5	5	205	10
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	6	31	1	1	57	3
Hourly Flow Rate, HFR	22	122	5	5	227	11
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	5	55	5	20
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	1	1	1	15	1	6
Hourly Flow Rate, HFR	5	5	5	61	5	22
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	122	227
Shared ln volume, major rt vehicles:	5	11
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0	0	0	0	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	238	127	424	416	124	416	413	232
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	124	232
Potential Capacity	932	812
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	932	812
Probability of Queue free St.	0.99	0.97
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	127	238
Potential Capacity	1472	1341
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1472	1341
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.	1.00	0.98
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	416	413
Potential Capacity	530	532
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	519	521
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	424	416
Potential Capacity	544	551
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity	517	535

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	416	413
Potential Capacity	530	532
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	519	521
Result for 2 stage process:		
a		
y		
C t	519	521
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	424	416
Potential Capacity	544	551
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity	517	535
Results for Two-stage process:		
a		
y		
C t	517	535

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5	5	5	61	5	22
Movement Capacity (vph)	517	519	932	535	521	812
Shared Lane Capacity (vph)		608			584	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	517	519	932	535	521	812
Volume	5	5	5	61	5	22
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		608			584	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	22	5		15			88	
C(m) (vph)	1341	1472		608			584	
v/c	0.02	0.00		0.02			0.15	
95% queue length	0.05	0.01		0.08			0.53	
Control Delay	7.7	7.5		11.1			12.3	
LOS	A	A		B			B	
Approach Delay				11.1			12.3	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(i1), Volume for stream 2 or 5	122	227
v(i2), Volume for stream 3 or 6	5	11
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.98	1.00
d(M,LT), Delay for stream 1 or 4	7.7	7.5
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/12
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		155	5	5	285	
Peak-Hour Factor, PHF		0.95	0.95	0.95	0.95	
Hourly Flow Rate, HFR		163	5	5	300	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.95		0.95			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1422		677				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.5		10.4				
LOS		A		B				
Approach Delay				10.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 1/30/12
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 without Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street: State Lane Drive
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		155	5	5	285	
Peak-Hour Factor, PHF		0.95	0.95	0.95	0.95	
Peak-15 Minute Volume		41	1	1	75	
Hourly Flow Rate, HFR		163	5	5	300	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.95		0.95			
Peak-15 Minute Volume	1		1			
Hourly Flow Rate, HFR	5		5			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0	0				
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		300
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			0	0		0			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.1	6.4		6.2			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		168	476		166			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	166	
Potential Capacity	884	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	884	
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	168	
Potential Capacity	1422	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1422	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	476	
Potential Capacity	551	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	549	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	476	
Potential Capacity	551	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	549	
Results for Two-stage process:		
a		
y		
C t	549	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5		5			
Movement Capacity (vph)	549		884			
Shared Lane Capacity (vph)		677				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	549		884			
Volume	5		5			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		677				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		5		10				
C(m) (vph)		1422		677				
v/c		0.00		0.01				
95% queue length		0.01		0.04				
Control Delay		7.5		10.4				
LOS		A		B				
Approach Delay				10.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		300
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.5
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street:
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	20	155	5	5	285	10
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	21	163	5	5	300	10
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	5	55	5	20
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	5	5	57	5	21
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	21	5		15			83	
C(m) (vph)	1262	1422		530			500	
v/c	0.02	0.00		0.03			0.17	
95% queue length	0.05	0.01		0.09			0.60	
Control Delay	7.9	7.5		12.0			13.6	
LOS	A	A		B			B	
Approach Delay				12.0			13.6	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: TM
Agency/Co.: Hall and Foreman, Inc
Date Performed: 4/24/2013
Analysis Time Period: PM Peak Hour
Intersection: Project Dwy#2/State Lane Drive
Jurisdiction: San Bernardino County
Units: U. S. Customary
Analysis Year: Year 2035 with Project
Project ID: VV.130048.0000
East/West Street: Project Driveway #2
North/South Street:
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	20	155	5	5	285	10
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	5	41	1	1	75	3
Hourly Flow Rate, HFR	21	163	5	5	300	10
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	5	55	5	20
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Peak-15 Minute Volume	1	1	1	14	1	5
Hourly Flow Rate, HFR	5	5	5	57	5	21
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	163	300
Shared ln volume, major rt vehicles:	5	10
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	310	168	536	528	166	527	525	305
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	166	305
Potential Capacity	884	740
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	884	740
Probability of Queue free St.	0.99	0.97

Step 2: LT from Major St.	4	1
Conflicting Flows	168	310
Potential Capacity	1422	1262
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1422	1262
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.	1.00	0.98

Step 3: TH from Minor St.	8	11
Conflicting Flows	528	525
Potential Capacity	459	460
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	449	450
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	536	527
Potential Capacity	459	465
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.97	0.97
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity	435	451

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	528	525
Potential Capacity	459	460
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	449	450
Result for 2 stage process:		
a		
y		
C t	449	450
Probability of Queue free St.	0.99	0.99
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	536	527
Potential Capacity	459	465
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.97
Maj. L, Min T Adj. Imp Factor.	0.97	0.97
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity	435	451
Results for Two-stage process:		
a		
y		
C t	435	451

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	5	5	5	57	5	21
Movement Capacity (vph)	435	449	884	451	450	740
Shared Lane Capacity (vph)		530			500	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	435	449	884	451	450	740
Volume	5	5	5	57	5	21
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		530			500	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	21	5		15			83	
C(m) (vph)	1262	1422		530			500	
v/c	0.02	0.00		0.03			0.17	
95% queue length	0.05	0.01		0.09			0.60	
Control Delay	7.9	7.5		12.0			13.6	
LOS	A	A		B			B	
Approach Delay				12.0			13.6	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(i1), Volume for stream 2 or 5	163	300
v(i2), Volume for stream 3 or 6	5	10
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.98	1.00
d(M,LT), Delay for stream 1 or 4	7.9	7.5
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	0.0

3. Traffic Signal Warrant Worksheets – Highway 38 and State Lane

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

COUNT DATE 12-4-12
CALC _____ DATE _____
CHK _____ DATE _____

DIST ____ CO ____ RTE ____ PM ____

Major St: Greenspot Blvd / Hwy 38
Minor St: State Lane

Critical Approach Speed _____ mph
Critical Approach Speed 40 mph

Speed limit or critical speed on major street traffic > 40 mph..... ☐ or
In built up area of isolated community of < 10,000 population..... ☐ } RURAL (R)
☐ URBAN (U)

WARRANT 1 - Eight Hour Vehicular Volume SATISFIED YES ☐ NO ☑
(Condition A or Condition B or combination of A and B must be satisfied)

Condition A - Minimum Vehicle Volume 100% SATISFIED YES ☐ NO ☐
80% SATISFIED YES ☐ NO ☑

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)												Hour
	U	R	U	R									
APPROACH LANES	1		2 or More										
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)								2[illegible]	
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)								[illegible]	

Condition B - Interruption of Continuous Traffic 100% SATISFIED YES ☐ NO ☐
80% SATISFIED YES ☐ NO ☑

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)												Hour
	U	R	U	R									
APPROACH LANES	1		2 or More										
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)								[illegible]	
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)								[illegible]	

Combination of Conditions A & B SATISFIED YES ☐ NO ☑

REQUIREMENT	CONDITION	✓	FULFILLED
TWO CONDITIONS SATISFIED 80%	A. MINIMUM VEHICULAR VOLUME		Yes ☐ No ☐
	AND, B. INTERRUPTION OF CONTINUOUS TRAFFIC		
AND, AN ADEQUATE TRIAL OF OTHER ALTERNATIVES THAT COULD CAUSE LESS DELAY AND INCONVENIENCE TO TRAFFIC HAS FAILED TO SOLVE THE TRAFFIC PROBLEMS			Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	Hour			
Both Approaches - Major Street			276	[illegible]	314	[illegible]
Higher Approach - Minor Street			135	118	130	164

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☑

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☑**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☑**
(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☑
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☑ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☑

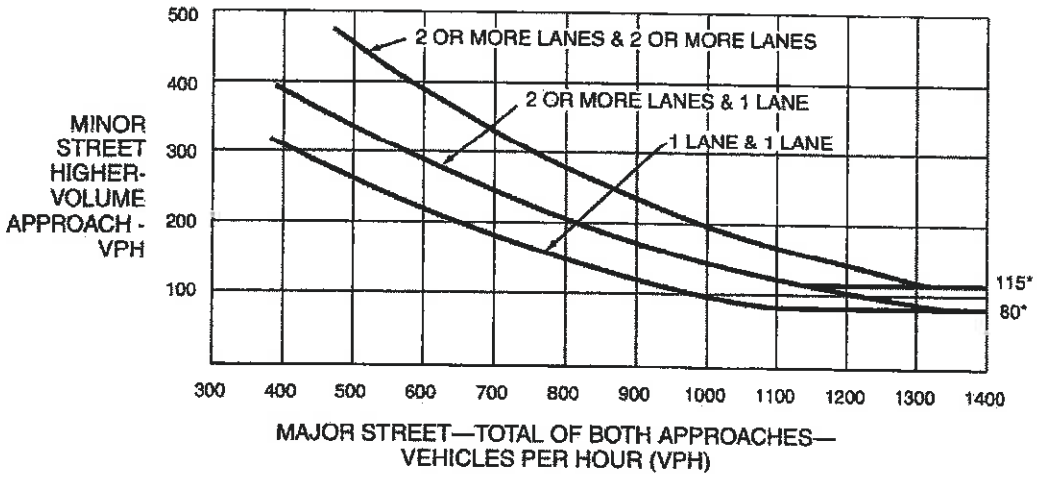
PART B **SATISFIED YES ☐ NO ☑**

APPROACH LANES	One	2 or More	Hour
Both Approaches - Major Street	341		
Higher Approach - Minor Street	115		

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☐
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☑

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

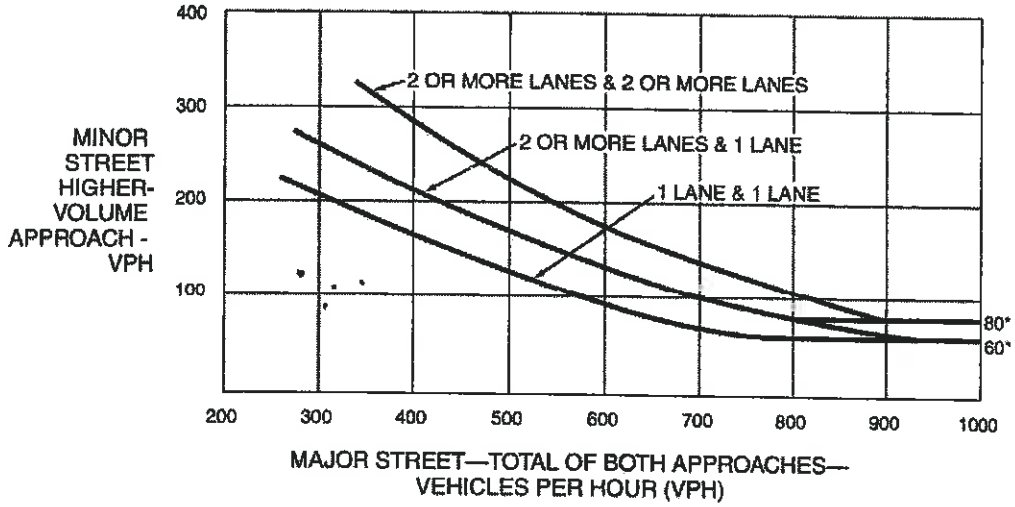
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

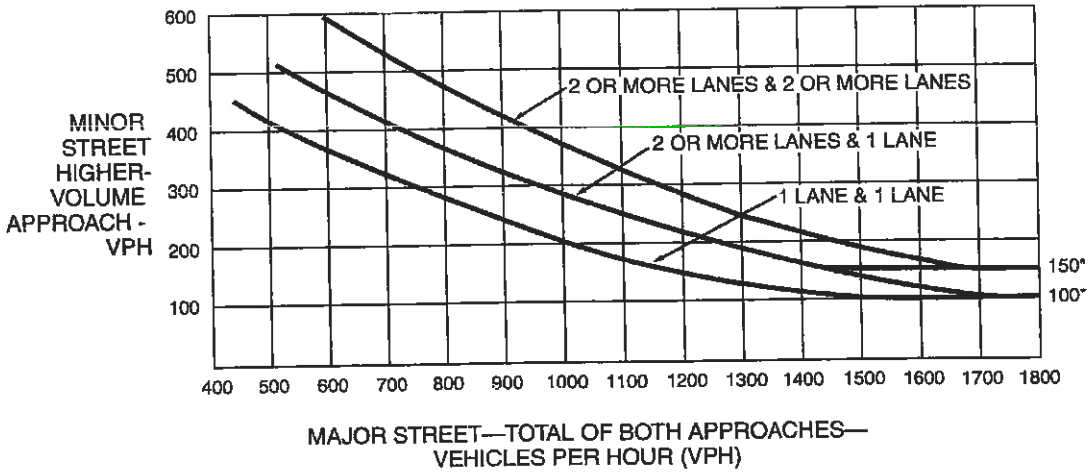
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

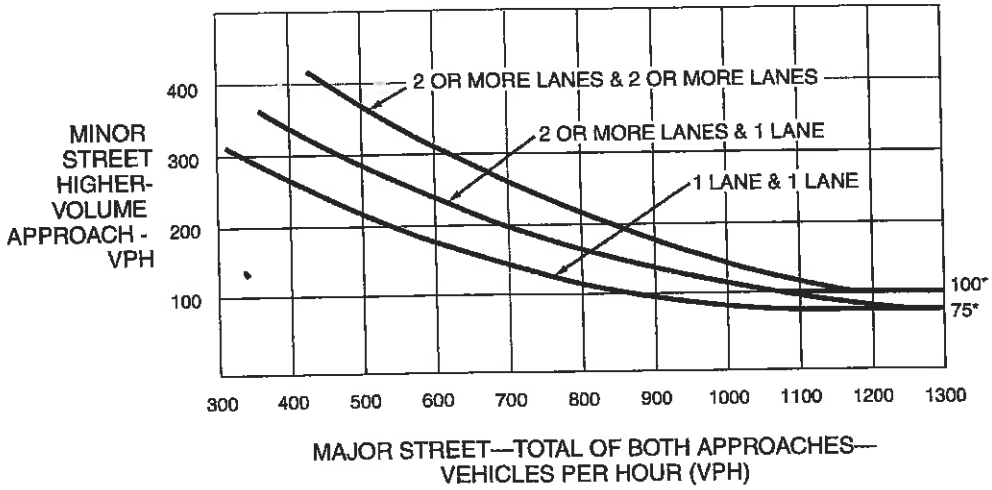
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 3 of 5)

WARRANT 4 - Pedestrian Volume
(Parts 1 and 2 Must Be Satisfied)

SATISFIED YES ☐ NO ☐

Part 1 (Parts A or B must be satisfied)

	Hours - - ->				
A.	Vehicles per hour for any 4 hours				
	Pedestrians per hour for any 4 hours				

Figure 4C-5 or Figure 4C-6
SATISFIED YES ☐ NO ☐

	Hours - - ->				
B.	Vehicles per hour for any 1 hour				
	Pedestrians per hour for any 1 hour				

Figure 4C-7 or Figure 4C-8
SATISFIED YES ☐ NO ☐

Part 2 **SATISFIED YES ☐ NO ☐**

AND, The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐ No ☐
OR, The proposed traffic signal will not restrict progressive traffic flow along the major street.	Yes ☐ No ☐

WARRANT 5 - School Crossing
(Parts A and B Must Be Satisfied)

SATISFIED YES ☐ NO ☐

Part A **SATISFIED YES ☐ NO ☐**
Gap/Minutes and # of Children

		Hour
Gaps vs Minutes	Minutes Children Using Crossing	
	Number of Adequate Gaps	
School Age Pedestrians Crossing Street / hr		

Gaps < Minutes YES ☐ NO ☐
AND Children > 20/hr YES ☐ NO ☐

AND, Consideration has been given to less restrictive remedial measures.	Yes ☐ No ☐

Part B **SATISFIED YES ☐ NO ☐**

The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐ No ☐
OR, The proposed signal will not restrict the progressive movement of traffic.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 4 of 5)

WARRANT 6 - Coordinated Signal System (All Parts Must Be Satisfied) **SATISFIED YES ☐ NO ☐**

MINIMUM REQUIREMENTS	DISTANCE TO NEAREST SIGNAL	
≥ 1000 ft	N _____ ft, S _____ ft, E _____ ft, W _____ ft	Yes ☐ No ☐
On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.		Yes ☐ No ☐
OR, On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.		

WARRANT 7 - Crash Experience Warrant (All Parts Must Be Satisfied) **SATISFIED YES ☐ NO ☐**

Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency.			Yes ☐ No ☐
REQUIREMENTS	Number of crashes reported within a 12 month period susceptible to correction by a traffic signal, and involving injury or damage exceeding the requirements for a reportable crash.		Yes ☐ No ☑
5 OR MORE			
REQUIREMENTS	CONDITIONS	✓	
ONE CONDITION SATISFIED 80%	Warrant 1, Condition A - Minimum Vehicular Volume		Yes ☐ No ☐
	OR, Warrant 1, Condition B - Interruption of Continuous Traffic		
	OR, Warrant 4, Pedestrian Volume Condition Ped Vol ≥ 152 for any hour OR, Ped Vol ≥ 80 for any 4 hours		

WARRANT 8 - Roadway Network (All Parts Must Be Satisfied) **SATISFIED YES ☐ NO ☐**

MINIMUM VOLUME REQUIREMENTS	ENTERING VOLUMES - ALL APPROACHES	✓	FULFILLED
1000 Veh/Hr	During Typical Weekday Peak Hour _____ Veh/Hr and has 5-year projected traffic volumes that meet one or more of Warrants 1, 2, and 3 during an average weekday.		Yes ☐ No ☐
	OR During Each of Any 5 Hrs. of a Sat. or Sun _____ Veh/Hr		

CHARACTERISTICS OF MAJOR ROUTES	MAJOR ROUTE A	MAJOR ROUTE B	
Hwy. System Serving as Principal Network for Through Traffic			
Rural or Suburban Highway Outside Of, Entering, or Traversing a City			
Appears as Major Route on an Official Plan			
Any Major Route Characteristics Met, Both Streets			Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 5 of 5)

WARRANT 9 - Intersection Near a Grade Crossing **SATISFIED YES ☐ NO ☐**
(Both Parts A and B Must Be Satisfied)

PART A A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach. Track Center Line to Limit Line _____ ft	Yes ☐ No ☐
PART B **There is one minor street approach lane at the track crossing** - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-9. Major Street - Total of both approaches: _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calculate AF) = _____ VPH	Yes ☐ No ☐
OR. There are two or more minor street approach lanes at the track crossing - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-10. Major Street - Total of both approaches : _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calcualte AF) = _____ VPH	

The minor street approach volume may be multiplied by up to three following adjustment factors (AF) as described in Section 4C.10.

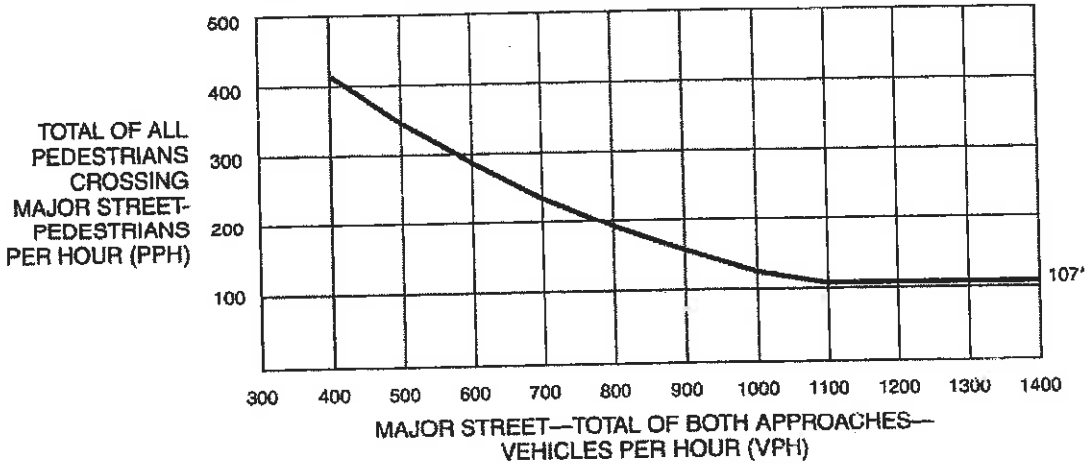
1- Number of Rail Traffic per Day_____ Adjustment factor from table 4C-2____

2- Percentage of High-Occupancy Buses on Minor Street Approach_____ Adjustment factor from table 4C-3____

3- Percentage of Tractor-Trailer Trucks on Minor Street Approach_____ Adjustment factor from table 4C-4____

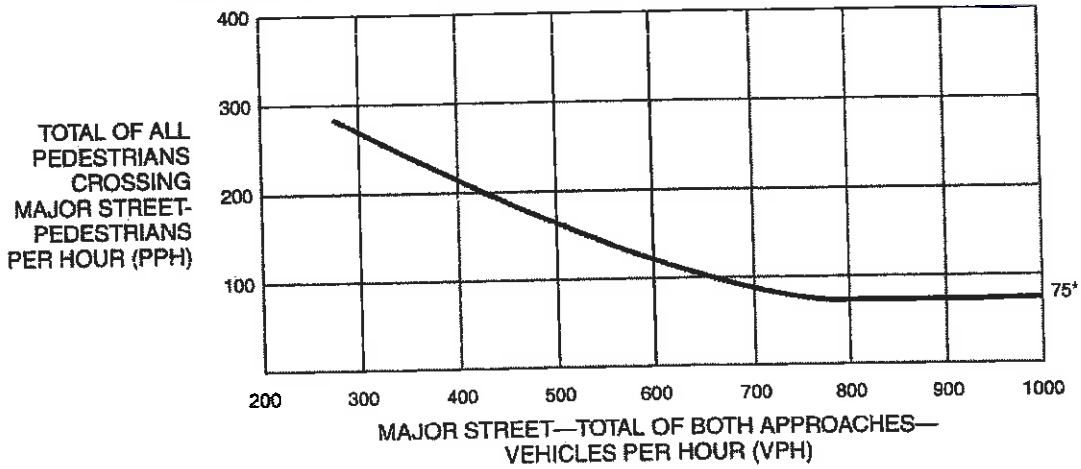
NOTE: If no data is availale or known, then use AF = 1 (no adjustment)

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



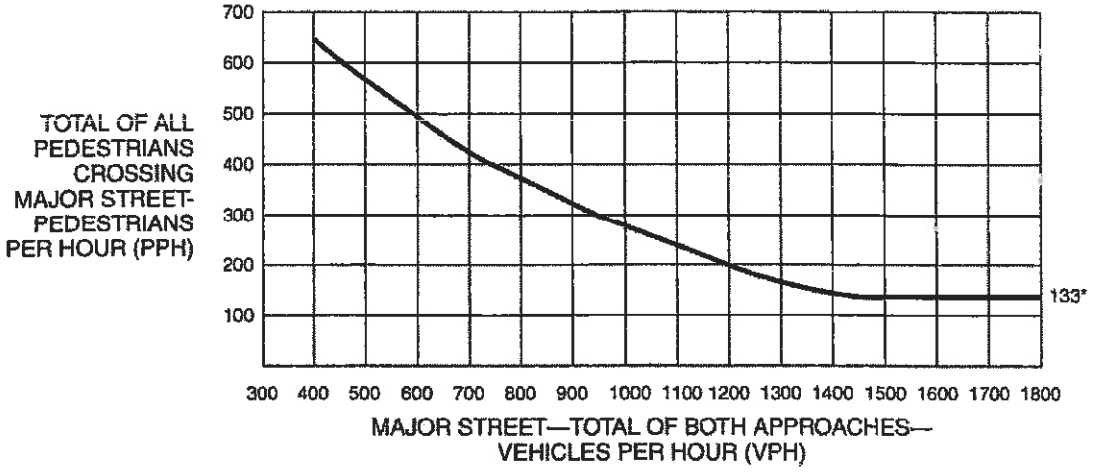
*Note: 107 pph applies as the lower threshold volume.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



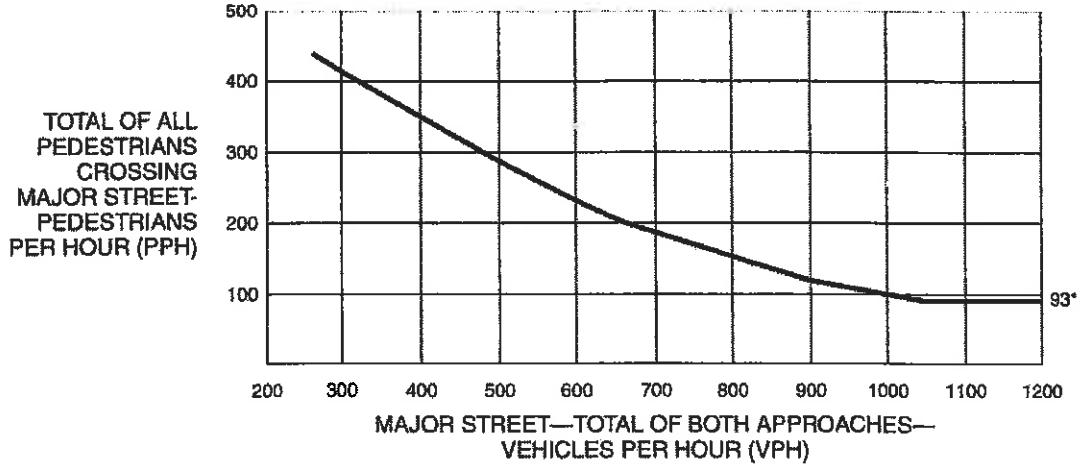
*Note: 75 pph applies as the lower threshold volume.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

Figure 4C-103 (CA). Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

COUNT DATE _____

CALC _____ DATE _____

CHK _____ DATE _____

_____ DIST _____ CO _____ RTE _____ PM

Major St: _____ Critical Approach Speed _____ mph

Minor St: _____ Critical Approach Speed _____ mph

Speed limit or critical speed on major street traffic > 40 mph..... ☐ or
In built up area of isolated community of < 10,000 population..... ☐ } **RURAL (R)**

☐ **URBAN (U)**

(Based on Estimated Average Daily Traffic - See Note)

URBAN..... RURAL.....	Minimum Requirements EADT			
CONDITION A - Minimum Vehicular Volume Satisfied _____ Not Satisfied _____	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban	Rural	Urban	Rural
1..... / 1.....	8,000	5,600	2,400	1,680
2 or More..... / 1.....	9,600	6,720	2,400	1,680
2 or More..... / 2 or More.....	9,600	6,720	3,200	2,240
1..... / 2 or More.....	8,000	5,600	3,200	2,240
CONDITION B - Interruption of Continuous Traffic Satisfied _____ Not Satisfied _____	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban	Rural	Urban	Rural
1..... / 1.....	12,000	8,400	1,200	850
2 or More..... / 1.....	14,400	10,080	1,200	850
2 or More..... / 2 or More.....	14,400	10,080	1,600	1,120
1..... / 2 or More.....	12,000	8,400	1,600	1,120
Combination of CONDITIONS A + B Satisfied _____ Not Satisfied _____ No one condition satisfied, but following conditions fulfilled 80% or more..... _____ A _____ B	2 CONDITIONS 80%		2 CONDITIONS 80%	

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Collision Details

Case ID# : 4996329

St Highway	Y	**Route**	38E	**Postmile**	46.621

County	SAN BERNARDINO	**City**	UNINCORPORATED
Date	2010-11-29	**Time**	14:32
Nearby Intersection	STATE LN & RT 38		
Coordinate Location	34.24399944, -116.8089355		

Injured Victims	1	**Fatalities**	0
Alcohol	NO	**Weather**	Clear
Primary Collision Factor	Unsafe Speed	**Involved with**	Other Motor Vehicle

Street View

24 HOUR INTERSECTION VOLUME

NORTH-SOUTH ST : HWY 38

EAST-WEST ST : STATE LANE

DATE : 12-04-12

		NORTH LEG	SOUTH LEG	EAST LEG	WEST LEG	TOTAL
	12:00	6	4	0	1	11
	1:00	7	5	7	2	21
	2:00	5	0	1	0	6
	3:00	7	2	3	0	12
	4:00	7	4	10	5	26
	5:00	17	6	34	5	62
	6:00	59	30	87	19	195
	7:00	96	39	168	33	336
	8:00	117	45	177	37	376 5
	9:00	127	41	109	32	309
	10:00	140	50	110	19	319
	11:00	181	54	108	13	356 7
AM	12:00	189	56	103	19	367 6
PM	1:00	176	47	114	19	356
	2:00	203	73	122	24	422 2
	3:00	275	66	115	25	481 1
	4:00	243	73	120	18	454 3
	5:00	247	57	94	18	416 4
	6:00	134	45	82	11	272
	7:00	88	37	45	7	177
	8:00	97	23	29	8	157
	9:00	61	26	26	8	121
	10:00	28	17	12	3	60
	11:00	16	12	6	1	35
	12:00	2,526	812	1,682	327	5,347

Prepared by NEWPORT TRAFFIC STUDIES

15 MINUTE COUNTS

NORTH-SOUTH ST : HWY 38
EAST-WEST ST : STATE LANE

DATE : 12-04-12

AM						PM				
NORTH LEG	SOUTH LEG	EAST LEG	WEST LEG	TOTAL		NORTH LEG	SOUTH LEG	EAST LEG	WEST LEG	TOTAL
1	1	0	0	2	12:00	55	18	20	5	98
0	1	0	0	1		52	14	30	8	104
2	2	0	1	5		43	9	31	1	84
3	0	0	0	3		39	15	22	5	81
1	1	1	0	3	1:00	39	14	24	4	81
1	0	2	0	3		60	11	33	7	111
5	0	1	1	7		31	9	30	4	74
0	4	3	1	8		46	13	27	4	90
2	0	1	0	3	2:00	44	22	26	4	96
1	0	0	0	1		65	14	29	7	115
0	0	0	0	0		48	17	31	7	103
2	0	0	0	2		46	20	36	6	108
1	1	1	0	3	3:00	63	14	23	4	104
2	1	0	0	3		63	19	33	9	124
3	0	2	0	5		66	17	25	6	114
1	0	0	0	1		83	16	34	6	139
0	0	2	3	5	4:00	67	15	37	6	125
2	0	1	1	4		60	20	26	7	113
2	2	2	0	6		63	23	32	1	119
3	2	5	1	11		53	15	25	4	97
7	0	3	1	11	5:00	87	10	23	4	124
1	2	6	2	11		69	9	22	8	108
6	1	11	1	19		58	17	27	4	106
3	3	14	1	21		33	21	22	2	78
6	5	7	4	22	6:00	40	13	25	2	80
15	3	18	3	39		39	9	23	5	76
17	12	28	4	61		32	15	19	1	67
21	10	34	8	73		23	8	15	3	49
12	10	35	9	66	7:00	36	10	17	2	65
24	8	30	6	68		23	12	11	1	47
31	6	59	7	103		10	8	9	0	27
29	15	44	11	99		19	7	8	4	38
26	17	34	16	93	8:00	33	7	5	3	48
28	9	54	5	96		24	7	11	1	43
33	9	52	8	102		30	6	7	2	45
30	10	37	8	85		10	3	6	2	21
31	15	30	8	84	9:00	23	4	10	1	38
35	8	20	8	71		19	9	6	0	34
29	8	43	4	84		7	3	2	4	16
32	10	16	12	70		12	10	8	3	33
39	9	20	5	73	10:00	8	4	1	2	15
28	14	35	5	82		9	8	6	0	23
38	14	35	1	88		8	2	4	0	14
35	13	20	8	76		3	3	1	1	8
38	14	30	3	85	11:00	2	5	4	1	12
47	9	20	2	78		10	2	1	0	13
53	9	32	4	98		3	2	0	0	5
43	22	26	4	95		1	3	1	0	5

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