



Nevada City SR 49 Multimodal Corridor Plan: Appendices

Nevada County
Transportation Commission





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Appendix A: Traffic Counts



**03-NEV-020 PM R17.398 / Route 49 / Uren Street
Nevada City, CA**

CALIFORNIA DEPARTMENT OF TRANSPORTATION
Count and warrant worksheet V2.20



Notes

Junction of Two State Highways
Using compass directions:
◦SR 20 is north-south
◦SR 49 is west leg
◦Uren is east leg

Bicycles
3 SB, 4 WB, 1 NB, 6 EB

Count taken 3 separate days

Morning Interval		Martin Earles with Jamar counter										Sunny					Tuesday, 04 June 2019					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
6:00 - 6:15		0	14	1	0	15	0	0	5	1	5	0	25	23	0	48	39	1	1	0	41	109
6:15 - 6:30		0	16	0	0	16	1	0	1	0	2	1	16	32	0	49	48	1	1	0	50	117
6:30 - 6:45		3	10	0	0	13	0	0	6	0	6	4	25	47	0	76	51	0	3	0	54	149
6:45 - 7:00		3	21	0	0	24	0	0	8	0	8	5	32	62	0	99	74	1	2	0	77	208
Total		6	61	1		68	1		20	1	21	10	98	164		272	212	3	7		222	583
7:00 - 7:15		5	27	1	0	33	1	0	10	0	11	4	22	80	0	106	65	3	2	0	70	220
7:15 - 7:30		6	33	0	0	39	0	0	2	0	2	4	27	84	0	115	101	0	2	0	103	259
7:30 - 7:45		3	31	0	0	34	0	0	4	0	4	3	30	107	0	140	99	0	2	0	101	279
7:45 - 8:00		7	67	1	0	75	1	0	5	0	6	6	45	135	0	186	150	4	2	0	156	423
Total		21	158	2		181	2		21		23	17	124	406		547	415	7	8		430	1181
8:00 - 8:15		9	38	0	0	47	2	0	12	0	14	5	56	113	0	174	167	0	4	0	171	406
8:15 - 8:30		10	59	0	0	69	3	0	7	0	10	12	52	118	0	182	161	0	4	0	165	426
8:30 - 8:45		3	37	4	0	44	0	0	13	0	13	9	48	119	0	176	117	0	9	0	126	359
8:45 - 9:00		6	53	0	0	59	1	1	6	0	8	8	61	117	0	186	110	1	12	0	123	376
Total		28	187	4		219	6	1	38		45	34	217	467		718	555	1	29		585	1567
9:00 - 9:15		3	47	0	0	50	3	0	4	0	7	7	57	100	0	164	115	4	9	0	128	349
9:15 - 9:30		9	37	0	0	46	0	0	3	0	3	14	48	117	0	179	103	2	5	0	110	338
9:30 - 9:45		8	46	0	0	54	4	0	2	0	6	3	59	90	0	152	122	2	10	0	134	346
9:45 - 10:00		1	42	0	0	43	0	1	10	0	11	9	39	103	0	151	106	0	3	1	109	314
Total		21	172			193	7	1	19		27	33	203	410		646	446	8	27	1	481	1347
Peak 15 Min.																						
7:50 - 8:05		7	61	1	0	69	1	0	3	0	4	6	53	140	0	199	160	4	2	0	166	438
Peak Hour																						
7:45 - 8:45		29	201	5	0	235	6	0	37	0	43	32	201	485	0	718	587	4	19	8	610	1606
PHF		0.66	0.75	0.31		0.78	0.50	#####	0.71		0.72	0.57	0.82	0.87		0.89	0.88	0.25	0.53		0.89	0.92
Truck %		13.8%	5.0%	20.0%		6.4%	0.0%	#####	0.0%		0.0%	6.3%	19.9%	6.6%		10.3%	3.6%	0.0%	5.3%		3.6%	6.9%

Midday Interval		Martin Earles with Jamar counter										Sunny					Thursday, 09 May 2019					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
10:00 - 10:15		2	39	0	0	41	0	0	10	0	10	7	55	72	0	134	71	0	5	0	76	261
10:15 - 10:30		1	45	0	0	46	4	0	9	0	13	6	45	103	0	154	87	0	5	1	92	305
10:30 - 10:45		4	44	0	0	48	1	0	8	0	9	5	43	91	0	139	92	2	7	0	101	297
10:45 - 11:00		2	41	0	0	43	0	2	5	0	7	14	36	90	0	140	116	0	3	0	119	309
Total		9	169			178	5	2	32		39	32	179	356		567	366	2	20	1	388	1172
11:00 - 11:15		2	43	0	0	45	0	0	7	0	7	10	47	104	0	161	124	1	4	0	129	342
11:15 - 11:30		4	63	0	0	67	2	1	7	0	10	6	41	92	0	139	105	0	10	1	115	331
11:30 - 11:45		1	37	0	0	38	1	0	4	0	5	10	29	97	0	136	107	2	3	0	112	291
11:45 - 12:00		3	37	3	0	43	0	1	6	0	7	18	46	96	0	160	115	3	3	2	121	331
Total		10	180	3		193	3	2	24		29	44	163	389		596	451	6	20	3	477	1295
12:00 - 12:15		5	49	0	4	54	0	0	8	4	8	9	44	85	0	138	110	3	1	1	114	314
12:15 - 12:30		4	47	1	0	52	1	0	6	0	7	8	43	113	0	164	102	3	3	0	108	331
12:30 - 12:45		6	66	0	0	72	0	3	7	0	10	18	37	93	1	148	106	1	2	0	109	339
12:45 - 13:00		6	63	0	0	69	1	1	6	0	8	7	52	110	0	169	114	2	7	0	123	369
Total		21	225	1	4	247	2	4	27	4	33	42	176	401	1	619	432	9	13	1	454	1353
13:00 - 13:15		2	54	4	0	60	2	1	6	0	9	10	42	99	0	151	108	5	2	0	115	335
13:15 - 13:30		9	63	0	0	72	0	0	1	0	1	11	47	98	0	156	101	1	1	0	103	332
13:30 - 13:45		6	41	1	0	48	2	1	6	0	9	8	40	124	0	172	103	2	4	4	109	338
13:45 - 14:00		8	49	0	0	57	1	1	5	0	7	14	48	118	2	180	101	0	4	0	105	349
Total		25	207	5		237	5	3	18		26	43	177	439	2	659	413	8	11	4	432	1354
Peak 15 Min.																						
12:50 - 13:05		4	69	2	0	75	1	0	3	0	4	10	52	124	0	186	107	3	6	0	116	381
Peak Hour																						
12:25 - 13:25		23	251	4	0	278	3	5	21	0	29	46	177	418	1	641	426	11	12	0	449	1397
PHF		0.82	0.88	0.25		0.89	0.38	0.31	0.66		0.60	0.64	0.78	0.84		0.86	0.88	0.55	0.43		0.89	0.92
Truck %		4.3%	8.4%	0.0%		7.9%	0.0%	0.0%	4.8%		3.4%	8.7%	12.4%	3.6%		6.4%	4.0%	0.0%	0.0%		3.8%	5.8%

Evening Interval		Martin Earles with Jamar counter										Cloudy/a bit of rain					Thursday, 30 May 2019					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
14:00 - 14:15		7	66	1	0	74	2	0	10	0	12	13	36	110	0	159	116	4	1	0	121	366
14:15 - 14:30		11	63	3	0	77	2	2	8	0	12	10	40	102	0	152	64	3	5	4	72	313
14:30 - 14:45		5	49	3	0	57	1	0	7	0	8	7	64	116	0	187	97	0	3	2	100	352
14:45 - 15:00		6	65	1	0	72	1	1	4	0	6	15	63	118	0	196	134	0	7	0	141	415
Total		29	243	8		280	6	3	29		38	45	203	446		694	411	7	16	6	434	1446
15:00 - 15:15		13	52	1	0	66	4	0	9	0	13	14	57	137	0	208	93	0	4	0	97	384
15:15 - 15:30		16	55	0	0	71	0	1	2	0	3	15	67	122	0	204	90	2	9	0	101	379
15:30 - 15:45		11	68	1	0	80	6	1	9	1	16	8	56	103	0	167	111	1	10	0	122	385
15:45 - 16:00		11	62	1	0	74	2	0	7	0	9	16	73	152	0	241	153	2	5	5	160	484
Total		51	237	3		291	12	2	27	1	41	53	253	514		820	447	5	28	5	480	1632
16:00 - 16:15		15	63	2	0	80	1	0	8	2	9	11	67	138	0	216	142	3	6	0	151	456
16:15 - 16:30		9	77	1	0	87	1	0	14	0	15	17	71	138	0	226	126	2	4	2	132	460
16:30 - 16:45		8	55	1	1	64	1	1	6	0	8	18	55	130	0	203	125	1	4	0	130	405
16:45 - 17:00		13	66	1	0	80	3	0	5	0	8	16	78	143	0	237	114	0	3	0	117	442
Total		45	261	5	1	311	6	1	33	2	40	62	271	549		882	507	6	17	2	530	1763
17:00 - 17:15		4	66	2	0	72	1	0	9	2	10	16	40	113	0	169	185	3	4	0	192	443
17:15 - 17:30		6	45	0	0	51	2	1	4	0	7	16	63	146	0	225	103	2	8	2	113	396
17:30 - 17:45		5	48	1	2	54	2	0	7	0	9	20	62	133	0	215	116	3	4	0	123	401
17:45 - 18:00		10	45	1	0	56	3	0	2	0	5	15	50	125	0	190	96	2	3	0	101	352
Total		25	204	4	2	233	8	1	22	2	31	67	215	517		799	500	10	19	2	529	1592
Peak 15 Min.																						
16:10 - 16:25		10	77	1	0	88	1	0	14	0	15	16	80	142	0	238	140	3	4	2	147	488
Peak Hour																						
15:50 - 16:50		46	269	5	1	320	5	1	31	2	37	65	266	571	0	902	540	7	18	7	565	1824
PHF		0.68	0.87	0.63		0.91	0.63	0.25	0.48		0.54	0.81	0.83	0.89		0.92	0.89	0.58	0.50		0.88	0.93
Truck %		10.9%	9.7%	0.0%		9.7%	0.0%	0.0%	9.7%		8.1%	1.5%	7.5%	5.1%		5.5%	7.8%	14.3%	0.0%		7.6%	7.0%

12 hour truck % and Total Pedestrian	7.2%	9.0%	2.8%	7	8.7%	4.8%	15.0%	5.5%	10	5.9%	6.2%	11.6%	5.9%	3	7.6%	5.1%	2.8%	4.7%	34	5.0%	6.9%
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Comments regarding the Route 20/Route 49/Uren Street intersection

As with all the counts in this study, we used compass directions. Although Route 20 is a generally east-west highway, it runs north-south at this intersection. Route 49 is a generally north-south highway, but increases in post miles to the west in Nevada City.

The count was done in three separate four-hour blocks in May and June of 2019, while school was in session.

Counts were performed using Jamar counters, so there is less precision in classification than is available with Miovision camera-based counts. Motorcycles and cars/pickups/vans are considered “regular vehicles”; vehicles towing trailers or having more than four wheels are considered “heavy vehicles.”

U-turns in the intersection were not counted. However, a separate U-turn lane was striped in 2011 to provide a northbound-to-southbound option north of the intersection. This works well for drivers on Uren Street who want to turn left to Route 20 or go straight in Route 49, and for northbound drivers who want to make a left turn, but not in the busy intersection. Here are the numbers for those U-turns:

June 4, 2019		May 9, 2019		May 30, 2019	
6 to 7 AM	0	10 to 11 AM	5	2 to 3 PM	3
7 to 8 AM	2	11 AM to Noon	3	3 to 4 PM	14
8 to 9 AM	7	Noon to 1 PM	5	4 to 5 PM	7
9 to 10 AM	8	1 to 2 PM	6	5 to 6 PM	6
	17		19		30
Total for the 12-hour period: 66					

The local transit agency apparently has a policy of requiring their drivers to use the U-turn lane rather than making northbound-to-westbound left turns; all buses made that U-turn.

The weather was nice all three days, with the exception of some clouds and a short burst of rain the afternoon of May 30.

It is obviously uncomfortable for drivers on the stop-controlled legs to go straight or make left turns, but I didn't observe any risky maneuvers that caused high-speed vehicles on Route 20 to brake for them. I did, however, notice many northbound vehicles making left turns in front of high-speed southbound through vehicles; those drivers had to slow down to avoid colliding. There were no close calls that required hard braking and squealing tires.



Notes
 0.4% Motorcycles
 75.9% Cars
 21.2% Light Goods Vehicles
 0.2% Buses
 1.9% Single Unit Trucks
 0.4% Tractor Trailers

U-Turns
 0 SB, 2 WB, 2 NB, 1 EB

Road Bikes
 3 SB, 4 WB, 4 NB, 0 EB

9 Bicycles in crosswalks
 12 Pedestrians in crosswalks

Although Route 49 is generally a north-south highway, we used the compass directions. Southbound is the north leg of Coyote Street; westbound is Route 49 from Nevada City; northbound is the south leg of Coyote Street; eastbound is Route 49 from Sierra County.

Morning Interval	Miovision Cameras					Sunny					Wednesday, 24 October 2018										
Begin End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
6:00 - 6:15	0	1	4	0	5	0	18	0	0	18						2	31	0	0	33	56
6:15 - 6:30	0	1	12	0	13	4	40	0	0	44						3	37	1	0	41	98
6:30 - 6:45	1	0	8	0	9	5	42	0	0	47						2	35	0	0	37	93
6:45 - 7:00	0	1	13	0	14	6	41	0	0	47	0	0	1	0	1	2	51	1	0	54	116
Total	1	3	37	0	41	15	141	0	0	156	0	0	1	0	1	9	154	2	0	165	363
7:00 - 7:15	0	2	10	0	12	12	37	1	0	50						5	50	0	0	55	117
7:15 - 7:30	1	4	11	0	16	12	59	0	0	71	0	3	0	0	3	1	53	0	0	54	144
7:30 - 7:45	4	0	10	0	14	5	80	0	0	85	0	2	0	0	2	3	86	1	0	90	191
7:45 - 8:00	0	2	14	1	16	11	150	2	0	163	1	1	4	0	6	4	112	0	0	116	301
Total	5	8	45	1	58	40	326	3	0	369	1	6	4	0	11	13	301	1	0	315	753
8:00 - 8:15	0	2	11	0	13	10	94	2	0	106	0	2	3	0	5	8	94	0	0	102	226
8:15 - 8:30	4	3	12	0	19	10	90	2	0	102	0	0	2	0	2	8	92	0	0	100	223
8:30 - 8:45	0	4	17	0	21	11	77	3	0	91	1	1	1	0	3	11	84	2	0	97	212
8:45 - 9:00	3	4	13	0	20	15	69	1	0	85	2	3	1	0	6	4	110	1	0	115	226
Total	7	13	53	0	73	46	330	8	0	384	3	6	7	0	16	31	380	3	0	414	887
9:00 - 9:15	1	4	14	1	19	9	61	1	0	71	0	0	3	0	3	5	92	1	0	98	191
9:15 - 9:30	0	6	8	1	14	9	68	0	0	77	1	2	2	1	5	3	94	0	0	97	193
9:30 - 9:45	1	3	18	0	22	9	74	2	0	85	0	2	3	0	5	5	94	0	0	99	211
9:45 - 10:00	3	2	18	0	23	8	80	0	0	88	0	0	3	0	3	11	123	0	0	134	248
Total	5	15	58	2	78	35	283	3	0	321	1	4	11	1	16	24	403	1	0	428	843
Peak 15 Min.																					
7:45 - 8:00	0	2	14	1	16	11	150	2	0	163	1	1	4	0	6	4	112	0	0	116	301
Peak Hour																					
7:40 - 8:40	4	11	52	1	67	42	420	8	0	470	2	4	9	0	15	26	383	2	0	411	963
PHF	0.25	0.55	0.68		0.67	0.81	0.67	0.67		0.70	0.50	0.50	0.56		0.63	0.72	0.82	0.25		0.86	0.80
Truck %	0.0%	0.0%	1.9%		1.5%	7.1%	4.5%	0.0%		4.7%	0.0%	0.0%	0.0%		0.0%	0.0%	2.6%	0.0%		2.4%	3.4%

Midday Interval		Miovision Cameras										Sunny					Wednesday, 24 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
10:00 - 10:15		1	3	17	0	21	8	73	0	0	81	0	1	0	0	1	6	101	0	0	107	210
10:15 - 10:30		0	3	14	0	17	2	76	0	0	78	0	1	0	0	1	7	96	1	0	104	200
10:30 - 10:45		2	4	8	0	14	5	74	2	0	81	1	0	5	0	6	5	98	2	0	105	206
10:45 - 11:00		2	0	17	0	19	7	78	5	0	90	1	3	0	0	4	7	107	1	1	115	228
Total		5	10	56		71	22	301	7		330	2	5	5		12	25	402	4	1	431	844
11:00 - 11:15		0	2	6	0	8	6	74	2	1	82	2	0	7	0	9	6	118	0	0	124	223
11:15 - 11:30		7	3	10	0	20	10	70	4	0	84	1	2	5	0	8	8	84	3	0	95	207
11:30 - 11:45		5	3	19	0	27	10	81	1	0	92	1	3	2	0	6	6	96	0	0	102	227
11:45 - 12:00		5	3	11	0	19	13	93	2	0	108	1	2	7	0	10	11	132	1	0	144	281
Total		17	11	46		74	39	318	9	1	366	5	7	21		33	31	430	4		465	938
12:00 - 12:15		1	6	11	2	18	11	100	4	2	115	3	6	4	0	13	7	118	0	0	125	271
12:15 - 12:30		1	4	14	0	19	11	97	5	0	113	1	3	2	0	6	8	102	2	0	112	250
12:30 - 12:45		4	2	13	1	19	15	124	1	0	140	3	3	3	0	9	3	80	1	0	84	252
12:45 - 13:00		1	4	17	0	22	16	112	2	0	130	0	4	4	0	8	9	98	1	0	108	268
Total		7	16	55	3	78	53	433	12	2	498	7	16	13		36	27	398	4		429	1041
13:00 - 13:15		0	2	10	0	12	14	90	3	0	107	1	6	1	0	8	13	111	2	0	126	253
13:15 - 13:30		0	1	15	0	16	18	84	5	0	107	0	5	3	0	8	8	107	2	0	117	248
13:30 - 13:45		2	9	17	0	28	18	89	7	2	114	3	0	8	2	11	12	89	0	0	101	254
13:45 - 14:00		2	3	11	0	16	9	96	1	0	106	1	1	5	0	7	12	110	2	0	124	253
Total		4	15	53		72	59	359	16	2	434	5	12	17	2	34	45	417	6		468	1008
Peak 15 Min.																						
11:40 - 11:55		7	4	19	0	30	15	97	2	0	114	1	2	7	0	10	6	136	1	0	143	297
Peak Hour																						
11:45 - 12:45		11	15	49	3	75	50	414	12	2	476	8	14	16	0	38	29	432	4	0	465	1054
PHF		0.55	0.63	0.77		0.82	0.83	0.83	0.60		0.85	0.50	0.58	0.57		0.68	0.60	0.82	0.50		0.81	0.94
Truck %		9.1%	0.0%	4.1%		4.0%	0.0%	1.9%	0.0%		1.7%	0.0%	0.0%	0.0%		0.0%	3.4%	3.0%	25.0%		3.2%	2.5%

Evening Interval		Miovision Cameras										Sunny					Wednesday, 24 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
14:00 - 14:15		2	8	17	0	27	11	90	1	0	102	3	3	3	0	9	11	99	1	0	111	249
14:15 - 14:30		1	5	6	0	12	10	104	2	0	116	0	7	5	0	12	10	92	1	0	103	243
14:30 - 14:45		0	3	10	0	13	15	98	4	0	117	1	1	4	0	6	5	112	2	0	119	255
14:45 - 15:00		1	2	12	0	15	8	100	4	0	112	1	2	3	0	6	10	105	3	0	118	251
Total		4	18	45		67	44	392	11		447	5	13	15		33	36	408	7		451	998
15:00 - 15:15		3	1	7	0	11	13	91	2	0	106	1	5	6	0	12	12	133	0	0	145	274
15:15 - 15:30		0	3	14	0	17	15	128	1	0	144	3	1	4	0	8	7	112	2	0	121	290
15:30 - 15:45		1	5	7	0	13	19	90	3	0	112	3	4	6	0	13	15	117	5	0	137	275
15:45 - 16:00		1	3	13	0	17	20	92	2	0	114	2	4	4	0	10	11	128	3	0	142	283
Total		5	12	41		58	67	401	8		476	9	14	20		43	45	490	10		545	1122
16:00 - 16:15		3	4	16	0	23	16	97	2	0	115	0	1	3	0	4	7	115	1	0	123	265
16:15 - 16:30		2	3	10	1	15	18	121	1	0	140	1	6	2	1	9	11	98	0	0	109	273
16:30 - 16:45		2	2	17	0	21	21	110	1	0	132	1	1	5	0	7	13	115	0	0	128	288
16:45 - 17:00		3	3	10	0	16	19	109	3	0	131	1	1	4	0	6	9	120	3	0	132	285
Total		10	12	53	1	75	74	437	7		518	3	9	14	1	26	40	448	4		492	1111
17:00 - 17:15		5	4	19	0	28	25	148	2	0	175	3	3	5	0	11	10	156	2	0	168	382
17:15 - 17:30		2	0	13	0	15	15	110	1	0	126	0	5	6	0	11	13	134	2	0	149	301
17:30 - 17:45		1	1	10	0	12	17	122	0	0	139	1	5	4	0	10	12	80	0	0	92	253
17:45 - 18:00		1	2	6	0	9	8	126	3	0	137	1	0	4	0	5	9	71	0	4	80	231
Total		9	7	48		64	65	506	6		577	5	13	19		37	44	441	4	4	489	1167
Peak 15 Min.																						
17:05 - 17:20		5	4	17	0	26	20	142	2	0	164	3	1	4	0	8	12	178	1	0	191	389
Peak Hour																						
16:30 - 17:30		12	9	59	0	80	80	477	7	0	564	5	10	20	0	35	45	525	7	0	577	1256
PHF		0.60	0.56	0.74		0.71	0.80	0.81	0.58		0.81	0.42	0.50	0.71		0.80	0.87	0.74	0.58		0.76	0.94
Truck %		0.0%	0.0%	3.4%		2.5%	1.3%	1.7%	0.0%		1.6%	0.0%	0.0%	0.0%		0.0%	0.0%	1.1%	0.0%		1.0%	1.4%

12 hour truck % and Total Pedestrian																						
		2.5%	0.0%	2.5%	7	2.1%	2.9%	3.0%	0.0%	5	2.9%	0.0%	1.0%	0.0%	4	0.3%	0.8%	2.3%	8.0%	5	2.3%	2.5%



Notes
 0.5% Motorcycles
 75.8% Cars
 21.5% Light Goods Vehicles
 0.2% Buses
 1.6% Single Unit Trucks
 0.5% Tractor Trailers

U-Turns
 0 SB, 5 WB, 0 NB, 0 EB

Road Bikes
 7 SB, 1 WB, 6 NB, 1 EB

9 Bicycles in crosswalks
 54 Pedestrians in crosswalks

Use compass directions:
 North Bloomfield is the north leg
 East Broad Street the south leg

Above values are for 24 hour period

Morning Interval	Miovision Cameras										sunny					Wednesday, 24 October 2018								
	Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total	
6:00 - 6:15			0	0	8	0	8	0	16	1	0	17	1	0	0	0	1	1	24	0	0	0	25	51
6:15 - 6:30			0	2	6	0	8	1	36	1	0	38						1	34	0	0	35	81	
6:30 - 6:45			3	0	7	0	10	3	43	1	0	47	0	0	2	0	2	0	31	1	0	32	91	
6:45 - 7:00			0	0	12	0	12	3	38	1	0	42	0	0	3	0	3	0	42	1	0	43	100	
Total			3	2	33		38	7	133	4		144	1		5		6	2	131	2		135	323	
7:00 - 7:15			3	4	8	1	15	3	30	1	0	34	1	1	3	0	5	1	44	0	0	45	99	
7:15 - 7:30			2	2	9	0	13	9	47	1	0	57	0	0	6	0	6	2	46	2	0	50	126	
7:30 - 7:45			2	3	25	5	30	7	79	0	0	86	2	3	7	0	12	2	60	0	0	62	190	
7:45 - 8:00			7	3	25	0	35	14	138	0	0	152	0	3	5	0	8	3	90	0	0	93	288	
Total			14	12	67	6	93	33	294	2		329	3	7	21		31	8	240	2		250	703	
8:00 - 8:15			5	0	23	0	28	7	81	4	0	92	2	3	2	0	7	3	75	1	0	79	206	
8:15 - 8:30			8	5	24	0	37	10	77	3	0	90	2	7	2	0	11	0	72	1	0	73	211	
8:30 - 8:45			5	8	21	0	34	8	76	0	0	84	0	4	1	0	5	1	77	3	0	81	204	
8:45 - 9:00			5	8	22	0	35	9	61	3	0	73	3	6	3	0	12	3	93	1	0	97	217	
Total			23	21	90		134	34	295	10		339	7	20	8		35	7	317	6		330	838	
9:00 - 9:15			2	6	37	0	45	11	48	2	1	61	1	5	5	0	11	0	61	3	0	64	181	
9:15 - 9:30			2	1	18	0	21	18	54	1	0	73	3	6	4	0	13	1	77	16	0	94	201	
9:30 - 9:45			1	4	22	0	27	21	55	3	0	79	4	2	2	0	8	1	84	2	0	87	201	
9:45 - 10:00			2	9	27	0	38	13	66	4	0	83	4	5	3	0	12	5	103	4	0	112	245	
Total			7	20	104		131	63	223	10	1	296	12	18	14		44	7	325	25		357	828	
Peak 15 Min.																								
7:45 - 8:00			7	3	25	0	35	14	138	0	0	152	0	3	5	0	8	3	90	0	0	93	288	
Peak Hour																								
7:45 - 8:45			25	16	93	0	134	39	372	7	0	418	4	17	10	0	31	7	314	5	0	326	909	
PHF			0.69	0.50	0.86		0.91	0.70	0.66	0.44		0.68	0.33	0.61	0.42		0.70	0.35	0.87	0.42		0.88	0.79	
Truck %			0.0%	0.0%	0.0%		0.0%	0.0%	4.8%	0.0%		4.3%	0.0%	0.0%	0.0%		0.0%	0.0%	2.5%	0.0%		2.5%	2.9%	

Midday Interval		Miovision Cameras										sunny					Wednesday, 24 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
10:00 - 10:15		5	3	23	2	31	17	58	3	0	78	4	3	4	0	11	2	84	2	0	88	208
10:15 - 10:30		5	5	21	0	31	8	59	2	0	69	2	7	2	0	11	5	80	1	0	86	197
10:30 - 10:45		2	7	22	3	31	12	70	1	0	83	4	4	4	0	12	1	78	2	0	81	207
10:45 - 11:00		4	8	25	1	37	14	69	1	2	84	3	11	4	1	18	1	90	5	0	96	235
Total		16	23	91	6	130	51	256	7	2	314	13	25	14	1	52	9	332	10		351	847
11:00 - 11:15		7	4	28	1	39	13	65	4	0	82	4	3	5	0	12	2	91	0	0	93	226
11:15 - 11:30		7	5	22	0	34	12	62	1	0	75	2	5	5	0	12	3	74	3	0	80	201
11:30 - 11:45		1	5	18	1	24	14	68	3	0	85	4	8	7	0	19	3	79	3	0	85	213
11:45 - 12:00		2	5	20	2	27	11	83	4	0	98	8	4	3	0	15	9	118	3	0	130	270
Total		17	19	88	4	124	50	278	12		340	18	20	20		58	17	362	9		388	910
12:00 - 12:15		1	7	17	2	25	15	88	2	0	105	2	12	4	0	18	6	105	1	0	112	260
12:15 - 12:30		4	7	21	2	32	6	95	0	0	101	1	7	5	0	13	3	89	2	0	94	240
12:30 - 12:45		3	7	13	2	23	26	98	2	0	126	5	8	1	0	14	7	69	3	0	79	242
12:45 - 13:00		6	7	16	1	29	15	103	3	0	121	5	3	10	0	18	4	85	3	0	92	260
Total		14	28	67	7	109	62	384	7		453	13	30	20		63	20	348	9		377	1002
13:00 - 13:15		5	7	21	7	33	9	79	2	0	90	2	5	7	0	14	4	105	3	0	112	249
13:15 - 13:30		3	6	21	4	30	13	74	2	0	89	4	6	9	0	19	6	87	3	0	96	234
13:30 - 13:45		3	3	25	0	31	15	82	7	0	104	3	6	11	1	20	5	77	4	0	86	241
13:45 - 14:00		7	3	21	1	31	12	85	7	1	104	7	6	8	2	21	4	95	1	0	100	256
Total		18	19	88	12	125	49	320	18	1	387	16	23	35	3	74	19	364	11		394	980
Peak 15 Min.																						
12:50 - 13:05		7	6	19	5	32	16	103	4	0	123	6	2	10	0	18	2	97	4	0	103	276
Peak Hour																						
12:25 - 13:25		20	27	74	16	121	58	373	7	0	438	16	21	27	0	64	18	358	11	0	387	1010
PHF		0.71	0.75	0.74		0.80	0.56	0.85	0.44		0.84	0.67	0.66	0.61		0.76	0.64	0.85	0.69		0.86	0.91
Truck %		0.0%	0.0%	4.1%		2.5%	3.4%	1.3%	0.0%		1.6%	0.0%	0.0%	0.0%		0.0%	0.0%	2.5%	9.1%		2.6%	2.0%

Evening Interval		Miovision Cameras										sunny					Wednesday, 24 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
14:00 - 14:15		4	5	17	2	26	17	78	5	0	100	5	10	10	0	25	1	88	1	0	90	241
14:15 - 14:30		1	8	16	0	25	18	90	3	0	111	3	11	5	0	19	4	86	3	0	93	248
14:30 - 14:45		1	4	19	2	24	10	82	7	0	99	5	10	5	0	20	4	90	2	0	96	239
14:45 - 15:00		5	3	20	1	28	20	80	4	0	104	10	6	4	0	20	3	92	2	0	97	249
Total		11	20	72	5	103	65	330	19		414	23	37	24		84	12	356	8		376	977
15:00 - 15:15		1	6	16	0	23	19	79	7	1	105	4	9	6	0	19	4	123	4	0	131	278
15:15 - 15:30		3	5	14	2	22	25	102	3	0	130	2	11	4	0	17	2	101	5	0	108	277
15:30 - 15:45		3	6	20	0	29	16	87	3	0	106	5	8	7	0	20	0	112	1	0	113	268
15:45 - 16:00		4	4	23	0	31	22	72	4	0	98	3	10	6	0	19	4	114	1	0	119	267
Total		11	21	73	2	105	82	340	17	1	439	14	38	23		75	10	450	11		471	1090
16:00 - 16:15		2	1	20	1	23	16	80	4	0	100	3	10	4	0	17	6	99	2	0	107	247
16:15 - 16:30		3	4	17	0	24	23	98	3	0	124	3	15	1	0	19	1	91	2	0	94	261
16:30 - 16:45		5	3	24	1	32	23	90	6	0	119	4	12	4	0	20	4	99	4	0	107	278
16:45 - 17:00		1	7	20	1	28	17	101	2	0	120	3	11	5	0	19	2	107	1	0	110	277
Total		11	15	81	3	107	79	369	15		463	13	48	14		75	13	396	9		418	1063
17:00 - 17:15		5	6	11	1	22	28	106	8	0	142	1	12	4	1	17	1	158	3	1	162	343
17:15 - 17:30		3	5	14	0	22	28	101	5	0	134	5	8	4	0	17	3	129	2	0	134	307
17:30 - 17:45		2	8	14	0	24	23	95	4	0	122	7	9	3	1	19	5	74	8	0	87	252
17:45 - 18:00		4	2	12	0	18	21	108	5	0	134	2	10	2	0	14	2	67	8	0	77	243
Total		14	21	51	1	86	100	410	22		532	15	39	13	2	67	11	428	21	1	460	1145
Peak 15 Min.																						
17:05 - 17:20		2	5	16	1	23	39	107	9	0	155	2	11	6	1	19	2	170	4	1	176	373
Peak Hour																						
16:30 - 17:30		14	21	69	3	104	96	398	21	0	515	13	43	17	1	73	10	493	10	1	513	1205
PHF		0.70	0.58	0.72		0.81	0.62	0.90	0.58		0.83	0.65	0.90	0.71		0.91	0.63	0.73	0.63		0.73	0.91
Truck %		0.0%	0.0%	0.0%		0.0%	1.0%	1.0%	4.8%		1.2%	7.7%	2.3%	0.0%		2.7%	0.0%	1.4%	10.0%		1.6%	1.3%

12 hour truck % and Total Pedestrian		Miovision Cameras										sunny					Wednesday, 24 October 2018					
		0.6%	2.3%	2.2%	46	2.0%	2.8%	2.8%	1.4%	5	2.7%	4.7%	3.3%	0.5%	6	2.7%	0.0%	2.2%	2.4%	1	2.2%	2.4%



**03-NEV-049 PM 15.319 / North Bloomfield - East Broad Street
Nevada City, CA**

AM Overnight		Miovision Cameras										dark					Wednesday, 24 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
0:00 - 0:15							1	4	0	0	5	1	2	3	0	6	0	1	1	0	2	13
0:15 - 0:30							5	8	0	0	13	1	0	1	0	2	0	1	1	0	2	17
0:30 - 0:45		0	0	2	0	2	0	6	0	0	6	0	2	2	0	4	0	5	1	0	6	18
0:45 - 1:00		0	0	1	0	1	1	4	0	0	5	1	2	1	0	4	1	4	1	0	6	16
Total				3		3	7	22			29	3	6	7		16	1	11	4		16	64
1:00 - 1:15							0	1	1	0	2	1	1	0	0	2	0	4	0	0	4	8
1:15 - 1:30							1	8	0	0	9	0	1	0	0	1	0	1	0	0	1	11
1:30 - 1:45							0	6	0	0	6						0	3	0	0	3	9
1:45 - 2:00		1	0	1	0	2	1	4	0	0	5	0	3	0	0	3	0	2	0	0	2	12
Total		1		1		2	2	19	1		22	1	5			6		10			10	40
2:00 - 2:15		0	0	1	0	1	0	2	0	1	2						0	4	0	0	4	7
2:15 - 2:30							0	5	0	0	5						0	2	0	0	2	7
2:30 - 2:45		0	0	2	0	2	0	2	0	0	2						0	1	0	0	1	5
2:45 - 3:00		0	0	1	0	1	1	3	0	0	4											5
Total				4		4	1	12		1	13							7			7	24
3:00 - 3:15							1	0	0	0	1						0	4	0	0	4	5
3:15 - 3:30							0	4	0	0	4	0	0	1	0	1						5
3:30 - 3:45							0	1	0	0	1						1	1	0	0	2	3
3:45 - 4:00							0	5	0	0	5						0	2	0	0	2	7
Total							1	10			11			1		1	1	7			8	20
4:00 - 4:15							0	4	0	0	4						0	1	0	0	1	5
4:15 - 4:30		0	0	1	0	1	1	4	0	0	5	1	0	0	0	1	0	1	0	0	1	8
4:30 - 4:45		0	0	2	0	2	0	2	0	0	2	0	1	0	0	1	0	6	0	0	6	11
4:45 - 5:00		0	0	3	0	3	0	2	0	0	2						0	4	0	0	4	9
Total				6		6	1	12			13	1	1			2		12			12	33
5:00 - 5:15		0	1	3	0	4	0	3	0	0	3						0	14	0	0	14	21
5:15 - 5:30		0	1	4	0	5	1	7	0	0	8						0	13	0	0	13	26
5:30 - 5:45		2	0	5	0	7	0	15	0	0	15						0	13	0	0	13	35
5:45 - 6:00		1	2	4	0	7	1	11	0	0	12	1	0	0	0	1	0	25	1	0	26	46
Total		3	4	16		23	2	36			38	1				1		65	1		66	128
Peak 15 Min.																						
5:40 - 5:55		2	2	7	0	11	0	13	0	0	13	1	0	0	0	1	0	25	1	0	26	51
Peak Hour																						
5:00 - 6:00		0	0	4	0	4	1	15	0	0	16	1	1	0	0	2	0	12	0	0	12	34
PHF		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Truck %		0.0%	0.0%	0.0%		0.0%	0.0%	5.6%	#####	5.3%	0.0%	#####	#####	0.0%	#####	#####	#####	1.5%	0.0%		1.5%	2.3%

PM Overnight	Miovision Cameras										dark					Wednesday, 24 October 2018					
Begin End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
18:00 - 18:15	4	2	19	0	25	11	76	0	0	87	1	10	3	0	14	4	67	3	0	74	200
18:15 - 18:30	2	5	8	0	15	22	70	3	0	95	3	8	3	0	14	1	59	4	0	64	188
18:30 - 18:45	2	6	17	0	25	17	55	3	0	75	2	8	1	0	11	0	56	0	0	56	167
18:45 - 19:00	2	1	8	1	11	18	53	0	0	71	0	4	3	0	7	0	49	2	0	51	140
Total	10	14	52	1	76	68	254	6		328	6	30	10		46	5	231	9		245	695
19:00 - 19:15	2	2	12	0	16	13	50	3	0	66	1	2	1	0	4	2	45	2	0	49	135
19:15 - 19:30	1	3	6	3	10	13	49	2	0	64	2	6	3	0	11	0	35	7	0	42	127
19:30 - 19:45	0	0	4	0	4	21	37	3	0	61	2	4	0	0	6	1	32	1	0	34	105
19:45 - 20:00	2	3	9	0	14	13	33	1	0	47	0	3	1	0	4	1	25	1	0	27	92
Total	5	8	31	3	44	60	169	9		238	5	15	5		25	4	137	11		152	459
20:00 - 20:15	0	4	4	0	8	13	31	2	0	46	7	9	1	0	17	1	25	1	0	27	98
20:15 - 20:30	2	1	4	0	7	10	38	3	0	51	2	7	1	0	10	1	30	1	0	32	100
20:30 - 20:45	0	8	10	0	18	8	26	0	0	34	3	5	1	0	9	0	31	0	0	31	92
20:45 - 21:00	0	1	3	0	4	13	26	2	0	41	1	9	1	0	11	0	28	2	0	30	86
Total	2	14	21		37	44	121	7		172	13	30	4		47	2	114	4		120	376
21:00 - 21:15	0	3	5	0	8	8	25	1	0	34	2	2	1	0	5	1	25	1	0	27	74
21:15 - 21:30	3	2	0	0	5	6	24	1	0	31	1	4	1	0	6	1	15	1	0	17	59
21:30 - 21:45	1	3	2	0	6	7	28	1	0	36	1	4	0	0	5	1	15	0	0	16	63
21:45 - 22:00	0	1	3	0	4	5	23	1	0	29	0	2	0	0	2	0	12	0	0	12	47
Total	4	9	10		23	26	100	4		130	4	12	2		18	3	67	2		72	243
22:00 - 22:15	0	1	1	0	2	5	12	0	0	17	0	5	0	0	5	0	9	1	0	10	34
22:15 - 22:30	0	1	2	0	3	3	15	2	0	20	1	1	0	0	2	0	10	0	0	10	35
22:30 - 22:45	0	1	1	0	2	5	15	3	0	23	1	1	2	0	4	0	15	0	0	15	44
22:45 - 23:00	1	0	3	0	4	4	15	0	0	19	0	6	0	0	6	1	7	0	0	8	37
Total	1	3	7		11	17	57	5		79	2	13	2		17	1	41	1		43	150
23:00 - 23:15	0	0	3	0	3	2	7	0	0	9	1	0	1	0	2	0	9	0	0	9	23
23:15 - 23:30	1	1	5	0	7	2	13	1	0	16	2	3	0	0	5	0	6	0	0	6	34
23:30 - 23:45	0	0	1	0	1	2	5	1	0	8	0	1	0	0	1	0	4	1	0	5	15
23:45 - 0:00	0	1	1	0	2	3	7	0	0	10	0	1	0	0	1	0	2	0	0	2	15
Total	1	2	10		13	9	32	2		43	3	5	1		9		21	1		22	87
Peak 15 Min.																					
18:00 - 18:15	4	2	19	0	25	11	76	0	0	87	1	10	3	0	14	4	67	3	0	74	200
Peak Hour																					
18:00 - 19:00	10	14	52	1	76	68	254	6	0	328	6	30	10	0	46	5	231	9	0	245	695
PHF	0.50	0.58	0.68		0.00	0.77	0.84	0.38		0.00	0.50	0.75	0.83		0.00	0.31	0.86	0.38		0.83	0.87
Truck %	10.0%	0.0%	0.0%		1.3%	0.0%	1.2%	0.0%		0.9%	0.0%	0.0%	0.0%		0.0%	0.0%	2.2%	0.0%		2.0%	1.3%
12 hour truck % and Total Pedestrian	3.7%	0.0%	1.2%	4	1.2%	0.4%	2.1%	2.9%	1	1.8%	0.0%	0.0%	3.1%	0	0.5%	5.9%	1.1%	0.0%	0	1.2%	1.4%



**03-NEV-49 PM 15.605 / Maidu Avenue / Orchard Street
Nevada City, CA**

Count and warrant worksheet V2.20



Notes
 0.4% Motorcycles
 73.6% Cars
 23.3% Light Goods Vehicles
 0.6% Buses
 1.5% Single Unit Trucks
 0.6% Tractor Trailers

U-Turns
 1 SB, 0 WB, 0 NB, 2 EB

Road Bikes
 0 SB, 0 WB, 0 NB, 1 EB

0 Bicycles in crosswalks
 32 Pedestrians in crosswalks

Use compass directions:
 Maidu Avenue is the north leg
 Orchard Street is the south leg

Morning Interval		Miovision Cameras										sunny					Wednesday, 31 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
8:00 - 8:15							1	11	0	0	12						0	20	0	0	20	32
8:15 - 8:30		0	0	1	0	1	8	25	0	0	33						0	29	0	0	29	63
8:30 - 8:45		1	0	0	0	1	17	23	0	0	40						0	37	0	0	37	78
8:45 - 9:00							18	33	0	0	51						0	36	0	0	36	87
Total		1		1		2	44	92			136							122			122	260
9:00 - 9:15		0	0	9	0	9	15	27	0	0	42						0	34	1	0	35	86
9:15 - 9:30		0	0	10	0	10	21	36	0	0	57						0	55	1	0	56	123
9:30 - 9:45		3	0	6	0	9	34	48	0	0	82	0	2	0	0	2	0	77	2	0	79	172
9:45 - 10:00		1	0	2	0	3	73	44	0	0	117	1	0	0	0	1	0	99	2	0	101	222
Total		4		27		31	143	155			298	1	2			3		265	6		271	603
10:00 - 10:15		0	0	8	0	8	57	73	0	0	130	2	0	1	0	3	0	100	2	0	102	243
10:15 - 10:30		0	0	8	0	8	36	60	0	0	96	1	0	0	0	1	0	94	1	0	95	200
10:30 - 10:45		3	0	9	0	12	23	66	0	0	89	3	0	0	0	3	0	72	5	0	77	181
10:45 - 11:00		2	0	14	0	16	27	51	0	0	78						0	103	2	0	105	199
Total		5		39		44	143	250			393	6		1		7		369	10		379	823
11:00 - 11:15		3	0	10	0	13	28	42	0	0	70	3	1	0	0	4	0	58	4	0	62	149
11:15 - 11:30		1	0	20	0	21	17	47	0	0	64						0	70	1	0	71	156
11:30 - 11:45		3	0	21	1	24	21	53	0	0	74						0	61	5	0	66	164
11:45 - 12:00		3	0	16	1	19	22	54	0	0	76						0	86	0	0	86	181
Total		10		67	2	77	88	196			284	3	1			4		275	10		285	650
Peak 15 Min.																						
7:55 - 8:10		0	0	6	0	6	80	62	0	0	142	1	0	0	0	1	0	107	4	0	111	260
Peak Hour																						
7:35 - 8:35		5	0	24	0	29	199	232	0	0	431	5	2	1	0	8	0	374	8	0	382	850
PHF		0.42	0.00	0.75		0.66	0.56	0.77	0.00		0.75	0.63	0.25	0.25		0.67	0.00	0.87	0.50		0.86	0.82
Truck %		40.0%	0.0%	0.0%		6.9%	1.0%	8.6%	0.0%		5.1%	0.0%	0.0%	0.0%		0.0%	0.0%	2.1%	0.0%		2.1%	3.8%

Midday Interval		Miovision Cameras										sunny					Wednesday, 31 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
12:00 - 12:15		1	0	19	0	20	21	54	0	0	75	0	1	0	0	1	0	64	5	0	69	165
12:15 - 12:30		2	0	24	0	26	26	60	0	0	86	0	1	0	0	1	0	65	3	0	68	181
12:30 - 12:45		6	0	24	1	30	33	45	0	0	78						0	67	5	0	72	180
12:45 - 13:00		6	0	29	1	35	44	29	0	0	73	1	1	1	0	3	0	69	3	0	72	183
Total		15		96	2	111	124	188			312	1	3	1		5		265	16		281	709
13:00 - 13:15		7	0	36	4	43	30	34	0	0	64						0	73	9	0	82	189
13:15 - 13:30		5	0	29	0	34	36	44	0	0	80	1	1	0	0	2	0	68	5	0	73	189
13:30 - 13:45		3	0	40	0	43	27	49	0	0	76						0	66	2	0	68	187
13:45 - 14:00		4	0	36	0	40	27	54	0	0	81	2	1	1	0	4	0	74	4	0	78	203
Total		19		141	4	160	120	181			301	3	2	1		6		281	20		301	768
14:00 - 14:15		2	0	52	0	54	27	51	0	0	78						0	81	3	0	84	216
14:15 - 14:30		1	0	28	0	29	27	67	0	0	94						0	67	2	0	69	192
14:30 - 14:45		6	0	25	1	31	35	71	0	0	106	1	0	1	0	2	0	50	2	0	52	191
14:45 - 15:00		2	0	36	1	38	45	69	0	0	114	2	0	0	0	2	0	70	5	0	75	229
Total		11		141	2	152	134	258			392	3		1		4		268	12		280	828
15:00 - 15:15		3	0	37	0	40	36	66	0	0	102						0	71	3	0	74	216
15:15 - 15:30		5	0	25	1	30	22	63	0	0	85						0	71	2	0	73	188
15:30 - 15:45		5	0	19	0	24	52	73	0	0	125						0	65	4	0	69	218
15:45 - 16:00		5	0	32	0	37	37	71	0	0	108	1	0	0	0	1	0	57	1	0	58	204
Total		18		113	1	131	147	273			420	1				1		264	10		274	826
Peak 15 Min.																						
12:45 - 13:00		2	0	36	1	38	45	69	0	0	114	2	0	0	0	2	0	70	5	0	75	229
Peak Hour																						
12:45 - 13:45		15	0	117	2	132	155	271	0	0	426	2	0	0	0	2	0	277	14	0	291	851
PHF		0.54	0.00	0.73		0.77	0.75	0.86	0.00		0.85	0.25	0.00	0.00		0.25	0.00	0.83	0.44		0.82	0.93
Truck %		6.7%	0.0%	0.0%		0.8%	0.6%	3.3%	0.0%		2.3%	0.0%	0.0%	0.0%		0.0%	0.0%	3.2%	0.0%		3.1%	2.4%

Evening Interval		Miovision Cameras										sunny					Wednesday, 31 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
16:00 - 16:15		9	0	32	0	41	48	70	0	0	118						0	76	7	0	83	242
16:15 - 16:30		5	0	23	0	28	32	63	0	0	95	2	0	0	0	2	0	62	2	0	64	189
16:30 - 16:45		7	0	39	0	46	19	76	0	0	95	2	1	0	0	3	0	77	8	0	85	229
16:45 - 17:00		5	0	37	0	42	35	78	0	1	113						0	96	5	0	101	256
Total		26		131		157	134	287		1	421	4	1			5		311	22		333	916
17:00 - 17:15		9	0	38	1	47	34	94	0	0	128	1	1	0	0	2	0	72	8	0	80	257
17:15 - 17:30		3	0	40	0	43	31	75	0	0	106						0	86	5	0	91	240
17:30 - 17:45		6	0	45	0	51	29	70	0	0	99						0	81	4	0	85	235
17:45 - 18:00		5	0	36	0	41	25	103	0	1	128						0	68	3	0	71	240
Total		23		159	1	182	119	342		1	461	1	1			2		307	20		327	972
18:00 - 18:15		7	0	43	0	50	18	84	0	1	102						0	90	2	0	92	244
18:15 - 18:30		5	0	26	0	31	20	97	0	0	117	1	1	0	0	2	0	85	1	0	86	236
18:30 - 18:45		5	0	51	2	56	17	95	0	0	112	0	0	1	0	1	0	99	3	0	102	271
18:45 - 19:00		3	0	28	7	31	18	79	1	0	98	1	0	1	0	2	0	99	2	0	101	232
Total		20		148	9	168	73	355	1	1	429	2	1	2		5		373	8		381	983
19:00 - 19:15		15	0	84	0	99	15	82	0	0	97						0	108	3	0	111	307
19:15 - 19:30		4	0	49	2	53	10	101	1	0	112	3	1	0	0	4	0	100	1	0	101	270
19:30 - 19:45		9	0	16	1	25	10	93	3	0	106						0	84	1	0	85	216
19:45 - 20:00		1	0	20	5	21	6	86	2	0	94	2	0	0	0	2	0	83	0	0	83	200
Total		29		169	8	198	41	362	6		409	5	1			6		375	5		380	993
Peak 15 Min.																						
17:05 - 17:20		12	0	87	1	99	12	94	1	0	107	2	0	0	0	2	0	116	1	0	117	325
Peak Hour																						
16:45 - 17:45		31	0	177	10	208	53	355	5	0	413	4	1	1	0	6	0	391	7	0	398	1025
PHF		0.47	0.00	0.61		0.60	0.80	0.91	0.50		0.92	0.42	0.00	0.50		0.58	0.00	0.88	0.56		0.89	0.93
Truck %		3.6%	0.0%	0.5%		0.8%	1.6%	0.6%	0.0%		0.7%	0.0%	0.0%	0.0%		0.0%	0.0%	1.7%	0.0%		1.7%	1.1%

12 hour truck % and Total Pedestrian																						
		7.2%	0.0%	0.3%	29	1.2%	1.5%	3.6%	0.0%	3	2.9%	0.0%	0.0%	0.0%	0	0.0%	0.0%	3.2%	0.0%	0	3.1%	2.7%



Notes
 0.6% Motorcycles
 73.8% Cars
 22.8% Light Goods Vehicles
 0.3% Buses
 1.8% Single Unit Trucks
 0.6% Tractor Trailers

U-Turns
 0 SB, 1 WB, 0 NB, 0 EB

Road Bikes
 4 SB, 0 WB, 3 NB, 1 EB

0 Bicycles in crosswalks
 40 Pedestrians in crosswalks

Use compass directions:
 Cement Hill Road is the north leg
 West Broad Street is the south leg

Morning Interval		Miovision Cameras										sunny					Wednesday, 24 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
6:00 - 6:15		0	1	0	0	1	0	14	0	0	14						1	23	0	0	24	39
6:15 - 6:30		0	0	7	0	7	2	27	0	0	29	2	0	1	0	3	1	26	1	0	28	67
6:30 - 6:45		1	0	4	0	5	2	25	2	0	29	3	0	1	0	4	3	23	1	0	27	65
6:45 - 7:00		0	2	5	0	7	4	22	0	0	26	2	0	2	0	4	6	30	1	0	37	74
Total		1	3	16	0	20	8	88	2		98	7		4		11	11	102	3		116	245
7:00 - 7:15		1	0	10	0	11	2	22	0	0	24	3	2	1	0	6	5	27	0	0	32	73
7:15 - 7:30		2	1	4	0	7	6	28	1	0	35	3	2	0	1	5	2	39	0	0	41	88
7:30 - 7:45		0	2	8	0	10	6	29	3	0	38	1	2	4	0	7	6	50	1	0	57	112
7:45 - 8:00		1	3	16	2	20	7	42	1	0	50	4	9	4	0	17	7	78	3	0	88	175
Total		4	6	38	2	48	21	121	5		147	11	15	9	1	35	20	194	4		218	448
8:00 - 8:15		2	4	9	0	15	6	50	1	0	57	1	3	15	0	19	7	49	2	0	58	149
8:15 - 8:30		1	6	15	0	22	5	55	0	0	60	2	3	13	0	18	9	56	1	0	66	166
8:30 - 8:45		1	3	17	0	21	8	51	3	0	62	5	3	11	0	19	10	49	0	0	59	161
8:45 - 9:00		0	7	16	0	23	8	40	2	0	50	3	5	7	0	15	17	58	0	0	75	163
Total		4	20	57		81	27	196	6		229	11	14	46		71	43	212	3		258	639
9:00 - 9:15		2	4	8	0	14	5	37	4	0	46	4	5	7	0	16	14	49	0	0	63	139
9:15 - 9:30		0	7	9	0	16	9	31	1	0	41	7	2	5	0	14	6	60	1	0	67	138
9:30 - 9:45		2	8	12	0	22	8	33	6	0	47	6	5	7	0	18	14	59	1	0	74	161
9:45 - 10:00		3	4	18	0	25	3	53	2	0	58	6	3	3	0	12	7	72	0	0	79	174
Total		7	23	47		77	25	154	13		192	23	15	22		60	41	240	2		283	612
Peak 15 Min.																						
9:40 - 9:55		2	7	18	0	27	4	56	5	0	65	5	3	4	0	12	9	70	0	0	79	183
Peak Hour																						
7:45 - 8:45		5	16	57	2	78	26	198	5	0	229	12	18	43	0	73	33	232	6	0	271	651
PHF		0.42	0.67	0.84		0.89	0.65	0.83	0.42		0.91	0.60	0.50	0.60		0.79	0.83	0.74	0.50		0.77	0.93
Truck %		0.0%	0.0%	0.0%		0.0%	0.0%	9.1%	20.0%		8.3%	0.0%	0.0%	0.0%		0.0%	3.0%	3.0%	0.0%		3.0%	4.1%

Midday Interval		Miovision Cameras										sunny					Wednesday, 24 October 2018					All Total
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	
10:00 - 10:15		1	3	6	2	10	11	40	3	0	54	4	2	3	0	9	6	54	1	0	61	134
10:15 - 10:30		3	5	10	0	18	3	44	4	0	51	2	4	8	0	14	9	53	3	0	65	148
10:30 - 10:45		0	2	11	1	13	5	42	5	1	52	3	8	11	0	22	11	60	0	0	71	158
10:45 - 11:00		0	1	13	0	14	9	41	6	0	56	1	5	9	0	15	13	57	0	0	70	155
Total		4	11	40	3	55	28	167	18	1	213	10	19	31		60	39	224	4		267	595
11:00 - 11:15		0	5	7	0	12	6	47	3	0	56	6	4	7	1	17	14	66	1	0	81	166
11:15 - 11:30		0	1	5	1	6	9	47	3	0	59	8	3	9	0	20	7	53	2	0	62	147
11:30 - 11:45		1	3	15	0	19	9	41	6	0	56	4	7	7	0	18	13	45	0	0	58	151
11:45 - 12:00		1	2	11	0	14	11	40	8	0	59	7	4	12	0	23	9	80	1	0	90	186
Total		2	11	38	1	51	35	175	20		230	25	18	35	1	78	43	244	4		291	650
12:00 - 12:15		0	1	12	0	13	6	55	2	0	63	1	1	12	0	14	12	46	0	0	58	148
12:15 - 12:30		1	6	11	1	18	18	51	3	1	72	1	5	11	0	17	6	57	1	0	64	171
12:30 - 12:45		1	3	7	2	11	15	60	7	0	82	6	6	10	0	22	16	46	1	0	63	178
12:45 - 13:00		4	9	13	0	26	17	59	2	0	78	8	2	13	0	23	11	51	1	0	63	190
Total		6	19	43	3	68	56	225	14	1	295	16	14	46		76	45	200	3		248	687
13:00 - 13:15		2	1	14	1	17	7	46	4	1	57	9	4	8	0	21	17	60	2	0	79	174
13:15 - 13:30		1	8	15	0	24	9	43	5	0	57	3	7	12	0	22	12	56	0	0	68	171
13:30 - 13:45		1	0	9	3	10	11	46	8	0	65	4	6	13	0	23	13	41	0	0	54	152
13:45 - 14:00		4	6	14	0	24	15	48	3	0	66	3	6	16	0	25	12	50	1	0	63	178
Total		8	15	52	4	75	42	183	20	1	245	19	23	49		91	54	207	3		264	675
Peak 15 Min.																						
12:50 - 13:05		3	5	18	0	26	11	66	4	0	81	7	5	14	0	26	16	61	1	0	78	211
Peak Hour																						
12:10 - 13:10		8	19	47	4	74	54	224	16	1	294	22	17	47	0	86	47	220	5	0	272	726
PHF		0.50	0.53	0.65		0.71	0.64	0.85	0.57		0.85	0.69	0.71	0.84		0.83	0.73	0.90	0.63		0.87	0.86
Truck %		0.0%	5.3%	0.0%		1.4%	1.9%	2.2%	6.3%		2.4%	9.1%	5.9%	0.0%		3.5%	2.1%	2.7%	0.0%		2.6%	2.5%

Evening Interval		Miovision Cameras										sunny					Wednesday, 24 October 2018					All Total
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	
14:00 - 14:15		0	3	10	2	13	8	54	9	0	71	6	6	11	0	23	9	55	0	0	64	171
14:15 - 14:30		1	2	10	0	13	12	57	3	0	72	2	4	12	2	18	9	58	1	0	68	171
14:30 - 14:45		3	4	21	0	28	10	51	11	0	72	10	5	9	0	24	10	59	3	0	72	196
14:45 - 15:00		1	1	11	1	13	13	53	9	0	75	3	8	8	0	19	8	59	3	0	70	177
Total		5	10	52	3	67	43	215	32		290	21	23	40	2	84	36	231	7		274	715
15:00 - 15:15		0	9	9	0	18	11	52	2	0	65	2	10	12	0	24	13	60	2	0	75	182
15:15 - 15:30		2	5	10	0	17	15	71	3	0	89	5	7	14	0	26	10	62	3	0	75	207
15:30 - 15:45		0	3	14	0	17	18	54	6	0	78	5	2	18	0	25	14	78	0	0	92	212
15:45 - 16:00		0	2	23	1	25	15	51	6	1	72	1	9	12	0	22	6	63	1	0	70	189
Total		2	19	56	1	77	59	228	17	1	304	13	28	56		97	43	263	6		312	790
16:00 - 16:15		1	6	6	0	13	11	66	8	0	85	9	3	10	0	22	21	70	0	0	91	211
16:15 - 16:30		2	5	10	1	17	17	65	6	0	88	7	4	20	0	31	9	53	0	0	62	198
16:30 - 16:45		2	7	7	0	16	9	68	8	0	85	1	5	19	0	25	11	69	3	0	83	209
16:45 - 17:00		1	7	12	1	20	13	81	5	0	99	8	7	12	0	27	14	61	2	0	77	223
Total		6	25	35	2	66	50	280	27		357	25	19	61		105	55	253	5		313	841
17:00 - 17:15		4	9	33	8	46	17	87	6	0	110	2	14	20	0	36	13	63	2	0	78	270
17:15 - 17:30		2	8	18	0	28	23	77	4	0	104	6	5	17	0	28	10	51	1	0	62	222
17:30 - 17:45		0	2	6	3	8	11	75	6	0	92	6	2	13	0	21	7	63	0	0	70	191
17:45 - 18:00		3	4	5	0	12	14	81	7	0	102	10	7	21	2	38	14	38	2	0	54	206
Total		9	23	62	11	94	65	320	23		408	24	28	71	2	123	44	215	5		264	889
Peak 15 Min.																						
17:05 - 17:20		5	12	30	8	47	18	91	6	0	115	3	13	16	0	32	8	68	2	0	78	272
Peak Hour																						
16:30 - 17:30		9	31	70	9	110	62	313	23	0	398	17	31	68	0	116	48	244	8	0	300	924
PHF		0.45	0.71	0.55		0.61	0.69	0.85	0.72		0.83	0.53	0.59	0.85		0.81	0.67	0.88	0.50		0.90	0.86
Truck %		0.0%	0.0%	0.0%		0.0%	0.0%	0.9%	4.3%		1.0%	0.0%	0.0%	0.0%		0.0%	0.0%	2.9%	0.0%		2.3%	1.1%

12 hour truck % and Total Pedestrian	3.4%	1.6%	0.7%	30	1.2%	2.0%	3.5%	8.6%	4	3.6%	2.4%	0.5%	0.4%	6	0.9%	1.1%	3.1%	4.1%	0	2.8%	2.7%
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Notes
 0.7% Motorcycles
 70.6% Cars
 25.7% Light Goods Vehicles
 0% Buses
 2.2% Single Unit Trucks
 0.8% Tractor Trailers

U-Turns
 0 SB, 3 WB, 0 NB, 0 EB

Road Bikes
 0 SB, 0 WB, 0 NB, 0 EB

0 Bicycles in crosswalks
 7 Pedestrians in crosswalks

Use compass directions:
 Elks Lodge driveway is the south leg

Morning Interval		Miovision Cameras										sunny					Wednesday, 24 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
6:00 - 6:15							0	16	0	0	16						0	23	0	0	23	39
6:15 - 6:30							0	28	1	0	29	1	0	0	0	1	0	26	0	0	26	56
6:30 - 6:45							0	24	0	0	24						0	28	0	0	28	52
6:45 - 7:00							0	24	0	0	24						0	36	0	0	36	60
Total							92	1		93	1				1		113			113	207	
7:00 - 7:15							0	24	0	0	24						0	33	0	0	33	57
7:15 - 7:30							0	30	0	0	30						0	43	0	0	43	73
7:30 - 7:45							0	34	0	0	34	1	0	0	0	1	0	68	0	0	68	103
7:45 - 8:00							0	46	0	0	46						0	75	0	0	75	121
Total							134			134	1				1		219			219	354	
8:00 - 8:15							0	71	0	0	71	1	0	0	0	1	0	57	0	0	57	129
8:15 - 8:30							0	66	2	0	68	1	0	0	0	1	0	65	0	0	65	134
8:30 - 8:45							0	62	1	0	63	0	0	1	0	1	0	65	0	0	65	129
8:45 - 9:00							0	45	2	0	47						0	72	0	0	72	119
Total							244	5		249	2		1		3		259			259	511	
9:00 - 9:15							0	46	1	0	47	1	0	0	0	1	0	62	0	0	62	110
9:15 - 9:30							0	35	0	0	35						0	68	0	0	68	103
9:30 - 9:45							0	42	0	0	42	2	0	0	0	2	0	72	0	0	72	116
9:45 - 10:00							0	60	0	0	60						0	81	0	0	81	141
Total							183	1		184	3				3		283			283	470	
Peak 15 Min.																						
9:40 - 9:55		0	0	0	0	0	0	64	0	0	64	2	0	0	0	2	0	76	0	0	76	142
Peak Hour																						
7:55 - 8:55		0	0	0	0	0	0	246	4	0	250	2	0	1	0	3	0	261	0	0	261	514
PHF		0.00	0.00	0.00		0.00	0.00	0.76	0.50		0.75	0.25	0.00	0.00		0.38	0.00	0.88	0.00		0.88	0.91
Truck %		0.0%	0.0%	0.0%		0.0%	0.0%	9.8%	0.0%		9.6%	0.0%	0.0%	0.0%		0.0%	0.0%	3.7%	0.0%		3.7%	6.2%

Midday Interval		Miovision Cameras					sunny					Wednesday, 24 October 2018					All Total					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total		EBR	EBT	EBL	Ped	Total
10:00 - 10:15							0	42	0	0	42						0	63	0	0	63	105
10:15 - 10:30							0	57	0	0	57						0	62	0	0	62	119
10:30 - 10:45							0	50	1	0	51						0	72	0	0	72	123
10:45 - 11:00							0	50	0	0	50						0	69	0	0	69	119
Total							199	1		200							266			266	466	
11:00 - 11:15							0	53	0	0	53						0	80	0	0	80	133
11:15 - 11:30							0	54	2	0	56	3	0	0	0	3	1	62	0	0	63	122
11:30 - 11:45							0	49	0	0	49						0	55	0	0	55	104
11:45 - 12:00							0	54	0	0	54	0	0	1	0	1	1	88	0	0	89	144
Total							210	2		212	3		1		4	2	285			287	503	
12:00 - 12:15							0	66	1	0	67	1	0	0	0	1	1	60	0	0	61	129
12:15 - 12:30							0	63	1	0	64						0	65	0	0	65	129
12:30 - 12:45							0	71	1	0	72						0	64	0	0	64	136
12:45 - 13:00							0	73	1	0	74						0	60	0	0	60	134
Total							273	4		277	1				1	1	249			250	528	
13:00 - 13:15							0	57	1	0	58	1	0	0	0	1	0	82	0	0	82	141
13:15 - 13:30							0	53	0	0	53						0	67	0	0	67	120
13:30 - 13:45							0	60	1	0	61	3	0	0	0	3	0	59	0	1	59	123
13:45 - 14:00							0	71	0	0	71	2	0	0	0	2	0	58	0	0	58	131
Total							241	2		243	6				6		266		1	266	515	
Peak 15 Min.																						
12:50 - 13:05		0	0	0	0	0	0	82	1	0	83	1	0	0	0	1	0	77	0	0	77	161
Peak Hour																						
12:10 - 13:10		0	0	0	0	0	0	274	5	0	279	2	0	0	0	2	0	267	0	0	267	548
PHF		0.00	0.00	0.00		0.00	0.00	0.84	0.63		0.84	0.50	0.00	0.00		0.50	0.00	0.87	0.00		0.87	0.85
Truck %		0.0%	0.0%	0.0%		0.0%	0.0%	1.5%	0.0%		1.4%	0.0%	0.0%	0.0%		0.0%	0.0%	2.2%	0.0%		2.2%	1.8%

Evening Interval		Miovision Cameras					sunny					Wednesday, 24 October 2018					All Total					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total		EBR	EBT	EBL	Ped	Total
14:00 - 14:15							0	59	1	0	60	1	0	0	0	1	1	59	0	0	60	121
14:15 - 14:30							0	70	0	0	70						0	67	0	2	67	137
14:30 - 14:45							0	63	0	0	63	1	0	0	0	1	1	73	0	0	74	138
14:45 - 15:00							0	60	1	0	61	0	0	1	0	1	0	74	0	0	74	136
Total							252	2		254	2		1		3	2	273		2	275	532	
15:00 - 15:15					1		0	64	0	0	64				1		0	73	0	0	73	137
15:15 - 15:30							0	86	1	0	87	1	0	0	0	1	0	71	0	0	71	159
15:30 - 15:45							0	67	1	0	68	1	0	0	0	1	0	97	0	0	97	166
15:45 - 16:00							0	62	1	0	63						0	72	0	0	72	135
Total					1		279	3		282	2			1	2		313			313	597	
16:00 - 16:15							0	78	4	0	82	2	0	0	0	2	0	88	0	0	88	172
16:15 - 16:30							0	83	1	0	84						0	61	0	0	61	145
16:30 - 16:45							0	86	2	0	88						0	77	0	1	77	165
16:45 - 17:00							0	91	4	0	95	1	0	0	0	1	0	78	0	0	78	174
Total							338	11		349	3				3		304		1	304	656	
17:00 - 17:15							0	116	5	0	121						1	78	0	0	79	200
17:15 - 17:30							0	83	1	0	84						0	62	0	0	62	146
17:30 - 17:45							0	84	4	0	88						0	69	0	0	69	157
17:45 - 18:00							0	102	7	0	109	1	0	0	0	1	3	52	0	1	55	165
Total							385	17		402	1				1	4	261		1	265	668	
Peak 15 Min.																						
17:00 - 17:15		0	0	0	0	0	0	116	5	0	121	0	0	0	0	0	1	78	0	0	79	200
Peak Hour																						
16:30 - 17:30		0	0	0	0	0	0	376	12	0	388	1	0	0	0	1	1	295	0	1	296	685
PHF		0.00	0.00	0.00		0.00	0.00	0.82	0.54		0.81	0.25	0.00	0.00		0.25	0.25	0.90	0.00		0.89	0.86
Truck %		0.0%	0.0%	0.0%		0.0%	0.0%	1.3%	0.0%		1.3%	0.0%	0.0%	0.0%		0.0%	0.0%	3.4%	0.0%		3.4%	2.0%

12 hour truck % and Total Pedestrian	0.0%	0.0%	0.0%	1	0.0%	0.0%	3.3%	0.0%	0	3.2%	0.0%	0.0%	0.0%	1	0.0%	0.0%	2.9%	0.0%	5	2.9%	3.0%
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Notes
 0.3% Motorcycles
 76.9% Cars
 19.2% Light Goods Vehicles
 0.3% Buses
 2.7% Single Unit Trucks
 0.6% Tractor Trailers

U-Turns
 0 SB, 1 WB, 0 NB, 2 EB

Road Bikes
 0 SB, 1 WB, 0 NB, 0 EB

0 Bicycles in crosswalks
 5 Pedestrians in crosswalks

Use compass directions:
 Juvenile Hall driveway is the south leg

Morning Interval		Miovision Cameras										sunny					Wednesday, 31 October 2018					
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
6:00 - 6:15							0	9	0	0	9	2	0	0	0	2	0	17	0	0	17	28
6:15 - 6:30							0	27	0	0	27						0	25	0	0	25	52
6:30 - 6:45							0	22	0	0	22						0	30	0	0	30	52
6:45 - 7:00							0	32	0	0	32						0	36	0	0	36	68
Total								90			90	2				2		108			108	200
7:00 - 7:15							0	19	0	0	19						0	28	0	0	28	47
7:15 - 7:30							0	35	0	0	35						0	52	0	0	52	87
7:30 - 7:45							0	40	0	0	40						0	79	0	0	79	119
7:45 - 8:00							0	37	4	0	41						0	105	0	0	105	146
Total								131	4		135							264			264	399
8:00 - 8:15							0	74	1	0	75	3	0	0	0	3	0	93	0	0	93	171
8:15 - 8:30							0	63	1	0	64						0	68	0	0	68	132
8:30 - 8:45							0	63	1	0	64	1	0	0	0	1	0	74	0	0	74	139
8:45 - 9:00							0	52	0	0	52	1	0	0	0	1	0	92	0	0	92	145
Total								252	3		255	5				5		327			327	587
9:00 - 9:15							0	55	0	0	55						0	59	0	0	59	114
9:15 - 9:30							0	39	0	0	39						1	63	0	0	64	103
9:30 - 9:45							0	50	2	0	52	0	0	1	0	1	0	68	0	0	68	121
9:45 - 10:00							0	45	3	0	48	2	0	0	0	2	0	65	0	0	65	115
Total								189	5		194	2		1		3	1	255			256	453
Peak 15 Min.																						
8:05 - 8:20		0	0	0	0	0	0	81	1	0	82	2	0	0	0	2	0	90	0	0	90	174
Peak Hour																						
7:50 - 8:50		0	0	0	0	0	0	246	6	0	252	5	0	0	0	5	0	335	0	0	335	592
PHF		0.00	0.00	0.00		0.00	0.00	0.76	0.50		0.77	0.42	0.00	0.00		0.42	0.00	0.81	0.00		0.81	0.85
Truck %		0.0%	0.0%	0.0%		0.0%	0.0%	7.7%	0.0%		7.5%	0.0%	0.0%	0.0%		0.0%	0.0%	1.8%	0.0%		1.8%	4.2%

Midday Interval		Miovision Cameras					sunny					Wednesday, 31 October 2018										
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
10:00 - 10:15							0	46	0	0	46	1	0	0	0	1	0	85	0	0	85	132
10:15 - 10:30							0	54	1	0	55	2	0	0	0	2	0	57	0	0	57	114
10:30 - 10:45							0	42	0	0	42	1	0	0	0	1	0	66	0	0	66	109
10:45 - 11:00							0	37	0	0	37						0	50	0	0	50	87
Total							179	1		180	4				4		258			258	442	
11:00 - 11:15							0	40	2	0	42	0	0	1	0	1	0	71	0	2	71	114
11:15 - 11:30							0	42	1	0	43	1	0	0	0	1	1	81	0	0	82	126
11:30 - 11:45							0	52	0	0	52	2	0	0	0	2	1	79	0	0	80	134
11:45 - 12:00							0	45	0	0	45						0	56	0	0	56	101
Total							179	3		182	3		1		4	2	287		2	289	475	
12:00 - 12:15							0	51	0	0	51	1	0	0	0	1	1	66	0	0	67	119
12:15 - 12:30							0	57	1	0	58	1	0	0	0	1	0	70	0	0	70	129
12:30 - 12:45							0	72	1	0	73	2	0	0	0	2	0	32	0	0	32	107
12:45 - 13:00							0	58	3	0	61						1	77	0	0	78	139
Total							238	5		243	4				4	2	245			247	494	
13:00 - 13:15							0	61	0	0	61	1	0	1	0	2	1	85	1	0	87	150
13:15 - 13:30							0	59	0	0	59	1	0	0	0	1	0	63	0	0	63	123
13:30 - 13:45							0	65	2	0	67	2	0	0	0	2	1	80	0	0	81	150
13:45 - 14:00							0	64	2	0	66	1	0	0	0	1	0	48	0	0	48	115
Total							249	4		253	5		1		6	2	276	1		279	538	
Peak 15 Min.																						
13:30 - 13:45	0	0	0	0	0	0	0	65	2	0	67	2	0	0	0	2	1	80	0	0	81	150
Peak Hour																						
12:45 - 13:45	0	0	0	0	0	0	0	243	5	0	248	4	0	1	0	5	3	305	1	0	309	562
PHF	0.00	0.00	0.00		0.00	0.00	0.79	0.42		0.79	0.33	0.00	0.25		0.42	0.38	0.90	0.25		0.89	0.94	
Truck %	0.0%	0.0%	0.0%		0.0%	0.0%	4.1%	0.0%		4.0%	0.0%	0.0%	0.0%		0.0%	0.0%	3.9%	0.0%		3.9%	3.9%	

Evening Interval		Miovision Cameras					sunny					Wednesday, 31 October 2018										
Begin	End	SBR	SBT	SBL	Ped	Total	WBR	WBT	WBL	Ped	Total	NBR	NBT	NBL	Ped	Total	EBR	EBT	EBL	Ped	Total	All Total
14:00 - 14:15							0	57	0	0	57	2	0	0	0	2	0	74	0	0	74	133
14:15 - 14:30							0	66	0	0	66	3	0	0	0	3	0	62	0	0	62	131
14:30 - 14:45							0	66	0	0	66	1	0	0	0	1	1	100	1	1	102	169
14:45 - 15:00							0	79	0	0	79						0	77	0	0	77	156
Total							268			268	6				6	1	313	1	1	315	589	
15:00 - 15:15							0	97	2	0	99	3	0	0	0	3	2	60	0	1	62	164
15:15 - 15:30							0	72	0	0	72						0	86	0	1	86	158
15:30 - 15:45							0	72	0	0	72	1	0	0	0	1	0	74	0	0	74	147
15:45 - 16:00							0	96	1	0	97	1	0	0	0	1	0	86	0	0	86	184
Total							337	3		340	5				5	2	306		2	308	653	
16:00 - 16:15							0	72	0	0	72						0	91	0	0	91	163
16:15 - 16:30							0	104	0	0	104						0	82	0	0	82	186
16:30 - 16:45							0	96	0	0	96						0	99	0	0	99	195
16:45 - 17:00							0	71	0	0	71						0	96	0	0	96	167
Total							343			343							368			368	711	
17:00 - 17:15							0	81	0	0	81						0	92	0	0	92	173
17:15 - 17:30							0	81	0	0	81						0	84	0	0	84	165
17:30 - 17:45							0	77	0	0	77	1	0	0	0	1	0	90	0	0	90	168
17:45 - 18:00							0	80	1	0	81	1	0	0	0	1	0	88	0	0	88	170
Total							319	1		320	2				2		354			354	676	
Peak 15 Min.																						
16:30 - 16:45	0	0	0	0	0	0	0	96	0	0	96	0	0	0	0	0	0	99	0	0	99	195
Peak Hour																						
15:45 - 16:45	0	0	0	0	0	0	0	368	1	0	369	1	0	0	0	1	0	358	0	0	358	728
PHF	0.00	0.00	0.00		0.00	0.00	0.88	0.25		0.89	0.25	0.00	0.00		0.25	0.00	0.90	0.00		0.90	0.94	
Truck %	0.0%	0.0%	0.0%		0.0%	0.0%	0.8%	0.0%		0.8%	0.0%	0.0%	0.0%		0.0%	0.0%	4.7%	0.0%		4.7%	2.7%	

12 hour truck % and Total Pedestrian	0.0%	0.0%	0.0%	0	0.0%	0.0%	3.7%	0.0%	0	3.7%	7.9%	0.0%	0.0%	0	7.3%	30.0%	3.6%	0.0%	5	3.7%	3.7%
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Appendix B: Synchro Worksheets

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	335	0	6	246	0	5
Future Vol, veh/h	335	0	6	246	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	394	0	7	289	0	6

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	394	0	697	394
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	303	-
Critical Hdwy	-	-	4.14	-	6.44	6.24
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	-	-	2.236	-	3.536	3.336
Pot Cap-1 Maneuver	-	-	1154	-	404	651
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	745	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1154	-	401	651
Mov Cap-2 Maneuver	-	-	-	-	401	-
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	740	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	10.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	651	-	-	1154	-
HCM Lane V/C Ratio	0.009	-	-	0.006	-
HCM Control Delay (s)	10.6	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	261	0	4	246	1	2
Future Vol, veh/h	261	0	4	246	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	6	6	6	6	6	6
Mvmt Flow	287	0	4	270	1	2

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	287	0	565	287
Stage 1	-	-	-	-	287	-
Stage 2	-	-	-	-	278	-
Critical Hdwy	-	-	4.16	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.254	-	3.554	3.354
Pot Cap-1 Maneuver	-	-	1252	-	479	743
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	760	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1252	-	477	743
Mov Cap-2 Maneuver	-	-	-	-	477	-
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	757	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	627	-	-	1252	-
HCM Lane V/C Ratio	0.005	-	-	0.004	-
HCM Control Delay (s)	10.8	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑	↗	↘	↑	↗		↔			↔	
Traffic Vol, veh/h	6	232	33	5	198	26	43	18	12	57	16	5
Future Vol, veh/h	6	232	33	5	198	26	43	18	12	57	16	5
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	80	-	100	200	-	100	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	1	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	6	249	35	5	213	28	46	19	13	61	17	5

Major/Minor	Major1		Major2		Minor1			Minor2				
Conflicting Flow All	243	0	-	249	0	0	509	514	249	502	486	215
Stage 1	-	-	-	-	-	-	261	261	-	225	225	-
Stage 2	-	-	-	-	-	-	248	253	-	277	261	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1312	-	0	1305	-	-	471	461	785	477	478	820
Stage 1	-	-	0	-	-	-	740	689	-	773	714	-
Stage 2	-	-	0	-	-	-	751	694	-	725	689	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1310	-	-	1305	-	-	452	456	785	450	473	818
Mov Cap-2 Maneuver	-	-	-	-	-	-	452	456	-	450	473	-
Stage 1	-	-	-	-	-	-	736	686	-	768	710	-
Stage 2	-	-	-	-	-	-	725	690	-	690	686	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	0.2		0.2		13.8		14.4	
HCM LOS					B		B	

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	487	1310	-	1305	-	-	468
HCM Lane V/C Ratio	0.161	0.005	-	0.004	-	-	0.179
HCM Control Delay (s)	13.8	7.8	-	7.8	-	-	14.4
HCM Lane LOS	B	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0	-	0	-	-	0.6

Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	374	0	0	232	199	1	2	5	24	0	5
Future Vol, veh/h	8	374	0	0	232	199	1	2	5	24	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	200	-	-	-	-	100	-	-	-	-	-	225
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82	82	82	82	82	82
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	10	456	0	0	283	243	1	2	6	29	0	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	283	0	0	456	0	0	762	759	456	763	759	283
Stage 1	-	-	-	-	-	-	476	476	-	283	283	-
Stage 2	-	-	-	-	-	-	286	283	-	480	476	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1268	-	-	1094	-	0	319	334	600	319	334	751
Stage 1	-	-	-	-	-	0	566	553	-	720	673	-
Stage 2	-	-	-	-	-	0	717	673	-	563	553	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1268	-	-	1094	-	-	315	331	600	312	331	751
Mov Cap-2 Maneuver	-	-	-	-	-	-	315	331	-	312	331	-
Stage 1	-	-	-	-	-	-	561	549	-	714	673	-
Stage 2	-	-	-	-	-	-	711	673	-	550	549	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	13.1	16.3
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	456	1268	-	-	1094	-	312	751
HCM Lane V/C Ratio	0.021	0.008	-	-	-	-	0.094	0.008
HCM Control Delay (s)	13.1	7.9	-	-	0	-	17.7	9.8
HCM Lane LOS	B	A	-	-	A	-	C	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	0.3	0

HCM 6th Signalized Intersection Summary
 5: E Broad Street/North Bloomfield Road & SR 49

Existing Conditions AM
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	314	7	7	372	39	10	17	4	93	16	25
Future Volume (veh/h)	5	314	7	7	372	39	10	17	4	93	16	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	6	397	9	9	471	49	13	22	5	118	20	32
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	454	742	17	538	679	71	262	257	46	451	61	60
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	875	1807	41	972	1653	172	295	1201	214	919	284	279
Grp Volume(v), veh/h	6	0	406	9	0	520	40	0	0	170	0	0
Grp Sat Flow(s),veh/h/ln	875	0	1848	972	0	1825	1709	0	0	1482	0	0
Q Serve(g_s), s	0.1	0.0	4.0	0.2	0.0	5.6	0.0	0.0	0.0	1.9	0.0	0.0
Cycle Q Clear(g_c), s	5.8	0.0	4.0	4.1	0.0	5.6	0.4	0.0	0.0	2.4	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.09	0.32		0.12	0.69		0.19
Lane Grp Cap(c), veh/h	454	0	759	538	0	749	565	0	0	571	0	0
V/C Ratio(X)	0.01	0.00	0.53	0.02	0.00	0.69	0.07	0.00	0.00	0.30	0.00	0.00
Avail Cap(c_a), veh/h	751	0	1387	868	0	1369	1432	0	0	1350	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.2	0.0	5.3	6.9	0.0	5.8	7.6	0.0	0.0	8.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.6	0.0	0.0	1.2	0.1	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.7	0.0	0.0	0.5	0.1	0.0	0.0	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.2	0.0	5.9	6.9	0.0	7.0	7.6	0.0	0.0	8.6	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Vol, veh/h		412			529			40				170
Approach Delay, s/veh		6.0			7.0			7.6				8.6
Approach LOS		A			A			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		9.6		14.4		9.6		14.4				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		2.4		7.8		4.4		7.6				
Green Ext Time (p_c), s		0.1		1.8		0.8		2.2				
Intersection Summary												
HCM 6th Ctrl Delay				6.9								
HCM 6th LOS				A								

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	↕
Traffic Vol, veh/h	2	383	26	8	420	42	9	4	2	52	11	4
Future Vol, veh/h	2	383	26	8	420	42	9	4	2	52	11	4
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	10
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	3	479	33	10	525	53	11	5	3	65	14	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	579	0	0	512	0	0	1083	1101	496	1079	1091	553
Stage 1	-	-	-	-	-	-	502	502	-	573	573	-
Stage 2	-	-	-	-	-	-	581	599	-	506	518	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	990	-	-	1048	-	-	194	211	572	195	214	531
Stage 1	-	-	-	-	-	-	550	540	-	503	502	-
Stage 2	-	-	-	-	-	-	498	489	-	547	532	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	989	-	-	1048	-	-	180	207	572	188	210	530
Mov Cap-2 Maneuver	-	-	-	-	-	-	180	207	-	188	210	-
Stage 1	-	-	-	-	-	-	548	538	-	500	494	-
Stage 2	-	-	-	-	-	-	473	482	-	537	530	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.1			24			34.7		
HCM LOS							C			D		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	188	572	989	-	-	1048	-	-	192	530
HCM Lane V/C Ratio	0.086	0.004	0.003	-	-	0.01	-	-	0.41	0.009
HCM Control Delay (s)	26	11.3	8.6	0	-	8.5	0	-	36.2	11.9
HCM Lane LOS	D	B	A	A	-	A	A	-	E	B
HCM 95th %tile Q(veh)	0.3	0	0	-	-	0	-	-	1.8	0

Intersection												
Int Delay, s/veh	11.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕	↗	↗	↕	↗
Traffic Vol, veh/h	19	4	587	37	0	6	485	201	32	5	201	29
Future Vol, veh/h	19	4	587	37	0	6	485	201	32	5	201	29
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	Stop	-	-	Free	-	-	Free
Storage Length	-	-	40	-	-	15	-	-	-	175	-	185
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	21	4	638	40	0	7	527	218	35	5	218	32

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1500	1500	-	1502	1500	218	218	0	-	218	0	0
Stage 1	228	228	-	1272	1272	-	-	-	-	-	-	-
Stage 2	1272	1272	-	230	228	-	-	-	-	-	-	-
Critical Hdwy	7.17	6.57	-	7.17	6.57	6.27	4.17	-	-	4.17	-	-
Critical Hdwy Stg 1	6.17	5.57	-	6.17	5.57	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.17	5.57	-	6.17	5.57	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4.063	-	3.563	4.063	3.363	2.263	-	-	2.263	-	-
Pot Cap-1 Maneuver	98	119	0	97	119	809	1322	-	0	1322	-	0
Stage 1	764	706	0	201	233	-	-	-	0	-	-	0
Stage 2	201	233	0	762	706	-	-	-	0	-	-	0
Platoon blocked, %								-				-
Mov Cap-1 Maneuver	67	71	-	64	71	809	1322	-	-	1322	-	-
Mov Cap-2 Maneuver	67	71	-	64	71	-	-	-	-	-	-	-
Stage 1	459	703	-	121	140	-	-	-	-	-	-	-
Stage 2	120	140	-	754	703	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	86	112.3	6.7	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	1322	-	68	-	64	809	1322	-
HCM Lane V/C Ratio	0.399	-	0.368	-	0.628	0.008	0.004	-
HCM Control Delay (s)	9.5	-	86	0	129	9.5	7.7	-
HCM Lane LOS	A	-	F	A	F	A	A	-
HCM 95th %tile Q(veh)	2	-	1.4	-	2.7	0	0	-

Lanes, Volumes, Timings
1: Juvenile Hall Entrance & SR 49

Existing Conditions
PM Peak Hour



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	358	0	1	368	0	1
Future Volume (vph)	358	0	1	368	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t						0.865
Fl _t Protected						
Satd. Flow (prot)	1845	0	0	1845	1596	0
Fl _t Permitted						
Satd. Flow (perm)	1845	0	0	1845	1596	0
Link Speed (mph)	55			45	30	
Link Distance (ft)	1772			607	164	
Travel Time (s)	22.0			9.2	3.7	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Adj. Flow (vph)	381	0	1	391	0	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	381	0	0	392	1	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		15	15		9
Sign Control	Free			Free	Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	30.2% ICU Level of Service A
Analysis Period (min)	15

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	358	0	1	368	0	1
Future Vol, veh/h	358	0	1	368	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	381	0	1	391	0	1

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	381	0	774 381
Stage 1	-	-	-	-	381 -
Stage 2	-	-	-	-	393 -
Critical Hdwy	-	-	4.13	-	6.43 6.23
Critical Hdwy Stg 1	-	-	-	-	5.43 -
Critical Hdwy Stg 2	-	-	-	-	5.43 -
Follow-up Hdwy	-	-	2.227	-	3.527 3.327
Pot Cap-1 Maneuver	-	-	1172	-	365 664
Stage 1	-	-	-	-	688 -
Stage 2	-	-	-	-	680 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1172	-	365 664
Mov Cap-2 Maneuver	-	-	-	-	365 -
Stage 1	-	-	-	-	688 -
Stage 2	-	-	-	-	679 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	664	-	-	1172	-
HCM Lane V/C Ratio	0.002	-	-	0.001	-
HCM Control Delay (s)	10.4	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings
2: Elks Lodge Entrance & SR 49

Existing Conditions
PM Peak Hour



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	295	1	12	376	0	1
Future Volume (vph)	295	1	12	376	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt						0.865
Flt Protected						0.998
Satd. Flow (prot)	1863	0	0	1859	1611	0
Flt Permitted						0.998
Satd. Flow (perm)	1863	0	0	1859	1611	0
Link Speed (mph)	45			30		30
Link Distance (ft)	607			891		257
Travel Time (s)	9.2			20.3		5.8
Confl. Peds. (#/hr)						1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	343	1	14	437	0	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	344	0	0	451	1	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0		12
Link Offset(ft)	0			0		0
Crosswalk Width(ft)	16			16		16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		15		15	
Sign Control	Free			Free		Stop

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	39.5%
Analysis Period (min)	15
	ICU Level of Service A

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	295	1	12	376	0	1
Future Vol, veh/h	295	1	12	376	0	1
Conflicting Peds, #/hr	0	0	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	343	1	14	437	0	1






















Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	344	0	810 344
Stage 1	-	-	-	-	344 -
Stage 2	-	-	-	-	466 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1215	-	349 699
Stage 1	-	-	-	-	718 -
Stage 2	-	-	-	-	632 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1215	-	343 699
Mov Cap-2 Maneuver	-	-	-	-	343 -
Stage 1	-	-	-	-	718 -
Stage 2	-	-	-	-	622 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	699	-	-	1215	-
HCM Lane V/C Ratio	0.002	-	-	0.011	-
HCM Control Delay (s)	10.2	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings
3: W Broad Street/Cement Hill Road & SR 49

Existing Conditions
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	244	48	23	313	62	68	31	17	70	31	9
Future Volume (vph)	8	244	48	23	313	62	68	31	17	70	31	9
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		100	200		100	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		0
Taper Length (ft)	117			160			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850		0.980			0.989	
Flt Protected	0.950			0.950				0.972			0.969	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	0	1774	0	0	1785	0
Flt Permitted	0.950			0.950				0.972			0.969	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	0	1774	0	0	1785	0
Link Speed (mph)		45			30			25			30	
Link Distance (ft)		891			934			871			602	
Travel Time (s)		13.5			21.2			23.8			13.7	
Confl. Peds. (#/hr)	9						9					
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	9	284	56	27	364	72	79	36	20	81	36	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	284	56	27	364	72	0	135	0	0	127	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	33.3%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	6.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖	↖	↗	↖		↕			↕	
Traffic Vol, veh/h	8	244	48	23	313	62	68	31	17	70	31	9
Future Vol, veh/h	8	244	48	23	313	62	68	31	17	70	31	9
Conflicting Peds, #/hr	9	0	0	0	0	9	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	80	-	100	200	-	100	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	284	56	27	364	72	79	36	20	81	36	10




















Major/Minor	Major1		Major2		Minor1			Minor2				
Conflicting Flow All	445	0	-	284	0	0	779	801	284	757	729	373
Stage 1	-	-	-	-	-	-	302	302	-	427	427	-
Stage 2	-	-	-	-	-	-	477	499	-	330	302	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1115	-	0	1278	-	-	313	318	755	324	350	673
Stage 1	-	-	0	-	-	-	707	664	-	606	585	-
Stage 2	-	-	0	-	-	-	569	544	-	683	664	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1105	-	-	1278	-	-	277	306	755	278	337	667
Mov Cap-2 Maneuver	-	-	-	-	-	-	277	306	-	278	337	-
Stage 1	-	-	-	-	-	-	701	659	-	596	567	-
Stage 2	-	-	-	-	-	-	513	528	-	624	659	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	0.3		0.5		24.8		24.7	
HCM LOS					C		C	

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	314	1105	-	1278	-	-	308
HCM Lane V/C Ratio	0.43	0.008	-	0.021	-	-	0.415
HCM Control Delay (s)	24.8	8.3	-	7.9	-	-	24.7
HCM Lane LOS	C	A	-	A	-	-	C
HCM 95th %tile Q(veh)	2.1	0	-	0.1	-	-	2

Lanes, Volumes, Timings
4: SR 49 & Maidu Ave

Existing Conditions
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	391	0	5	355	53	1	1	4	177	0	31
Future Volume (vph)	7	391	0	5	355	53	1	1	4	177	0	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		100	0		0	0		225
Storage Lanes	1		0	0		1	0		0	0		1
Taper Length (ft)	170			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Fr _t						0.850		0.910				0.850
Fl _t Protected	0.950				0.999			0.992			0.950	
Satd. Flow (prot)	1770	1863	0	0	1861	1583	0	1682	0	0	1770	1583
Fl _t Permitted	0.950				0.999			0.992			0.950	
Satd. Flow (perm)	1770	1863	0	0	1861	1583	0	1682	0	0	1770	1583
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		934			1119			351			429	
Travel Time (s)		14.2			17.0			8.0			9.8	
Confl. Peds. (#/hr)	10					10						
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	420	0	5	382	57	1	1	4	190	0	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	420	0	0	387	57	0	6	0	0	190	33
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	45.8%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	8.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↖	↗		↔			↖	↗
Traffic Vol, veh/h	7	391	0	5	355	53	1	1	4	177	0	31
Future Vol, veh/h	7	391	0	5	355	53	1	1	4	177	0	31
Conflicting Peds, #/hr	10	0	0	0	0	10	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	200	-	-	-	-	100	-	-	-	-	-	225
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	420	0	5	382	57	1	1	4	190	0	33




















Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	392	0	0	420	0	0	845	838	420	841	838	392
Stage 1	-	-	-	-	-	-	436	436	-	402	402	-
Stage 2	-	-	-	-	-	-	409	402	-	439	436	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1167	-	-	1139	-	0	283	302	633	284	302	657
Stage 1	-	-	-	-	-	0	599	580	-	625	600	-
Stage 2	-	-	-	-	-	0	619	600	-	597	580	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1156	-	-	1139	-	-	266	295	633	276	295	651
Mov Cap-2 Maneuver	-	-	-	-	-	-	266	295	-	276	295	-
Stage 1	-	-	-	-	-	-	595	576	-	615	590	-
Stage 2	-	-	-	-	-	-	584	590	-	588	576	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.1			13.2			37.9		
HCM LOS							B			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	445	1156	-	-	1139	-	276	651
HCM Lane V/C Ratio	0.014	0.007	-	-	0.005	-	0.69	0.051
HCM Control Delay (s)	13.2	8.1	-	-	8.2	0	42.7	10.8
HCM Lane LOS	B	A	-	-	A	A	E	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	4.6	0.2


Lanes, Volumes, Timings
5: E Broad Street/North Bloomfield Road & SR 49

Existing Conditions
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	493	10	21	398	96	17	43	13	69	21	14
Future Volume (vph)	10	493	10	21	398	96	17	43	13	69	21	14
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	140		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	80			80			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt		0.997			0.971			0.976			0.982	
Flt Protected	0.950			0.950				0.988			0.968	
Satd. Flow (prot)	1770	1856	0	1770	1800	0	0	1796	0	0	1766	0
Flt Permitted	0.373			0.362				0.905			0.751	
Satd. Flow (perm)	694	1856	0	674	1800	0	0	1645	0	0	1370	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			32			14			15	
Link Speed (mph)		30			45			25			25	
Link Distance (ft)		1119			1040			617			754	
Travel Time (s)		25.4			15.8			16.8			20.6	
Confl. Peds. (#/hr)	3		1	1		3	1					1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	542	11	23	437	105	19	47	14	76	23	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	553	0	23	542	0	0	80	0	0	114	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

Lanes, Volumes, Timings
5: E Broad Street/North Bloomfield Road & SR 49

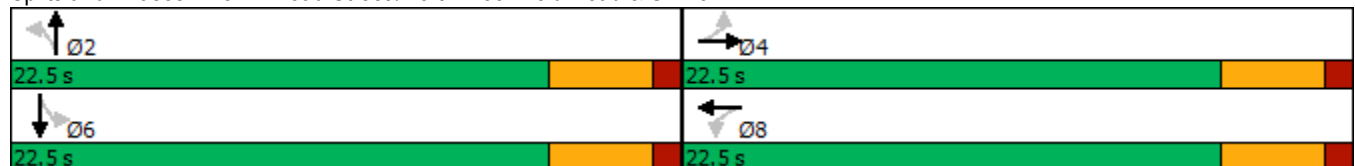
Existing Conditions
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	18.0	18.0		18.0	18.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	14.2	14.2		14.2	14.2		7.8	7.8		7.8	7.8	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.25	0.25		0.25	0.25	
v/c Ratio	0.04	0.66		0.08	0.65		0.19	0.19		0.32	0.32	
Control Delay	5.4	11.1		5.8	10.6		10.1	10.1		12.2	12.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	5.4	11.1		5.8	10.6		10.1	10.1		12.2	12.2	
LOS	A	B		A	B		B	B		B	B	
Approach Delay		11.0			10.4		10.1	10.1			12.3	
Approach LOS		B			B		B	B			B	

Intersection Summary




















Area Type:	Other
Cycle Length:	45
Actuated Cycle Length:	31.2
Natural Cycle:	50
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	10.8
Intersection LOS:	B
Intersection Capacity Utilization:	46.9%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 5: E Broad Street /North Bloomfield Road & SR 49





















HCM 6th Signalized Intersection Summary
 5: E Broad Street/North Bloomfield Road & SR 49

Existing Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	493	10	21	398	96	17	43	13	69	21	14
Future Volume (veh/h)	10	493	10	21	398	96	17	43	13	69	21	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	542	11	23	437	105	19	47	14	76	23	15
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	458	802	16	460	640	154	226	240	61	402	104	41
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	863	1826	37	854	1456	350	241	1183	302	807	512	200
Grp Volume(v), veh/h	11	0	553	23	0	542	80	0	0	114	0	0
Grp Sat Flow(s),veh/h/ln	863	0	1864	854	0	1806	1726	0	0	1519	0	0
Q Serve(g_s), s	0.3	0.0	5.9	0.6	0.0	6.0	0.0	0.0	0.0	0.5	0.0	0.0
Cycle Q Clear(g_c), s	6.3	0.0	5.9	6.5	0.0	6.0	0.9	0.0	0.0	1.4	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.19	0.24		0.17	0.67		0.13
Lane Grp Cap(c), veh/h	458	0	818	460	0	793	527	0	0	547	0	0
V/C Ratio(X)	0.02	0.00	0.68	0.05	0.00	0.68	0.15	0.00	0.00	0.21	0.00	0.00
Avail Cap(c_a), veh/h	697	0	1335	696	0	1294	1385	0	0	1292	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.2	0.0	5.6	8.2	0.0	5.6	8.4	0.0	0.0	8.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	1.0	0.0	0.0	1.1	0.1	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.0	0.1	0.0	0.5	0.3	0.0	0.0	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.2	0.0	6.6	8.3	0.0	6.7	8.5	0.0	0.0	8.7	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Vol, veh/h		564			565			80			114	
Approach Delay, s/veh		6.6			6.8			8.5			8.7	
Approach LOS		A			A			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		9.6		15.5		9.6		15.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		2.9		8.3		3.4		8.5				
Green Ext Time (p_c), s		0.3		2.6		0.5		2.3				
Intersection Summary												
HCM 6th Ctrl Delay				7.0								
HCM 6th LOS				A								

Lanes, Volumes, Timings
6: Coyote Street & SR 49

Existing Conditions
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	525	45	7	477	80	20	10	5	59	9	12
Future Volume (vph)	7	525	45	7	477	80	20	10	5	59	9	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		10	0		10
Storage Lanes	0		0	0		0	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989			0.981				0.850			0.850
Flt Protected		0.999			0.999			0.968			0.959	
Satd. Flow (prot)	0	1840	0	0	1826	0	0	1803	1583	0	1786	1583
Flt Permitted		0.999			0.999			0.968			0.959	
Satd. Flow (perm)	0	1840	0	0	1826	0	0	1803	1583	0	1786	1583
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		1040			712			1061			555	
Travel Time (s)		15.8			10.8			24.1			15.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	7	559	48	7	507	85	21	11	5	63	10	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	614	0	0	599	0	0	32	5	0	73	13
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.6%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	↕
Traffic Vol, veh/h	7	525	45	7	477	80	20	10	5	59	9	12
Future Vol, veh/h	7	525	45	7	477	80	20	10	5	59	9	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	10	-	-	10
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	559	48	7	507	85	21	11	5	63	10	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	592	0	0	607	0	0	1172	1203	583	1169	1185	550
Stage 1	-	-	-	-	-	-	597	597	-	564	564	-
Stage 2	-	-	-	-	-	-	575	606	-	605	621	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	984	-	-	971	-	-	169	184	512	170	189	535
Stage 1	-	-	-	-	-	-	490	491	-	510	508	-
Stage 2	-	-	-	-	-	-	503	487	-	485	479	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	984	-	-	971	-	-	156	180	512	158	185	535
Mov Cap-2 Maneuver	-	-	-	-	-	-	156	180	-	158	185	-
Stage 1	-	-	-	-	-	-	485	486	-	504	502	-
Stage 2	-	-	-	-	-	-	476	482	-	464	474	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.1			29.5			39.5		
HCM LOS							D			E		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	163	512	984	-	-	971	-	-	161	535
HCM Lane V/C Ratio	0.196	0.01	0.008	-	-	0.008	-	-	0.449	0.024
HCM Control Delay (s)	32.4	12.1	8.7	0	-	8.7	0	-	44.4	11.9
HCM Lane LOS	D	B	A	A	-	A	A	-	E	B
HCM 95th %tile Q(veh)	0.7	0	0	-	-	0	-	-	2.1	0.1

Lanes, Volumes, Timings
7: SR 49/SR 20 & SR 49/Uren St

Existing Conditions
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	7	540	31	1	5	571	266	65	5	269	46
Future Volume (vph)	18	7	540	31	1	5	571	266	65	5	269	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	16	12	12	16
Storage Length (ft)	0		40	0		15	500		245	175		185
Storage Lanes	0		1	0		1	0		0	1		1
Taper Length (ft)	25			25			50			170		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.966			0.954		0.950			0.950		
Satd. Flow (prot)	0	1715	1509	0	1694	1509	1687	1776	1711	1687	1776	1711
Flt Permitted		0.966			0.954		0.950			0.950		
Satd. Flow (perm)	0	1715	1509	0	1694	1509	1687	1776	1711	1687	1776	1711
Link Speed (mph)		45			30			50			50	
Link Distance (ft)		712			320			631			1411	
Travel Time (s)		10.8			7.3			8.6			19.2	
Confl. Peds. (#/hr)	1						1	7		2	2	7
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Adj. Flow (vph)	19	8	581	33	1	5	614	286	70	5	289	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	27	581	0	34	5	614	286	70	5	289	49
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	64.4%
	ICU Level of Service C
Analysis Period (min)	15

Intersection												
Int Delay, s/veh	21.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↑	↕	↕	↑	↕
Traffic Vol, veh/h	18	7	540	31	1	5	571	266	65	5	269	46
Future Vol, veh/h	18	7	540	31	1	5	571	266	65	5	269	46
Conflicting Peds, #/hr	1	0	0	0	0	1	7	0	2	2	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	Stop	-	-	Free	-	-	Free
Storage Length	-	-	40	-	-	15	-	-	-	175	-	185
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	19	8	581	33	1	5	614	286	70	5	289	49

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1822	1822	-	1819	1822	289	296	0	-	288	0	0
Stage 1	306	306	-	1516	1516	-	-	-	-	-	-	-
Stage 2	1516	1516	-	303	306	-	-	-	-	-	-	-
Critical Hdwy	7.17	6.57	-	7.17	6.57	6.27	4.17	-	-	4.17	-	-
Critical Hdwy Stg 1	6.17	5.57	-	6.17	5.57	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.17	5.57	-	6.17	5.57	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4.063	-	3.563	4.063	3.363	2.263	-	-	2.263	-	-
Pot Cap-1 Maneuver	58	75	0	58	75	738	1237	-	0	1246	-	0
Stage 1	693	653	0	145	177	-	-	-	0	-	-	0
Stage 2	145	177	0	696	653	-	-	-	0	-	-	0
Platoon blocked, %								-				
Mov Cap-1 Maneuver	34	37	-	~30	37	736	1229	-	-	1244	-	-
Mov Cap-2 Maneuver	34	37	-	~30	37	-	-	-	-	-	-	-
Stage 1	344	646	-	72	88	-	-	-	-	-	-	-
Stage 2	71	88	-	685	646	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	251.3		\$ 355.2		7.4		0.1	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	1229	-	35	-	30	736	1244	-
HCM Lane V/C Ratio	0.5	-	0.768	-	1.147	0.007	0.004	-
HCM Control Delay (s)	10.8	-	251.3	\$	409.1	9.9	7.9	-
HCM Lane LOS	B	-	F	A	F	A	A	-
HCM 95th %tile Q(veh)	2.9	-	2.7	-	3.9	0	0	-

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

LANE SUMMARY

 Site: 101 [SR 49 & SR 20 - AM]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Total veh/h	Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: NB - SR 20													
Lane 1 ^d	780	7.0	1201	0.650	100	11.6	LOS B	8.3	218.5	Full	1600	0.0	0.0
Approach	780	7.0		0.650		11.6	LOS B	8.3	218.5				
East: WB - SR 49													
Lane 1 ^d	48	7.0	581	0.082	100	7.2	LOS A	0.5	12.6	Full	250	0.0	0.0
Approach	48	7.0		0.082		7.2	LOS A	0.5	12.6				
North: SB - SR 20													
Lane 1 ^d	255	7.0	717	0.356	100	9.6	LOS A	2.2	59.2	Full	1600	0.0	0.0
Approach	255	7.0		0.356		9.6	LOS A	2.2	59.2				
West: EB - SR 49													
Lane 1 ^d	663	7.0	930	0.713	100	16.4	LOS B	12.1	320.0	Full	500	0.0	0.0
Approach	663	7.0		0.713		16.4	LOS B	12.1	320.0				
Intersection	1747	7.0		0.713		13.0	LOS B	12.1	320.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [SR 49 & Maidu Ave/Orchard St - PM]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Total veh/h	Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: NB - Orchard St													
Lane 1 ^d	6	2.0	747	0.009	100	4.9	LOS A	0.0	1.2	Full	1100	0.0	0.0
Approach	6	2.0		0.009		4.9	LOS A	0.0	1.2				
East: WB - SR 49													
Lane 1 ^d	444	2.0	1298	0.342	100	5.9	LOS A	2.5	62.7	Full	1000	0.0	0.0
Approach	444	2.0		0.342		5.9	LOS A	2.5	62.7				
North: SB - Maidu Ave													
Lane 1 ^d	225	2.0	939	0.239	100	6.2	LOS A	1.3	34.0	Full	275	0.0	0.0
Approach	225	2.0		0.239		6.2	LOS A	1.3	34.0				
West: EB - SR 49													
Lane 1 ^d	429	2.0	1069	0.401	100	7.6	LOS A	2.9	72.7	Full	800	0.0	0.0
Approach	429	2.0		0.401		7.6	LOS A	2.9	72.7				
Intersection	1104	2.0		0.401		6.6	LOS A	2.9	72.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [SR 49 & Maidu Ave/Orchard St - AM]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Total	Flows HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Veh	Queue Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: NB - Orchard St													
Lane 1 ^d	10	4.0	829	0.012	100	4.5	LOS A	0.1	1.5	Full	1100	0.0	0.0
Approach	10	4.0		0.012		4.5	LOS A	0.1	1.5				
East: WB - SR 49													
Lane 1 ^d	527	4.0	1268	0.415	100	6.9	LOS A	3.1	79.1	Full	1000	0.0	0.0
Approach	527	4.0		0.415		6.9	LOS A	3.1	79.1				
North: SB - Maidu Ave													
Lane 1 ^d	37	4.0	988	0.037	100	4.0	LOS A	0.2	4.6	Full	275	0.0	0.0
Approach	37	4.0		0.037		4.0	LOS A	0.2	4.6				
West: EB - SR 49													
Lane 1 ^d	467	4.0	1241	0.376	100	6.5	LOS A	2.8	72.0	Full	800	0.0	0.0
Approach	467	4.0		0.376		6.5	LOS A	2.8	72.0				
Intersection	1040	4.0		0.415		6.6	LOS A	3.1	79.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
 LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
 Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
 Roundabout Capacity Model: SIDRA Standard.
 HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

LANE SUMMARY

 Site: 102 [SR 49 & Coyote Street - PM]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Total	Flows HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB- Coyote Street													
Lane 1 ^d	37	2.0	739	0.050	100	5.4	LOS A	0.3	7.1	Full	400	0.0	0.0
Approach	37	2.0		0.050		5.4	LOS A	0.3	7.1				
East: WB - SR 49													
Lane 1 ^d	600	2.0	1254	0.479	100	7.9	LOS A	4.2	107.1	Full	500	0.0	0.0
Approach	600	2.0		0.479		7.9	LOS A	4.2	107.1				
North: SB - Coyote St													
Lane 1 ^d	85	2.0	817	0.104	100	5.4	LOS A	0.6	14.4	Full	275	0.0	0.0
Approach	85	2.0		0.104		5.4	LOS A	0.6	14.4				
West: EB - SR 49													
Lane 1 ^d	614	2.0	1200	0.512	100	8.7	LOS A	4.6	115.6	Full	900	0.0	0.0
Approach	614	2.0		0.512		8.7	LOS A	4.6	115.6				
Intersection	1336	2.0		0.512		8.0	LOS A	4.6	115.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
 LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
 Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
 Roundabout Capacity Model: SIDRA Standard.
 HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

LANE SUMMARY

 Site: 102 [SR 49 & Coyote Street - AM]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Total veh/h	Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Queue Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: NB- Coyote Street													
Lane 1 ^d	19	3.0	789	0.024	100	4.8	LOS A	0.1	3.3	Full	400	0.0	0.0
Approach	19	3.0		0.024		4.8	LOS A	0.1	3.3				
East: WB - SR 49													
Lane 1 ^d	588	3.0	1271	0.462	100	7.6	LOS A	4.1	103.9	Full	500	0.0	0.0
Approach	588	3.0		0.462		7.6	LOS A	4.1	103.9				
North: SB - Coyote St													
Lane 1 ^d	84	3.0	808	0.104	100	5.5	LOS A	0.6	14.2	Full	275	0.0	0.0
Approach	84	3.0		0.104		5.5	LOS A	0.6	14.2				
West: EB - SR 49													
Lane 1 ^d	514	3.0	1176	0.437	100	7.6	LOS A	3.5	88.5	Full	900	0.0	0.0
Approach	514	3.0		0.437		7.6	LOS A	3.5	88.5				
Intersection	1204	3.0		0.462		7.4	LOS A	4.1	103.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [SR 49 & SR 20 - PM]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Total veh/h	Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Queue Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: NB - SR 20													
Lane 1 ^d	970	7.0	1197	0.810	100	18.4	LOS B	16.6	438.5	Full	1600	0.0	0.0
Approach	970	7.0		0.810		18.4	LOS B	16.6	438.5				
East: WB - SR 49													
Lane 1 ^d	40	7.0	434	0.092	100	9.6	LOS A	0.6	15.3	Full	250	0.0	0.0
Approach	40	7.0		0.092		9.6	LOS A	0.6	15.3				
North: SB - SR 20													
Lane 1 ^d	344	7.0	624	0.551	100	15.4	LOS B	5.2	136.6	Full	1600	0.0	0.0
Approach	344	7.0		0.551		15.4	LOS B	5.2	136.6				
West: EB - SR 49													
Lane 1 ^d	608	7.0	856	0.710	100	17.3	LOS B	11.5	304.5	Full	500	0.0	0.0
Approach	608	7.0		0.710		17.3	LOS B	11.5	304.5				
Intersection	1961	7.0		0.810		17.4	LOS B	16.6	438.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [SR 49 & Cement Hill Rd/W Broad St - PM]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Total	Flows HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Queue Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB - W Broad St													
Lane 1 ^d	135	2.0	974	0.138	100	5.0	LOS A	0.8	19.4	Full	1200	0.0	0.0
Approach	135	2.0		0.138		5.0	LOS A	0.8	19.4				
East: WB - SR 49													
Lane 1 ^d	463	2.0	1193	0.388	100	6.9	LOS A	2.8	71.5	Full	800	0.0	0.0
Approach	463	2.0		0.388		6.9	LOS A	2.8	71.5				
North: SB - Cement Hill Rd													
Lane 1 ^d	128	2.0	899	0.142	100	5.4	LOS A	0.8	20.5	Full	500	0.0	0.0
Approach	128	2.0		0.142		5.4	LOS A	0.8	20.5				
West: EB - SR 49													
Lane 1 ^d	349	2.0	1172	0.298	100	5.9	LOS A	1.9	49.3	Full	750	0.0	0.0
Approach	349	2.0		0.298		5.9	LOS A	1.9	49.3				
Intersection	1074	2.0		0.388		6.1	LOS A	2.8	71.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

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LANE SUMMARY

 Site: 101 [SR 49 & Cement Hill Rd/W Broad St - AM]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Total	Flows HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Queue Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: NB - W Broad St													
Lane 1 ^d	78	4.0	1004	0.078	100	4.2	LOS A	0.4	10.4	Full	1200	0.0	0.0
Approach	78	4.0		0.078		4.2	LOS A	0.4	10.4				
East: WB - SR 49													
Lane 1 ^d	246	4.0	1234	0.200	100	4.6	LOS A	1.2	30.6	Full	800	0.0	0.0
Approach	246	4.0		0.200		4.6	LOS A	1.2	30.6				
North: SB - Cement Hill Rd													
Lane 1 ^d	84	4.0	1048	0.080	100	4.1	LOS A	0.4	10.5	Full	500	0.0	0.0
Approach	84	4.0		0.080		4.1	LOS A	0.4	10.5				
West: EB - SR 49													
Lane 1 ^d	291	4.0	1220	0.239	100	5.1	LOS A	1.5	37.8	Full	750	0.0	0.0
Approach	291	4.0		0.239		5.1	LOS A	1.5	37.8				
Intersection	700	4.0		0.239		4.7	LOS A	1.5	37.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

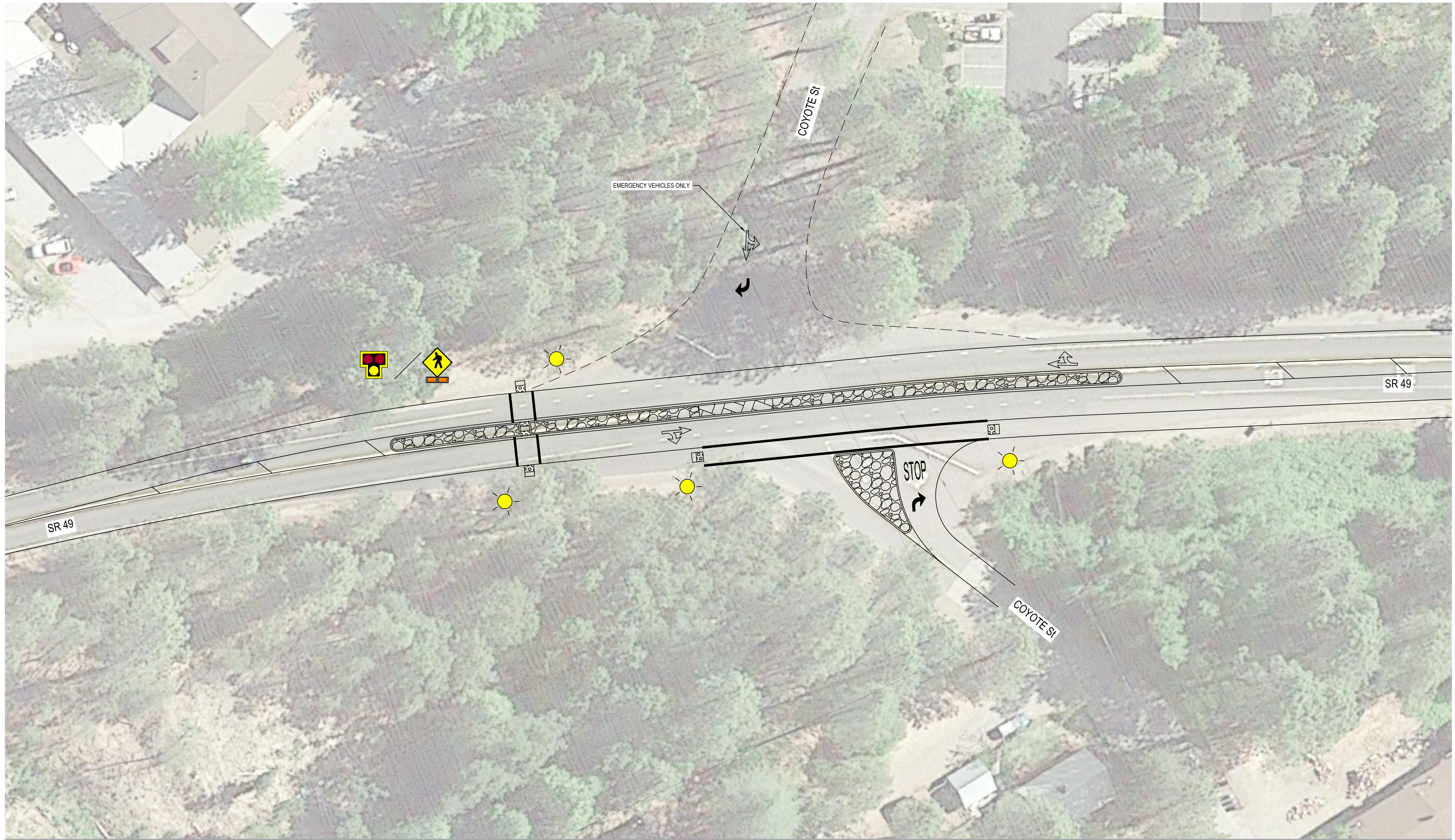
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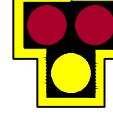

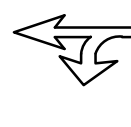



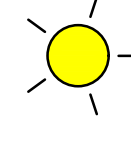

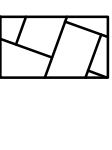
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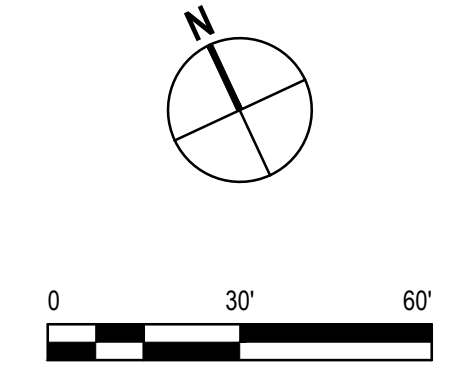


Appendix C: Low Cost Alternative Concept Renderings



LEGEND

- | | | | | | | | |
|---|--|---|--|---|-----------------------------------|---|------------------------------|
|  | HIGH-INTENSITY ACTIVATED CROSSWALK (HAWK) BEACON |  | CHANNELIZED INTERSECTION |  | PERMISSIBLE MOVEMENTS |  | PAVEMENT MARKINGS |
|  | PROPOSED SPEED FEEDBACK SIGN |  | RECTANGULAR RAPID FLASHING BEACON (RRFB) |  | INTERSECTION / CROSSWALK LIGHTING |  | STAMPED AND COLORED CONCRETE |
| | | | |  | EMERGENCY VEHICLE ACCESS | | |

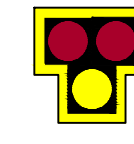



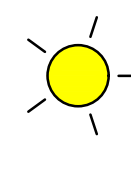


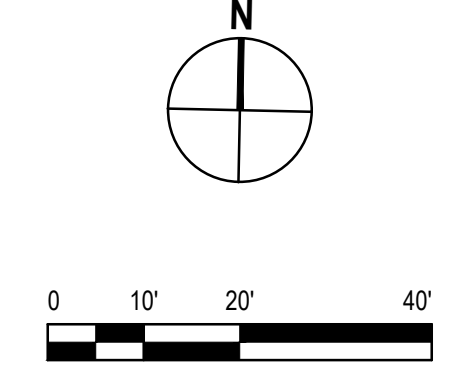
NEVADA COUNTY TRANSPORTATION COMMISSION
 STATE ROUTE 49 MULTIMODAL CORRIDOR STUDY
 LOW COST IMPROVEMENTS
 SR 49 / COYOTE St

Project No. 11194668
 Comp. No. 2646
 Date JULY 2019



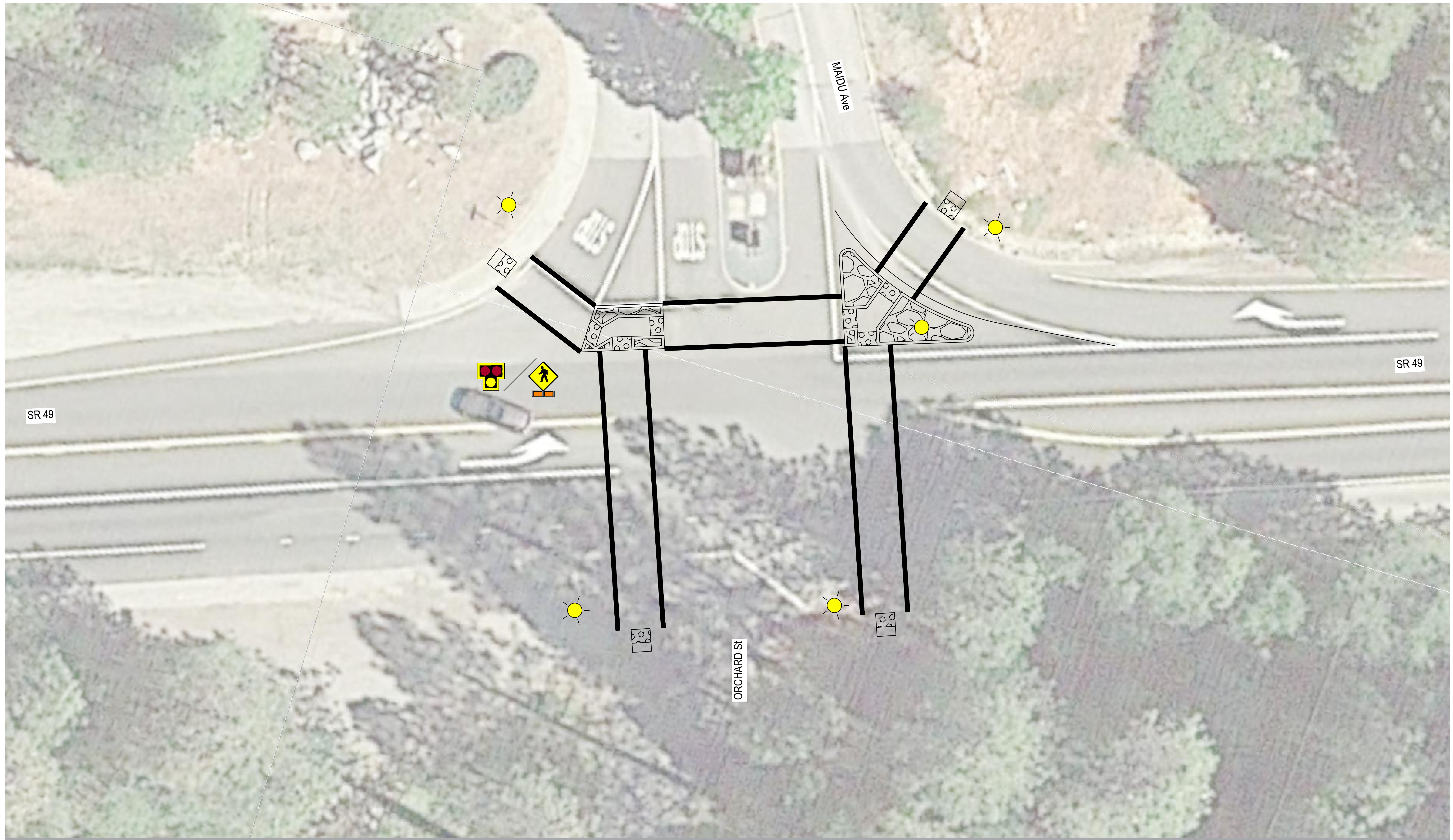
LEGEND

- 
HIGH-INTENSITY ACTIVATED CROSSWALK (HAWK) BEACON
- 
CHANNELIZED INTERSECTION
- 
PROPOSED SPEED FEEDBACK SIGN
- 
RECTANGULAR RAPID FLASHING BEACON (RRFB)
- 
INTERSECTION / CROSSWALK LIGHTING

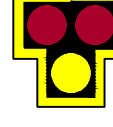

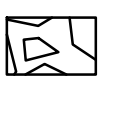
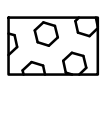


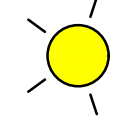


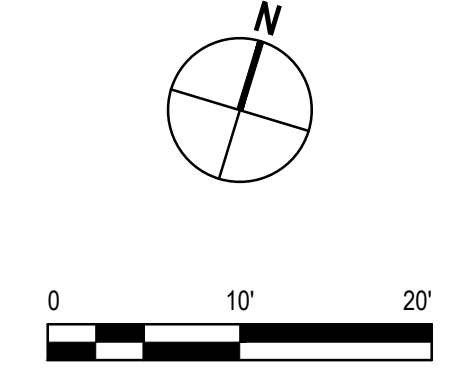
NEVADA COUNTY TRANSPORTATION COMMISSION
 STATE ROUTE 49 MULTIMODAL CORRIDOR STUDY
 LOW COST IMPROVEMENTS
 SR 49 / N BLOOMFIELD Rd / E BROAD St

Project No. 11194668
 Comp. No. 2646
 Date JULY 2019



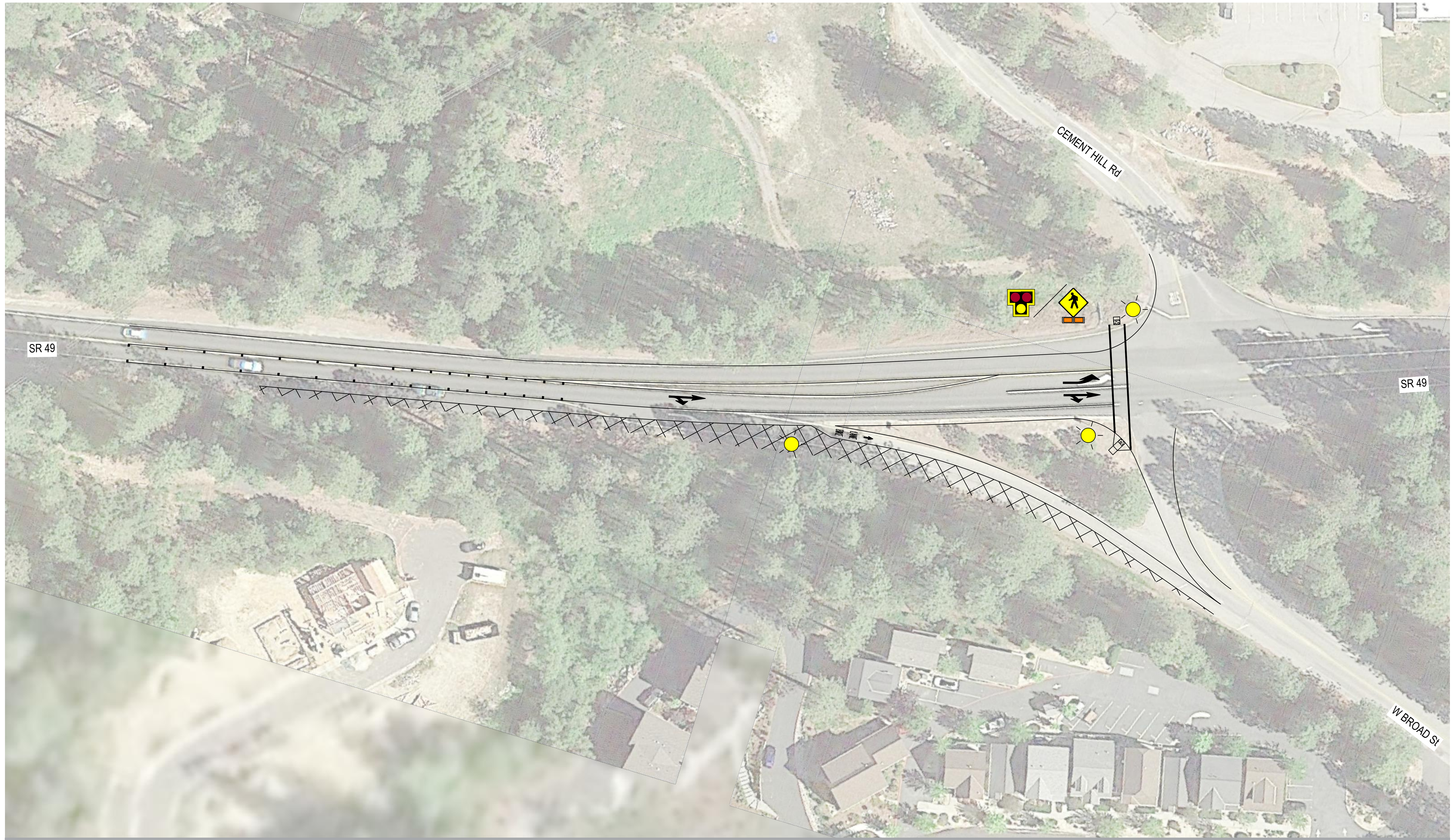
LEGEND

- | | | | | | | | |
|---|--|---|--|---|-----------------------------------|---|----------------------------|
|  | HIGH-INTENSITY ACTIVATED CROSSWALK (HAWK) BEACON |  | CHANNELIZED INTERSECTION |  | STAMPED AND COLORED CONCRETE |  | DETECTABLE WARNING SURFACE |
|  | PROPOSED SPEED FEEDBACK SIGN |  | RECTANGULAR RAPID FLASHING BEACON (RRFB) |  | INTERSECTION / CROSSWALK LIGHTING | | |

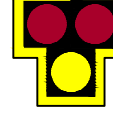

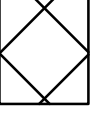



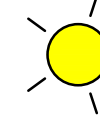


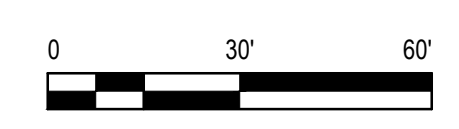
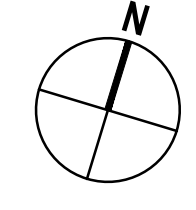
NEVADA COUNTY TRANSPORTATION COMMISSION
 STATE ROUTE 49 MULTIMODAL CORRIDOR STUDY
 LOW COST IMPROVEMENTS
 SR 49 / MAIDU Ave / ORCHARD St

Project No. 11194668
 Comp. No. 2646
 Date JULY 2019



LEGEND

-  HIGH-INTENSITY ACTIVATED CROSSWALK (HAWK) BEACON
-  CHANNELIZED INTERSECTION
-  REMOVED PAVEMENT
-  OPTICAL SPEED BARS WITH CONTRAST SURFACE TREATMENT
-  PROPOSED SPEED FEEDBACK SIGN
-  RECTANGULAR RAPID FLASHING BEACON (RRFB)
-  INTERSECTION / CROSSWALK LIGHTING

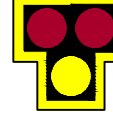



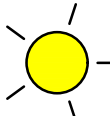


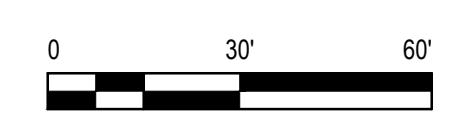
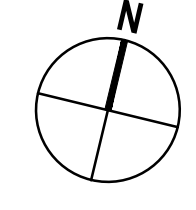
NEVADA COUNTY TRANSPORTATION COMMISSION
 STATE ROUTE 49 MULTIMODAL CORRIDOR STUDY
 LOW COST IMPROVEMENTS
 SR 49 / CEMENT HILL Rd / W BROAD St

Project No. 11194668
 Comp. No. 2646
 Date JULY 2019



LEGEND

-  HIGH-INTENSITY ACTIVATED CROSSWALK (HAWK) BEACON
-  CHANNELIZED INTERSECTION
-  PROPOSED SPEED FEEDBACK SIGN
-  RECTANGULAR RAPID FLASHING BEACON (RRFB)
-  INTERSECTION / CROSSWALK LIGHTING



NEVADA COUNTY TRANSPORTATION COMMISSION
 STATE ROUTE 49 MULTIMODAL CORRIDOR STUDY
 LOW COST IMPROVEMENTS
**SR 49 AT JUVENILE HALL AND ELKS
 LODGE DRIVEWAYS**

Project No. 11194668
 Comp. No. 2646
 Date JULY 2019



Appendix D: Benefit Cost Summaries

Safety Benefit-Cost Summary (Comprehensive Study Area)

Segment	Countermeasure	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
1	Roundabout (NS4B)	\$ 24,371,486	\$11,385,485	2.14	20	\$24,371,486	\$ 11,385,485	2.14
1	Intersection Lighting (NS1)	\$ 132,160	\$ 684,956	0.19	20	\$ 132,160	\$ 684,956	0.19
1	Class I Path (R37)	\$ 37,760	\$ 742,559	0.05	20	\$ 37,760	\$ 742,559	0.05
2	Roundabout (NS4B)	\$ 4,481,260	\$ 3,079,400	1.46	20	\$ 4,481,260	\$ 3,079,400	1.46
3	Roundabout (NS4B)	\$ 6,241,275	\$ 4,950,622	1.26	20	\$ 6,241,275	\$ 4,950,622	1.26
3	Intersection Lighting (NS1)	\$ 336,320	\$ 617,178	0.54	20	\$ 336,320	\$ 617,178	0.54
Study Area	Total Expected Benefit	\$ 35,600,261	\$ 21,460,200	1.66		\$ 35,600,261	\$ 21,460,200	1.66

*Notes:

1. Safety benefit analyzed using Caltrans HSIP analyzer, and considers full project costs, including set-aside for pedestrian improvements.

Induced Demand Benefit-Cost Summary 20-Year Life Cycle (Comprehensive Study Area)

Segment	Total Annualized Benefit	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
Study Area	Bicycle Mode Shift Benefit	\$ 758,977	\$ 4,895,036	0.16	20	\$ 15,179,544	\$ 7,959,176	1.91

*Notes:

1. Mode Shift to Bike Transportation induced demand benefit calculated using NCHRP 552 methodology.
2. 20-year life cycle cost estimated using planning-level cost estimates include 20 year life cycle of Class I Paths and Class II bike lanes

Safety Benefit-Cost Summary 20-Year Life Cycle (Segment 1)

Segment	Countermeasure	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
1	Roundabout (NS4B)	\$ 24,371,486	\$11,385,485	2.14	20	\$ 24,371,486	\$ 11,385,485	2.14
1	Intersection Lighting (NS1)	\$ 132,160	\$ 684,956	0.19	20	\$ 132,160	\$ 684,956	0.19
1	Class I Path (R37)	\$ 37,760	\$ 742,559	0.05	20	\$ 37,760	\$ 742,559	0.05
1	Total Expected Benefit	\$ 24,541,406	\$ 12,813,000	1.92		\$ 24,541,406	\$ 12,813,000	1.92

*Notes:

- 1. Safety benefit analyzed using Caltrans HSIP analyzer, and considers full project costs, including set-aside for pedestrian improvements.

Induced Demand Benefit-Cost Summary 20-Year Life Cycle (Segment 1)

Segment	Total Annualized Benefit	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
1	Bicycle Mode Shift Benefit	\$ 758,977	\$ 4,745,583	0.16	20	\$ 15,179,544	\$ 5,934,213	2.56

*Notes:

- 1. Mode Shift to Bike Transportation induced demand benefit calculated using NCHRP 552 methodology.
- 2. 20-year life cycle cost estimated using planning-level cost estimates include 20 year life cycle of Class I Paths and Class II bike lanes.

Safety Benefit-Cost Summary 20-Year Life Cycle (Segment 2)

Segment	Countermeasure	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
2	Roundabout (NS4B)	\$ 4,481,260	\$ 3,079,400	1.46	20	\$ 4,481,260	\$ 3,079,400	1.46
2	Total Expected Benefit	\$ 4,481,260	\$ 3,079,400	1.46		\$ 4,481,260	\$ 3,079,400	1.46

*Notes:

- 1. Safety benefit analyzed using Caltrans HSIP analyzer, and considers full project costs, including set-aside for pedestrian improvements.

Table X Induced Demand Benefit-Cost Summary 20-Year Life Cycle (Segment 2)

Segment	Total Annualized Benefit	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
2	Bicycle Mode Shift Benefit	\$ 758,977	\$ 689,347	1.10	20	\$ 15,179,544	\$ 689,347	22.02

*Notes:

- 1. Mode Shift to Bike Transportation induced demand benefit calculated using NCHRP 552 methodology.
- 2. 20-year life cycle cost estimated using planning-level cost estimates include 20 year life cycle of Class I Paths and Class II bike lanes.

Safety Benefit-Cost Summary 20-Year Life Cycle (Segment 3)

Segment	Countermeasure	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
3	Roundabout (NS4B)	\$ 6,241,275	\$ 4,950,622	1.26	20	\$ 6,241,275	\$ 4,950,622	1.26
3	Intersection Lighting (NS1)	\$ 336,320	\$ 617,178	0.54	20	\$ 336,320	\$ 617,178	0.54
3	Total Expected Benefit	\$ 6,577,595	\$ 5,567,800	1.18		\$ 6,577,595	\$ 5,567,800	1.18

*Notes:

- 1. Safety benefit analyzed using Caltrans HSIP analyzer, and considers full project costs, including set-aside for pedestrian improvements.

Table X Induced Demand Benefit-Cost Summary 20-Year Life Cycle (Segment 3)

Segment	Total Annualized Benefit	2019 Benefit	2019 Cost	B/C	Expected Life (Years)	20 Year Adjusted Benefit	20 Year Adjusted Cost	B/C
3	Bicycle Mode Shift Benefit	\$ 758,977	\$ 1,538,121	0.49	20	\$ 15,179,544	\$ 3,413,631	4.45

*Notes:

- 1. Mode Shift to Bike Transportation induced demand benefit calculated using NCHRP 552 methodology.
- 2. 20-year life cycle cost estimated using planning-level cost estimates include 20 year life cycle of Class I Paths and Class II bike lanes.

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Save this file using the Application ID plus "Calc" as the file name (e.g. "07-Los Angeles-01Calc.pdf").

Project Location: SR 49/ SR 20: Uren Street to N Bloomfield/ East Broad Street
(limited to 250 characters)

Project Description: SR 49 MMCP Segment 1; includes SR 20/ SR49, SR 49/ Coyote St and SR 49/ N
(limited to 250 characters) Bloomfield Street interscetions

2. Application Category (Check one):

Application Categories that require a Benefit Cost Ratio (BCR):

- Common BCR Application Set-aside for High Friction Surface Treatment

Application Categories that do NOT require a Benefit Cost Ratio (BCR):

- Set-aside for Guardrail Upgrades Set-aside for Horizontal Curve Signing
 Set-aside for Pedestrian Crossing Enhancements Set-aside for Tribes

Dual consideration?

- If an Application Category that does not require a BCR is selected above, check this box to indicate your desire that this application will be considered as a Common BCR Application as well in case it does not get selected for funding under the set-aside category. If this box is checked, a benefit cost analysis is required so the project will have a BCR.
-

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- Test if countermeasures (CMs) (up to 3) are eligible for being used in the project benefit calculation. For a CM to be used in the project benefit calculation, the construction cost of the CM must be at least 15% of the project's total construction cost, unless an exception is requested. And
- Determine the project's maximum Federal Reimbursement Ratio (FRR).

I.1 Select up to 3 countermeasures (CMs) to be tested in the Engineer's Estimate:

Number of CMs to be used in this project:

CM No. 1:	NS4B: Convert intersection to roundabout (from stop or yield control on minor road)
CM No. 2:	NSI: Add intersection lighting (NS.I.)
CM No. 3:	R37: Install sidewalk/pathway (to avoid walking along roadway)

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated.

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS4B)	% for CM#2 (NS1)	% for CM#3 (R37)	% for OS*	% for NS**
+ -	1	High Visibility Striping (SR 20/SR 49)	LF	6,260	\$1.25	7,825	0%	%	0%	0%	100
+ -	2	Reconstruct Roadway/ Roadway Widening (SR 49/SR 20)	SQFT	60,200	\$25.00	1,505,000	%	%	%	%	100
+ -	3	Concrete Sidewalk/Path (Includes Curb and Gutter) (SR 49/SR 20)	SQFT	13,702	\$17.00	232,934	%	%	0%	%	100
+ -	4	Pedestrian Activated Rectangular Rapid Flashing Beacon (RRFB) (SR 49/SR 20)	EA	6	\$15000.00	90,000	%	%	%	%	100
+ -	5	Roundabout Intersection (SR 49/SR 20)	LS	1	1,400,000	1,400,000	56%	0%	0%	44%	0
+ -	6	Lighting (SR 49/SR 20)	LS	1	110,000	110,000	0%	43%	%	57%	0
+ -	7	High Visibility Striping (SR 49/Coyote St)	LF	2,845	\$1.25	3,556	%	%	%	%	100
+ -	8	High Visibility Striping with Rumblestrips (SR 49/Coyote St)	LF	883	\$2.25	1,987	%	%	%	%	100
+ -	9	Reconstruct Roadway/Roadway Widening (SR 49/Coyote St)	SQFT	4,994	\$25.00	124,850	%	%	%	%	100
+ -	10	Roundabout Intersection (SR 49/Coyote St)	LS	1	1,900,000	1,900,000	44%	0%	0%	56%	0
+ -	11	Lighting (SR 49/Coyote St)	LS	1	\$88000.00	88,000	0%	57%	0%	43%	0
+ -	12	Retaining Walls (SR 49/Coyote St)	LF	135	\$350.00	47,250	%	%	%	%	100
+ -	13	Decomposed Granite Path (SR 49/Coyote St)	SQFT	13,207	\$8.00	105,656	%	%	100%	%	0
+ -	14	Concrete Sidewalk/ Path (Includes Curb and Gutter)	SQFT	15,349	\$17.00	260,933	%	%	%	%	100

No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS4B)	% for CM#2 (NS1)	% for CM#3 (R37)	% for OS*	% for NS**
	Weighted Average (%)					28%	2%	2%	30%	39%
	Total (\$)				\$5,877,991					

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

50 % \$2,938,996

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$8,817,000

I.3 Summary

3 CM(s) are eligible to be used in the project benefit calculation.

Countermeasure ID	Federal Funding Eligibility (FFE)	Cost %	Eligible to be used in benefit calculation?	Request exception to the 15% rule*
NS4B	100%	27.56%	Yes (\geq 15% cost)	<input type="checkbox"/>
NS1	100%	1.66%	Yes ($<$ 15% cost) (Exception being requested)	<input checked="" type="checkbox"/>
R37	90%	1.80%	Yes ($<$ 15% cost) (Exception being requested)	<input checked="" type="checkbox"/>

*By requesting an exception to the 15% rule, the CM with less than 15% of the construction cost will then be eligible to be used in the benefit calculation. if an exception is requested for any CM(s) above, please provide the reason (low cost treatment with significant safety benefits, etc.):

Lighting is a low cost treatment with significant safety benefits as the collision history shows a number of crashes occurring under dark conditions/ no street lights. Implementation of sidewalk/ path would connect to the roundabouts, reflecting lower cost but high connectivity and safety benefit. Moreover, pedestrian collision history reflects the need to address lack of active transportation infrastructure.

Project's Maximum Federal Reimbursement Ratio = 61.3%

The project's Maximum Federal Reimbursement Ratio is calculated as the least of the FFEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total (%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Federal Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in Question No. 5 in Section II of the HSIP Application Form.

Project's maximum Federal Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

62 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$1,502,500	62 %	\$931,550	\$570,950
PS&E	\$1,766,500	62 %	\$1,095,230	\$671,270
Subtotal - PE	\$3,269,000	62 %	\$2,026,780	\$1,242,220
Right of Way (ROW) Phase				
Right of Way Engineering	\$20,000	62 %	\$12,400	\$7,600
Appraisals, Acquisitions & Utilities	\$0	62 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$20,000	62 %	\$12,400	\$7,600
Construction (CON) Phase				
Construction Engineering (CE)	\$707,000	62 %	\$438,340	\$268,660
Construction Items	\$8,817,000 <small>(Read only - from Section I)</small>	62 %	\$5,466,540	\$3,350,460
Subtotal - Construction	\$9,524,000	62 %	\$5,904,880	\$3,619,120
PROJECT TOTAL	12,813,000	62 %	\$7,944,060	\$4,868,940

Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in Question No 5, Section II in the HSIP Application.

1. The HSIP amount for PE exceeds 25% of the HSIP amount for Construction Items.

Section III. Project Location Groups, Countermeasures and Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the project's safety CMs and historical crash data at the project sites. The data will be used to estimate the project benefit in Section IV.

1. Divide the project locations into groups.

It is quite often that an HSIP project has multiple locations. Theoretically the benefit for every single location may be calculated separately and then sum them up. However, that may be time consuming or almost impossible when there are a lot of locations. It is more efficient that the project locations with exactly the same safety countermeasures are combined into a group. The benefits of the locations in the same group can then be calculated at once.

When only one group is needed:

If your project consists of only one location or multiple locations that have similar features, address similar safety issues and utilize the same countermeasure(s). The crash data of all the locations can be combined and only one group is needed.

When multiple groups are needed:

If your project include multiple locations that have various safety issues and the proposed safety improvements (countermeasures) are not exactly the same for all the locations. The locations must be divided into different groups. The project benefits are then calculated multiple times, once for each location group. The project total benefit is the sum of the benefits from the different groups.

It should be noted that within a group, all locations should be of the same type: Signalized Intersection (S), Non-Signalized Intersection (NS), or Roadway (R).

If necessary, you may explain the location grouping for your project in details in Question No. 3 (Crash Data Evaluation), Section II in the HSIP Application Form.

2. After the number of location groups is entered, one subform will be populated for each location group. For each location group:

1) First, select the applicable CMs. *Note: If a Roundabout CM (S18 or NS4A or NS4B) is selected, additional information is required.*

For each group, only the CMs of the same type as the group location type can be used. For example, if a group consists of 5 signalized intersections, only "Signalized Intersection" CMs may be used for this group.

2) Based on the selected CMs, crash data tables of the required types are displayed for data entry.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the group, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

For more information regarding grouping project locations and examples, please refer to the Manual for HSIP Analyzer.

III.1 List of Project Locations and Location Groups

List all locations/sites included in this project by groups. The locations entered in Table III.1 below will be automatically populated in the crash data tables in III.2.

Based on the criteria described on the last page, the locations/sites need to be divided into 3 groups.

Table III.1 List of Project Locations by Groups

Highlighted fields must be filled in. For each group:

- 1) Must select a Location Type;
- 2) Initially each group has one location line. Click "+"/"-" to add a new line/delete an existing line;
- 3) Enter location description for each line. The same descriptions will be auto-populated in III.2.

*Note: If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc., as long as they have similar features and the safety improvements to be implemented are the same.

	No.	No. in Group	Location Description (Intersection Name or Road Limit or General Description)	
	GROUP 1		Select Location Type:	NS (Non-signalized Intersections)
<input type="checkbox"/>	1	G1-1	Roundabouts	
	GROUP 2		Select Location Type:	NS (Non-signalized Intersections)
<input type="checkbox"/>	2	G2-1	Intersection/ Crosswalk Lighting	
	GROUP 3		Select Location Type:	R (Roadways)
<input type="checkbox"/>	3	G3-1	Sidewalk/ Path	

III.2: Countermeasures and Crash Data

(Repeats for each location group)

Countermeasures and Crash Data -Location Group No. 1 of 3

[Hide Group Details](#)

Step 1: Select countermeasure(s) to be applied to this location group

This group's location type: NS (Non-signalized Intersections)

Please check the CMs for this location group. All the CMs that have passed the test in Section I AND match the location type of this group are listed below.

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS4B: Convert intersection to roundabout (from stop or yield control on minor road)	NS	0.5	20	All	100%
<input type="checkbox"/>	2	NSI: Add intersection lighting (NS.I.)	NS	0.4	20	Night	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Additional information is required:

Since Roundabout is selected, the below additional information is required for calculating Roundabout benefit.

Roundabout Location	Please select:	Rural				
Intersection Type	Please select:	Four-leg Intersection				
Roundabout Lanes	Please select:	1 Lane				
ADT	Major Road:	11,700	Minor Road:	16,200	Total	27,900

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Roundabouts	0	0	1	2	16	19
	Total	0	0	1	2	16	19

III.2: Countermeasures and Crash Data

(Repeats for each location group)

Countermeasures and Crash Data -Location Group No. 2 of 3

[Hide Group Details](#)

Step 1: Select countermeasure(s) to be applied to this location group

This group's location type: NS (Non-signalized Intersections)

Please check the CMs for this location group. All the CMs that have passed the test in Section I AND match the location type of this group are listed below.

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input type="checkbox"/>	1	NS4B: Convert intersection to roundabout (from stop or yield control on minor road)	NS	0.5	20	All	100%
<input checked="" type="checkbox"/>	2	NSI: Add intersection lighting (NS.I.)	NS	0.4	20	Night	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) Night

Crash Data Table for Crash Type: Night-time (Night)

No.	Location (from Table III.1)	Fatal (Night)	Severe Injury (Night)	Other Visible Injury (Night)	Complaint of Pain (Night)	PDO (Night)	Total
1	Intersection/ Crosswalk Lighting	0	0	0	0	7	7
	Total	0	0	0	0	7	7

III.2: Countermeasures and Crash Data

(Repeats for each location group)

Countermeasures and Crash Data -Location Group No. 3 of 3

[Hide Group Details](#)

Step 1: Select countermeasure(s) to be applied to this location group

This group's location type: R (Roadways)

Please check the CMs for this location group. All the CMs that have passed the test in Section I AND match the location type of this group are listed below.

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	R37: Install sidewalk/pathway (to avoid walking along roadway)	R	0.8	20	Ped & Bike	90%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) Ped & Bike

Crash Data Table for Crash Type: Pedestrians and Bicyclists Involved (P&B)

No.	Location (from Table III.1)	Fatal (P&B)	Severe Injury (P&B)	Other Visible Injury (P&B)	Complaint of Pain (P&B)	PDO (P&B)	Total
1	Sidewalk/ Path	0	0	0	0	1	1
	Total	0	0	0	0	1	1

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Project Summary Information:

Project Total Cost: 12813000

3 countermeasures are eligible in benefit calculation. (NS4B NS1 R37)

Project location(s) are divided into 3 group(s) for calculating the benefits.

IV.1 Benefit Summary by location groups

Group No.	Group Info/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit of the group
1	Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS4B) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,1,2,16	\$24,371,486	\$0	\$0	\$24,371,486
2	Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS1) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: Night: 0,0,0,0,7	\$0	\$132,160	\$0	\$132,160
3	Location type: R (Roadways) Number of location(s): 1 Number of selected countermeasure(s): 1 (R37) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: Ped & Bike: 0,0,0,0,1	\$0	\$0	\$37,760	\$37,760
Sum		\$24,371,486	\$132,160	\$37,760	\$24,541,406

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

IV.2. Project Benefit and BCR Summary

No.	Countermeasure Name	Benefit	Cost	Resulting B/C
1	NS4B	24,371,486	11,385,485.216019	2.1
2	NS1	\$132,160	\$684,956	0.2
3	R37	\$37,760	\$742,559	0.1
	Entire Project	24,541,406	12,813,000	1.9

Data to be transferred to the HSIP Application Form

This section is generated automatically once the data entry and calculation have been completed. Transfer the data on this page to Section III of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 3

NS4B: Convert intersection to roundabout (from stop or yield control on minor road)

NSI: Add intersection lighting (NS.I.)

R37: Install sidewalk/pathway (to avoid walking along roadway)

Cost, FRR, Benefit and BCR:

Total Project Cost:	12,813,000
HSIP Funds Requested:	\$7,944,060
Max. Federal Reimbursement Ratio (FRR):	61%
Total Expected Benefit:	24,541,406
Benefit Cost Ratio:	1.92

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Save this file using the Application ID plus "Calc" as the file name (e.g. "07-Los Angeles-01Calc.pdf").

Project Location:
(limited to 250 characters)

SR 49 - Segment 2 (North Bloomfield/East Broad Street to Maidu/Orchard St)

Project Description:
(limited to 250 characters)

SR 49 MMCP

2. Application Category (Check one):

Application Categories that require a Benefit Cost Ratio (BCR):

- Common BCR Application Set-aside for High Friction Surface Treatment

Application Categories that do NOT require a Benefit Cost Ratio (BCR):

- Set-aside for Guardrail Upgrades Set-aside for Horizontal Curve Signing
- Set-aside for Pedestrian Crossing Enhancements Set-aside for Tribes

Dual consideration?

- If an Application Category that does not require a BCR is selected above, check this box to indicate your desire that this application will be considered as a Common BCR Application as well in case it does not get selected for funding under the set-aside category. If this box is checked, a benefit cost analysis is required so the project will have a BCR.
-

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Test if countermeasures (CMs) (up to 3) are eligible for being used in the project benefit calculation. For a CM to be used in the project benefit calculation, the construction cost of the CM must be at least 15% of the project's total construction cost, unless an exception is requested. And
- o Determine the project's maximum Federal Reimbursement Ratio (FRR).

I.1 Select up to 3 countermeasures (CMs) to be tested in the Engineer's Estimate:

Number of CMs to be used in this project:

CM No. 1: NS4B: Convert intersection to roundabout (from stop or yield control on minor road)

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated.

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS4B)	% for OS*	% for NS**
+ -	1	High Visibility Striping	LF	2,450	\$1.25	3,063	0%	100%	0
+ -	2	Reconstruct Roadway/ Roadway Widening	SQFT	4,885	\$25.00	122,125	%	%	100
+ -	3	Concrete Sidewalk/Path (Includes Curb and Gutter)	SQFT	10,825	\$17.00	184,025	%	%	100
+ -	4	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	500	\$4.00	2,000	%	%	100
+ -	5	Roundabout Intersection	LS	1	1,000,000	1,000,000	100%	%	0
+ -	6	Lighting	LS	1	\$99000.00	99,000	%	%	0
		Weighted Average (%)					71%	0%	22%
		Total (\$)				\$1,410,213			

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

(e.g. enter 10 for 10%)

\$705,106

Total Construction Cost (Con Items & Contingencies):

(Rounded up to the nearest hundreds)

\$2,115,400

I.3 Summary

1 CM(s) are eligible to be used in the project benefit calculation.

Countermeasure ID	Federal Funding Eligibility (FFE)	Cost %	Eligible to be used in benefit calculation?	Request exception to the 15% rule*
NS4B	100%	70.91%	Yes (>=15% cost)	<input type="checkbox"/>

*By requesting an exception to the 15% rule, the CM with less than 15% of the construction cost will then be eligible to be used in the benefit calculation. if an exception is requested for any CM(s) above, please provide the reason (low cost treatment with significant safety benefits, etc.):

low cost treatment with significant safety benefits, as collision history of majority of collisions occurring in nighttime conditions without adequate lighting.

Project's Maximum Federal Reimbursement Ratio = 88.1%

The project's Maximum Federal Reimbursement Ratio is calculated as the least of the FFEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. **This is the maximum value allowed to be entered in "HSIP/Total (%)" column in Section II (Project Cost Estimate).**

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Federal Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in Question No. 5 in Section II of the HSIP Application Form.

Project's maximum Federal Reimbursement Ratio (FRR)
(from Section I, rounded up to integer) %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$360,000	89 %	\$320,400	\$39,600
PS&E	\$424,000	89 %	\$377,360	\$46,640
Subtotal - PE	\$784,000	89 %	\$697,760	\$86,240
Right of Way (ROW) Phase				
Right of Way Engineering	\$10,000	89 %	\$8,900	\$1,100
Appraisals, Acquisitions & Utilities	\$0	89 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$10,000	89 %	\$8,900	\$1,100
Construction (CON) Phase				
Construction Engineering (CE)	\$170,000	89 %	\$151,300	\$18,700
Construction Items	\$2,115,400 <small>(Read only - from Section I)</small>	89 %	\$1,882,706	\$232,694
Subtotal - Construction	\$2,285,400	89 %	\$2,034,006	\$251,394
PROJECT TOTAL	\$3,079,400	89 %	\$2,740,666	\$338,734

Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in Question No 5, Section II in the HSIP Application.

1. The HSIP amount for PE exceeds 25% of the HSIP amount for Construction Items.

Section III. Project Location Groups, Countermeasures and Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the project's safety CMs and historical crash data at the project sites. The data will be used to estimate the project benefit in Section IV.

1. Divide the project locations into groups.

It is quite often that an HSIP project has multiple locations. Theoretically the benefit for every single location may be calculated separately and then sum them up. However, that may be time consuming or almost impossible when there are a lot of locations. It is more efficient that the project locations with exactly the same safety countermeasures are combined into a group. The benefits of the locations in the same group can then be calculated at once.

When only one group is needed:

If your project consists of only one location or multiple locations that have similar features, address similar safety issues and utilize the same countermeasure(s). The crash data of all the locations can be combined and only one group is needed.

When multiple groups are needed:

If your project include multiple locations that have various safety issues and the proposed safety improvements (countermeasures) are not exactly the same for all the locations. The locations must be divided into different groups. The project benefits are then calculated multiple times, once for each location group. The project total benefit is the sum of the benefits from the different groups.

It should be noted that within a group, all locations should be of the same type: Signalized Intersection (S), Non-Signalized Intersection (NS), or Roadway (R).

If necessary, you may explain the location grouping for your project in details in Question No. 3 (Crash Data Evaluation), Section II in the HSIP Application Form.

2. After the number of location groups is entered, one subform will be populated for each location group. For each location group:

1) First, select the applicable CMs. *Note: If a Roundabout CM (S18 or NS4A or NS4B) is selected, additional information is required.*

For each group, only the CMs of the same type as the group location type can be used. For example, if a group consists of 5 signalized intersections, only "Signalized Intersection" CMs may be used for this group.

2) Based on the selected CMs, crash data tables of the required types are displayed for data entry.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the group, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

For more information regarding grouping project locations and examples, please refer to the Manual for HSIP Analyzer.

III.1 List of Project Locations and Location Groups

List all locations/sites included in this project by groups. The locations entered in Table III.1 below will be automatically populated in the crash data tables in III.2.

Based on the criteria described on the last page, the locations/sites need to be divided into groups.

Table III.1 List of Project Locations by Groups

Highlighted fields must be filled in. For each group:

- 1) Must select a Location Type;
- 2) Initially each group has one location line. Click "+" / "-" to add a new line/delete an existing line;
- 3) Enter location description for each line. The same descriptions will be auto-populated in III.2.

*Note: If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc., as long as they have similar features and the safety improvements to be implemented are the same.

	No.	No. in Group	Location Description (Intersection Name or Road Limit or General Description)	
GROUP 1			Select Location Type:	NS (Non-signalized Intersections)
+	1	G1-1	Roundabout	
-				

III.2: Countermeasures and Crash Data

(Repeats for each location group)

Countermeasures and Crash Data -Location Group No. 1 of 1

[Hide Group Details](#)

Step 1: Select countermeasure(s) to be applied to this location group

This group's location type: NS (Non-signalized Intersections)

Please check the CMs for this location group. All the CMs that have passed the test in Section I AND match the location type of this group are listed below.

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS4B: Convert intersection to roundabout (from stop or yield control on minor road)	NS	0.5	20	All	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Additional information is required:

Since Roundabout is selected, the below additional information is required for calculating Roundabout benefit.

Roundabout Location	Please select:	Rural				
Intersection Type	Please select:	Four-leg Intersection				
Roundabout Lanes	Please select:	1 Lane				
ADT	Major Road:	7,900	Minor Road:	1,230	Total	9,130

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 4

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Roundabout	1	0	0	0	2	3
	Total	1	0	0	0	2	3

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Project Summary Information:

Project Total Cost: 3079400

1 countermeasures are eligible in benefit calculation. (NS4B)

Project location(s) are divided into 1 group(s) for calculating the benefits.

IV.1 Benefit Summary by location groups

Group No.	Group Info/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit of the group
1	Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS4B) Crash Data Information: Crash data period (years): 4 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 1,0,0,0,2	\$4,481,260	\$0	\$0	\$4,481,260
Sum		\$4,481,260	\$0	\$0	\$4,481,260

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

IV.2. Project Benefit and BCR Summary

No.	Countermeasure Name	Benefit	Cost	Resulting B/C
1	NS4B	\$4,481,260	\$3,079,400	1.5
2		\$0	\$0	0
3		\$0	\$0	0
	Entire Project	\$4,481,260	\$3,079,400	1.5

Data to be transferred to the HSIP Application Form

This section is generated automatically once the data entry and calculation have been completed. Transfer the data on this page to Section III of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 1

NS4B: Convert intersection to roundabout (from stop or yield control on minor road)

Cost, FRR, Benefit and BCR:

Total Project Cost:	\$3,079,400
HSIP Funds Requested:	\$2,740,666
Max. Federal Reimbursement Ratio (FRR):	88%
Total Expected Benefit:	\$4,481,260
Benefit Cost Ratio:	1.46

HSIP ANALYZER

Cost Estimate, Crash Data and Benefit Cost Ratio (BCR) Calculation for Highway Safety Improvement Program (HSIP) Application

Important: Review and follow the step-by-step instructions in "[Manual for HSIP Analyzer](#)". Completing the HSIP Analyzer without referencing to the manual may result in an application with fatal flaws that will be disqualified from the ranking and selection process.

All yellow highlighted fields must be filled in. The gray fields are calculated and read-only. This is a dynamic form (later steps vary depending on the data entered in earlier steps). If any error messages in red appear, fix the errors prior to proceeding to the next steps.

1. Application ID, Project Location and Project Description (copy from the HSIP Application Form):

Application ID:

Save this file using the Application ID plus "Calc" as the file name (e.g. "07-Los Angeles-01Calc.pdf").

Project Location: SR 49 - Segment 3 (Cement Hill Rd/ W broad St to Juvenile Hall Driveway)
(limited to 250 characters)

Project Description: SR 49 MMCP
(limited to 250 characters)

2. Application Category (Check one):

Application Categories that require a Benefit Cost Ratio (BCR):

- Common BCR Application Set-aside for High Friction Surface Treatment

Application Categories that do NOT require a Benefit Cost Ratio (BCR):

- Set-aside for Guardrail Upgrades Set-aside for Horizontal Curve Signing
 Set-aside for Pedestrian Crossing Enhancements Set-aside for Tribes

Dual consideration?

- If an Application Category that does not require a BCR is selected above, check this box to indicate your desire that this application will be considered as a Common BCR Application as well in case it does not get selected for funding under the set-aside category. If this box is checked, a benefit cost analysis is required so the project will have a BCR.
-

A safety benefit cost analysis is required for this application. This tool will guide through cost estimate, safety benefit evaluation and Benefit Cost Ratio (BCR) calculation.

Section I. Construction Cost Estimate and Cost Breakdown

The purpose of this section is to:

- o Provide detailed engineer's estimate (for construction items only). The costs for other phases (PE, ROW, and CE) will be included in Section II.
- o Test if countermeasures (CMs) (up to 3) are eligible for being used in the project benefit calculation. For a CM to be used in the project benefit calculation, the construction cost of the CM must be at least 15% of the project's total construction cost, unless an exception is requested. And
- o Determine the project's maximum Federal Reimbursement Ratio (FRR).

I.1 Select up to 3 countermeasures (CMs) to be tested in the Engineer's Estimate:

Number of CMs to be used in this project:

CM No. 1: NS4B: Convert intersection to roundabout (from stop or yield control on minor road)

CM No. 2: NS1: Add intersection lighting (NS.I.)

I.2 Detailed Engineer's Estimate for Construction Items:

Cost breakdown by CMs. For each item, enter a cost percentage for each of the CMs and "Other Safety-Related" (OS) components. (e.g. enter 10 for 10%). The cost % for "Non-Safety-Related" (NS) components is calculated.

	No.	Item Description	Unit	Quantity	Unit Cost	Total	% for CM#1 (NS4B)	% for CM#2 (NS1)	% for OS*	% for NS**
+ -	1	High Visibility Striping with Rumble Strips	LF	1,171	\$2.25	2,635	%	%	100%	0
+ -	2	High Visibility Striping	LF	4,674	\$1.25	5,843	%	%	%	100
+ -	3	Resurface Roadway	SQFT	13,660	\$10.00	136,600	%	%	0%	100
+ -	4	Reconstruct Roadway/ Roadway Widening	SQFT	9,915	\$25.00	247,875	%	%	%	100
+ -	5	Concrete Sidewalk/ Path (Includes Curb and Gutter)	SQFT	17,233	\$17.00	292,961	%	%	100%	0
+ -	6	Decomposed Granite Path	SQFT	20,839	\$8.00	166,712	%	%	100%	0
+ -	7	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	600	\$4.00	2,400	%	%	100%	0
+ -	8	Speed Feedback Sign	EA	1	\$12500.00	12,500	%	%	100%	0
+ -	9	Roundabout Intersection	LS	1	1,500,000	1,500,000	100%	0%	0%	0
+ -	10	Lighting	LS	1	187,000	187,000	%	100%	%	0
		Weighted Average (%)					59%	7%	19%	15%
		Total (\$)				\$2,554,525				

* % for OS: Cost % for Other Safety-Related components;

** % for NS: Cost % for Non Safety-Related components.

Contingencies, as % of the above "Total" of the construction items:

Total Construction Cost (Con Items & Contingencies):

I.3 Summary

2 CM(s) are eligible to be used in the project benefit calculation.

Countermeasure ID	Federal Funding Eligibility (FFE)	Cost %	Eligible to be used in benefit calculation?	Request exception to the 15% rule*
NS4B	100%	58.72%	Yes (>=15% cost)	<input type="checkbox"/>
NS1	100%	7.32%	Yes (<15% cost) (Exception being requested)	<input checked="" type="checkbox"/>

*By requesting an exception to the 15% rule, the CM with less than 15% of the construction cost will then be eligible to be used in the benefit calculation. If an exception is requested for any CM(s) above, please provide the reason (low cost treatment with significant safety benefits, etc.):

low cost treatment with significant benefit considering night crashes and lack of lighting throughout the segment area.

Project's Maximum Federal Reimbursement Ratio = 94.7%

The project's Maximum Federal Reimbursement Ratio is calculated as the least of the FFEs of the above countermeasures, minus the percentage of the non-safety related costs in excess of 10%. This is the maximum value allowed to be entered in "HSIP/Total (%)" column in Section II (Project Cost Estimate).

Section II. Project Cost Estimate

All project costs, for all phases and by all funding sources, must be accounted for on this form.

- i. **"Total Cost"**: Round all costs up to the nearest hundred dollars.
- ii. **"HSIP/Total (%)"**: The maximum allowed is the project's Federal Reimbursement Ratio (FRR) as determined in Section I. Click the button to assign the maximum to all, OR enter if not the maximum.
- iii. **"HSIP Funds"** and **"Local/Other Funds"** are calculated.

Pay attention to the interactive warning/error messages below the table. The messages, if any, must be fixed, or exceptions should be justified in Question No. 5 in Section II of the HSIP Application Form.

Project's maximum Federal Reimbursement Ratio (FRR)
(from Section I, rounded up to integer)

95 %

To set all "HSIP/Total (%)" in the below table
to the above maximum FRR, click "Set":

Set

Description	Total Cost	HSIP/Total (%)	HSIP Funds	Local/Other Funds
Preliminary Engineering (PE) Phase				
Environmental	\$652,000	95 %	\$619,400	\$32,600
PS&E	\$767,000	95 %	\$728,650	\$38,350
Subtotal - PE	\$1,419,000	95 %	\$1,348,050	\$70,950
Right of Way (ROW) Phase				
Right of Way Engineering	\$10,000	95 %	\$9,500	\$500
Appraisals, Acquisitions & Utilities	\$0	95 %	\$0	\$0
Subtotal - Right of Way (ROW)	\$10,000	95 %	\$9,500	\$500
Construction (CON) Phase				
Construction Engineering (CE)	\$307,000	95 %	\$291,650	\$15,350
Construction Items	\$3,831,800 <small>(Read only - from Section I)</small>	95 %	\$3,640,210	\$191,590
Subtotal - Construction	\$4,138,800	95 %	\$3,931,860	\$206,940
PROJECT TOTAL	\$5,567,800	95 %	\$5,289,410	\$278,390

Agency does NOT request HSIP funds for PE Phase (automatically checked if PE - HSIP funds is \$0).

Interactive Warning/Error Messages:

If there are any messages in the below box, please fix OR explain justification for exceptions in Question No 5, Section II in the HSIP Application.

1. The HSIP amount for PE exceeds 25% of the HSIP amount for Construction Items.

Section III. Project Location Groups, Countermeasures and Crash Data

The benefit of an HSIP safety project is achieved by reducing potential future crashes due to the application of the safety countermeasures (CMs). In this section, you will need to provide information regarding the project's safety CMs and historical crash data at the project sites. The data will be used to estimate the project benefit in Section IV.

1. Divide the project locations into groups.

It is quite often that an HSIP project has multiple locations. Theoretically the benefit for every single location may be calculated separately and then sum them up. However, that may be time consuming or almost impossible when there are a lot of locations. It is more efficient that the project locations with exactly the same safety countermeasures are combined into a group. The benefits of the locations in the same group can then be calculated at once.

When only one group is needed:

If your project consists of only one location or multiple locations that have similar features, address similar safety issues and utilize the same countermeasure(s). The crash data of all the locations can be combined and only one group is needed.

When multiple groups are needed:

If your project include multiple locations that have various safety issues and the proposed safety improvements (countermeasures) are not exactly the same for all the locations. The locations must be divided into different groups. The project benefits are then calculated multiple times, once for each location group. The project total benefit is the sum of the benefits from the different groups.

It should be noted that within a group, all locations should be of the same type: Signalized Intersection (S), Non-Signalized Intersection (NS), or Roadway (R).

If necessary, you may explain the location grouping for your project in details in Question No. 3 (Crash Data Evaluation), Section II in the HSIP Application Form.

2. After the number of location groups is entered, one subform will be populated for each location group. For each location group:

1) First, select the applicable CMs. *Note: If a Roundabout CM (S18 or NS4A or NS4B) is selected, additional information is required.*

For each group, only the CMs of the same type as the group location type can be used. For example, if a group consists of 5 signalized intersections, only "Signalized Intersection" CMs may be used for this group.

2) Based on the selected CMs, crash data tables of the required types are displayed for data entry.

Different CMs will reduce crashes of different types during the life of the safety improvements. Depending on the selected CMs for the group, you will be required to fill in one or more crash data tables, for any combination of the five crash types (datasets): "All" , "Night" , Ped & Bike" , "Emergency Vehicle" , and "Animal" (Each of the later four datasets is a sub-dataset of the "All" dataset.)

For more information regarding grouping project locations and examples, please refer to the Manual for HSIP Analyzer.

III.1 List of Project Locations and Location Groups

List all locations/sites included in this project by groups. The locations entered in Table III.1 below will be automatically populated in the crash data tables in III.2.

Based on the criteria described on the last page, the locations/sites need to be divided into 2 groups.

Table III.1 List of Project Locations by Groups

Highlighted fields must be filled in. For each group:

- 1) Must select a Location Type;
- 2) Initially each group has one location line. Click "+"/"-" to add a new line/delete an existing line;
- 3) Enter location description for each line. The same descriptions will be auto-populated in III.2.

*Note: If your project has a large number of locations, please aggregate some locations into one description, e.g. 10 stop controlled intersections, 5 horizontal curves, etc., as long as they have similar features and the safety improvements to be implemented are the same.

	No.	No. in Group	Location Description (Intersection Name or Road Limit or General Description)	
GROUP 1			Select Location Type:	NS (Non-signalized Intersections)
+	1	G1-1	Roundabout	
-				
GROUP 2			Select Location Type:	NS (Non-signalized Intersections)
+	2	G2-1	Intersection Lighting	
-				

III.2: Countermeasures and Crash Data

(Repeats for each location group)

Countermeasures and Crash Data -Location Group No. 1 of 2

[Hide Group Details](#)

Step 1: Select countermeasure(s) to be applied to this location group

This group's location type: NS (Non-signalized Intersections)

Please check the CMs for this location group. All the CMs that have passed the test in Section I AND match the location type of this group are listed below.

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input checked="" type="checkbox"/>	1	NS4B: Convert intersection to roundabout (from stop or yield control on minor road)	NS	0.5	20	All	100%
<input type="checkbox"/>	2	NSI: Add intersection lighting (NS.I.)	NS	0.4	20	Night	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Additional information is required:

Since Roundabout is selected, the below additional information is required for calculating Roundabout benefit.

Roundabout Location	Please select:	Rural				
Intersection Type	Please select:	Four-leg Intersection				
Roundabout Lanes	Please select:	1 Lane				
ADT	Major Road:	6,980	Minor Road:	2,260	Total	9,240

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) All

Crash Data Table for Crash Type: ALL

No.	Location (from Table III.1)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	Roundabout	0	0	1	3	1	5
	Total	0	0	1	3	1	5

III.2: Countermeasures and Crash Data

(Repeats for each location group)

Countermeasures and Crash Data -Location Group No. 2 of 2

[Hide Group Details](#)

Step 1: Select countermeasure(s) to be applied to this location group

This group's location type: NS (Non-signalized Intersections)

Please check the CMs for this location group. All the CMs that have passed the test in Section I AND match the location type of this group are listed below.

	No.	Countermeasure (CM) Name	CM Type*	Crash Reduction Factor (CRF)	Expected Life (Years)	Crash Type	Federal Funding Eligibility
<input type="checkbox"/>	1	NS4B: Convert intersection to roundabout (from stop or yield control on minor road)	NS	0.5	20	All	100%
<input checked="" type="checkbox"/>	2	NSI: Add intersection lighting (NS.I.)	NS	0.4	20	Night	100%
*CM Type: S-Signalized Intersection; NS-Non-Signalized Intersection; R-Roadway.							

Step 2: Provide crash data.

2.1 Crash Data Period: must be between 3 and 5 years.

from (MM/DD/YYYY): To (MM/DD/YYYY): Crash Data Period (years) = 5

2.2 Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 1.

Based on the countermeasures selected in Step 1, the crash data types to be provided are:

(1) Night

Crash Data Table for Crash Type: Night-time (Night)

No.	Location (from Table III.1)	Fatal (Night)	Severe Injury (Night)	Other Visible Injury (Night)	Complaint of Pain (Night)	PDO (Night)	Total
1	Intersection Lighting	0	0	1	1	1	3
	Total	0	0	1	1	1	3

Section IV. Calculation and Results

Click the "Calculate" button to calculate. The script will first check if there are any errors or inconsistencies in the countermeasure selections and crash data. If errors are detected and displayed below, the errors must be fixed first before you click the "Calculate" button again. If no errors are displayed, the calculation results are provided in this section. Please refer to the Manual for HSIP Analyzer for details regarding possible errors.

Calculate

Project Summary Information:

Project Total Cost: 5567800

2 countermeasures are eligible in benefit calculation. (NS4B NSI)

Project location(s) are divided into 2 group(s) for calculating the benefits.

IV.1 Benefit Summary by location groups

Group No.	Group Info/Data*	Benefit from CM #1	Benefit from CM #2	Benefit from CM #3	Total Benefit of the group
1	Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NS4B) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: All: 0,0,1,3,1	\$6,241,275	\$0	\$0	\$6,241,275
2	Location type: NS (Non-signalized Intersections) Number of location(s): 1 Number of selected countermeasure(s): 1 (NSI) Crash Data Information: Crash data period (years): 5 Number of crashes(F/SI/OVI/I-CP/PDO)*: Night: 0,0,1,1,1	\$0	\$336,320	\$0	\$336,320
Sum		\$6,241,275	\$336,320	\$0	\$6,577,595

*Number of crashes: five crash numbers are for Fatal (F), Severe Injury (SI), Other Visible Injury (OVI), Injury - Complaint of Pain (I-CP), and Property Damage Only (PDO), respectively.

IV.2. Project Benefit and BCR Summary

No.	Countermeasure Name	Benefit	Cost	Resulting B/C
1	NS4B	\$6,241,275	\$4,950,622	1.3
2	NSI	\$336,320	\$617,178	0.5
3		\$0	\$0	0
	Entire Project	\$6,577,595	\$5,567,800	1.2

Data to be transferred to the HSIP Application Form

This section is generated automatically once the data entry and calculation have been completed. Transfer the data on this page to Section III of the HSIP Application Form.

Safety Countermeasure Information

Number of countermeasures: 2

NS4B: Convert intersection to roundabout (from stop or yield control on minor road)

NSI: Add intersection lighting (NS.I.)

Cost, FRR, Benefit and BCR:

Total Project Cost:	\$5,567,800
HSIP Funds Requested:	\$5,289,410
Max. Federal Reimbursement Ratio (FRR):	95%
Total Expected Benefit:	\$6,577,595
Benefit Cost Ratio:	1.18



Appendix E: Planning Level Cost and Operations and Maintenance Estimates

State Route 49 Multimodal Corridor Study
 Opinion of Probable Construction Cost
Project Cost - Overall (Ultimate Improvements Only)

Item #	Item Description	Unit	Quantity	Unit Cost	Total
1	High Visibility Striping	LF	16,229	\$ 1.25	\$ 20,286
2	High Visibility Striping with Rumblestrips	LF	2,054	\$ 2.25	\$ 4,622
3	Resurface Roadway	SQFT	13,660	\$ 10	\$ 136,600
4	Reconstruct Roadway/Roadway Widening	SQFT	79,994	\$ 25	\$ 1,999,850
5	Retaining Walls	LF	135	\$ 350	\$ 47,250
6	Concrete Sidewalk/Path (Includes Curb and Gutter)	SQFT	57,109	\$ 17	\$ 970,853
7	Decomposed Granite Path	SQFT	34,046	\$ 8	\$ 272,368
8	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	2,720	\$ 4	\$ 10,880
9	Pedestrian Activated Rectangular Rapid Flashing Beacon (RRFB)	EA	6	\$ 15,000	\$ 90,000
10	Speed Feedback Sign	EA	1	\$ 12,500	\$ 12,500
11	Roundabout Intersection	LS	1	\$ 5,800,000	\$ 5,800,000
12	Lighting	LS	1	\$ 484,000	\$ 484,000
13	Contingency/Miscellaneous Items (50%)	LS	1	\$ 4,924,700	\$ 4,924,700

Rounded Total (Construction Cost) \$ 14,774,000

Project Administration (5%)	\$ 739,000
Preliminary Alternatives / Environmental Document (12%)	\$ 1,773,000
Plans, Specifications, and Estimate Design Cost (15%)	\$ 2,217,000
Right of Way	\$ 40,000
Construction Support (8%)	\$ 1,182,000
Total Project Cost	\$ 20,725,000



State Route 49 Multimodal Corridor Study
 Opinion of Probable Construction Cost
Project Cost - SR 49 & SR 20 Ultimate Improvements

Item #	Item Description	Unit	Quantity	Unit Cost	Total
1	High Visibility Striping	LF	6,260	\$ 1.25	\$ 7,825
2	High Visibility Striping with Rumblestrips	LF	0	\$ -	\$ -
3	Resurface Roadway	SQFT	0	\$ -	\$ -
4	Reconstruct Roadway/Roadway Widening	SQFT	60,200	\$ 25	\$ 1,505,000
5	Retaining Walls	LF	0	\$ -	\$ -
6	Concrete Sidewalk/Path (Includes Curb and Gutter)	SQFT	13,702	\$ 17	\$ 232,934
7	Decomposed Granite Path	SQFT	0	\$ -	\$ -
8	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	0	\$ -	\$ -
9	Pedestrian Activated Rectangular Rapid Flashing Beacon (RRFB)	EA	6	\$ 15,000	\$ 90,000
10	Speed Feedback Sign	EA	0	\$ -	\$ -
11	Roundabout Intersection	LS	1	\$ 1,400,000	\$ 1,400,000
12	Lighting	LS	1	\$ 110,000	\$ 110,000
13	Contingency/Miscellaneous Items (50%)	LS	1	\$ 1,672,900	\$ 1,672,900
Rounded Total (Construction Cost)					\$ 5,019,000

Project Administration, County and Caltrans Involvement (10%)	\$ 502,000
Preliminary Alternatives / Environmental Document (12%)	\$ 603,000
Plans, Specifications, and Estimate Design Cost (15%)	\$ 753,000
Right of Way	\$ 10,000
Construction Support (8%)	\$ 402,000
Total Intersection Cost	\$ 7,289,000

State Route 49 Multimodal Corridor Study
 Opinion of Probable Construction Cost
Project Cost - SR 49 & Coyote Street Ultimate Improvements

Item #	Item Description	Unit	Quantity	Unit Cost	Total
1	High Visibility Striping	LF	2,845	\$ 1.25	\$ 3,556
2	High Visibility Striping with Rumblestrips	LF	883	\$ 2.25	\$ 1,987
3	Resurface Roadway	SQFT	0	\$ -	\$ -
4	Reconstruct Roadway/Roadway Widening	SQFT	4,994	\$ 25	\$ 124,850
5	Retaining Walls	LF	135	\$ 350	\$ 47,250
6	Concrete Sidewalk/Path (Includes Curb and Gutter)	SQFT	15,349	\$ 17	\$ 260,933
7	Decomposed Granite Path	SQFT	13,207	\$ 8	\$ 105,656
8	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	1,620	\$ 4	\$ 6,480
9	Pedestrian Activated Rectangular Rapid Flashing Beacon (RRFB)	EA	0	\$ -	\$ -
10	Speed Feedback Sign	EA	0	\$ -	\$ -
11	Roundabout Intersection	LS	1	\$ 1,900,000	\$ 1,900,000
12	Lighting	LS	1	\$ 88,000	\$ 88,000
13	Contingency/Miscellaneous Items (50%)	LS	1	\$ 1,269,400	\$ 1,269,400
Rounded Total (Construction Cost)					\$ 3,809,000

Project Administration, County and Caltrans Involvement (10%)	\$ 381,000
Preliminary Alternatives / Environmental Document (12%)	\$ 458,000
Plans, Specifications, and Estimate Design Cost (15%)	\$ 572,000
Right of Way	\$ 10,000
Construction Support (8%)	\$ 305,000
Total Intersection Cost	\$ 5,535,000

State Route 49 Multimodal Corridor Study
 Opinion of Probable Construction Cost
Project Cost - SR 49 & Coyote Street Low Cost Improvements

Item #	Item Description	Unit	Quantity	Unit Cost	Total
1	High Visibility Striping	LF	3,239	\$ 1.25	\$ 4,049
2	High Visibility Striping with Rumblestrips	LF	1,277	\$ 2.25	\$ 2,873
3	Resurface Roadway	SQFT	0	\$ -	\$ -
4	Reconstruct Roadway/Roadway Widening	SQFT	931	\$ 25	\$ 23,275
5	Retaining Walls	LF	0	\$ -	\$ -
6	Concrete Sidewalk/Path (Includes Curb and Gutter)	SQFT	872	\$ 17	\$ 14,824
7	Decomposed Granite Path	SQFT	19,493	\$ 8	\$ 155,944
8	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	2,380	\$ 4	\$ 9,520
9	Pedestrian Activated Rectangular Rapid Flashing Beacon (RRFB)	EA	3	\$ 15,000	\$ 45,000
10	Speed Feedback Sign	EA	0	\$ -	\$ -
11	Roundabout Intersection	LS	0	\$ -	\$ -
12	Lighting	LS	1	\$ 44,000	\$ 44,000
13	Contingency/Miscellaneous Items (50%)	LS	1	\$ 149,800	\$ 149,800
Rounded Total (Construction Cost)					\$ 450,000

Project Administration, County and Caltrans Involvement (10%)	\$ 45,000
Preliminary Alternatives / Environmental Document (12%)	\$ 54,000
Plans, Specifications, and Estimate Design Cost (15%)	\$ 68,000
Right of Way	\$ 10,000
Construction Support (8%)	\$ 36,000
Total Intersection Cost	\$ 663,000

State Route 49 Multimodal Corridor Study
 Opinion of Probable Construction Cost
Project Cost - SR 49 & Maidu Avenue Ultimate Improvements

Item #	Item Description	Unit	Quantity	Unit Cost	Total
1	High Visibility Striping	LF	2,450	\$ 1.25	\$ 3,063
2	High Visibility Striping with Rumblestrips	LF	0	\$ -	\$ -
3	Resurface Roadway	SQFT	0	\$ -	\$ -
4	Reconstruct Roadway/Roadway Widening	SQFT	4,885	\$ 25	\$ 122,125
5	Retaining Walls	LF	0	\$ -	\$ -
6	Concrete Sidewalk/Path (Includes Curb and Gutter)	SQFT	10,825	\$ 17	\$ 184,025
7	Decomposed Granite Path	SQFT	0	\$ -	\$ -
8	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	500	\$ 4	\$ 2,000
9	Pedestrian Activated Rectangular Rapid Flashing Beacon (RRFB)	EA	0	\$ -	\$ -
10	Speed Feedback Sign	EA	0	\$ -	\$ -
11	Roundabout Intersection	LS	1	\$ 1,000,000	\$ 1,000,000
12	Lighting	LS	1	\$ 99,000	\$ 99,000
13	Contingency/Miscellaneous Items (50%)	LS	1	\$ 705,200	\$ 705,200
Rounded Total (Construction Cost)					\$ 2,116,000

Project Administration, County and Caltrans Involvement (10%)	\$ 212,000
Preliminary Alternatives / Environmental Document (12%)	\$ 254,000
Plans, Specifications, and Estimate Design Cost (15%)	\$ 318,000
Right of Way	\$ 10,000
Construction Support (8%)	\$ 170,000
Total Intersection Cost	\$ 3,080,000

State Route 49 Multimodal Corridor Study
 Opinion of Probable Construction Cost
Project Cost - SR 49 & Cement Hill Road Ultimate Improvements

Item #	Item Description	Unit	Quantity	Unit Cost	Total
1	High Visibility Striping	LF	4,674	\$ 1.25	\$ 5,843
2	High Visibility Striping with Rumblestrips	LF	1,171	\$ 2.25	\$ 2,635
3	Resurface Roadway	SQFT	13,660	\$ 10	\$ 136,600
4	Reconstruct Roadway/Roadway Widening	SQFT	9,915	\$ 25	\$ 247,875
5	Retaining Walls	LF	0	\$ -	\$ -
6	Concrete Sidewalk/Path (Includes Curb and Gutter)	SQFT	17,233	\$ 17	\$ 292,961
7	Decomposed Granite Path	SQFT	20,839	\$ 8	\$ 166,712
8	Pedestrian Crosswalk (High Visibility Markings Only)	SQFT	600	\$ 4	\$ 2,400
9	Pedestrian Activated Rectangular Rapid Flashing Beacon (RRFB)	EA	0	\$ -	\$ -
10	Speed Feedback Sign	EA	1	\$ 12,500	\$ 12,500
11	Roundabout Intersection	LS	1	\$ 1,500,000	\$ 1,500,000
12	Lighting	LS	1	\$ 187,000	\$ 187,000
13	Contingency/Miscellaneous Items (50%)	LS	1	\$ 1,277,300	\$ 1,277,300
Rounded Total (Construction Cost)					\$ 3,832,000

Project Administration, County and Caltrans Involvement (10%)	\$ 384,000
Preliminary Alternatives / Environmental Document (12%)	\$ 460,000
Plans, Specifications, and Estimate Design Cost (15%)	\$ 575,000
Right of Way	\$ 10,000
Construction Support (8%)	\$ 307,000
Total Intersection Cost	\$ 5,568,000

O&M Costs (Study Area)

Improvements	Unit (SQSF)	Unit Cost	O& M Cost over 20 years
Class II Bike Lane	included in regular road maintenance costs		
Decomposed Granite Path	34,046	\$ 4.50	\$ 3,064,140
Total Cost			\$ 3,064,140

O&M Costs (Segment 1)

Improvements	Unit (SQSF)	Unit Cost	O& M Cost over 20 years
Class II Bike Lane	included in regular road maintenance costs		
Decomposed Granite Path	13,207	\$ 4.50	\$ 1,188,630
Total Cost			\$ 1,188,630

O&M Costs (Segment 2)

Improvements	Unit (SQSF)	Unit Cost	O& M Cost over 20 years
Class II Bike Lane	included in regular road maintenance costs		
Decomposed Granite Path	0	\$ 4.50	\$ -
Total Cost			\$ -

O&M Costs (Segment 3)

Improvements	Unit (SQSF)	Unit Cost	O& M Cost over 20 years
Class II Bike Lane	included in regular road maintenance costs		
Decomposed Granite Path	20,839	\$ 4.50	\$ 1,875,510
Total Cost			\$ 1,875,510



Appendix F: Delay and Emissions Benefits Analysis

Fill in Orange Cells.

Delay Entry

Enter average vehicle occupancy. This is used to convert vehicle delay to person delay.

Vehicle Occupancy From Caltrans Life-Cycle Benefit-Cost Analysis - Economic Parameters 2016

Enter the duration in hours of each time period of the day. If delay data is not available for a time period, enter a duration of 0

	Weekday
AM	1
PM	1
Midday	
Off-Peak1	
Off-Peak2	
Total	2

	Weekend
AM	
PM	
Midday	
Off-Peak1	
Off-Peak2	
Total	0

This could be used for...
This could be used for...

Total for weekday and weekend should equal 24 for analysis of all hours of the week, or should equal less than 24 for analysis of certain time periods only. Full day analysis for weekdays and weekends is recommended if sufficient data is available.

Enter the hourly volume (total entering vehicles) for each time period of the day. This is used to convert average delay per vehicle to person delay. If analysis of certain time periods is not desired, leave cells for that time period blank

	Weekday	
	Existing Year	Design Year
AM	1747	2096.4
PM	1983	2379.6
Midday		
Off-Peak1		
Off-Peak2		
ADT	Requires 24	hour data

	Weekend	
	Opening Year	Design Year
AM		
PM		
Midday		
Off-Peak1		
Off-Peak2		
ADT	Requires 24	hour data

Orange cells in tables below can be left blank if consideration of time period is not desired.
 For example, if it is desired to only analyze peak hours, delay entries for midday and off-peak may be left blank.
 Enter the delay from SIDRA outputs.

Weekday

No Build Alternative (from SIDRA)

	AM	PM	Midday	Off-Peak1	Off-Peak2
	Delay	Delay	Delay	Delay	Delay
	sec/veh	sec/veh	sec/veh	sec/veh	sec/veh
2019	151.8	560.0			
2039	613.0	2363.0			

Roundabout Alternative

	AM	PM	Midday	Off-Peak1	Off-Peak2
	Delay	Delay	Delay	Delay	Delay
	sec/veh	sec/veh	sec/veh	sec/veh	sec/veh
2019	13	18			
2039	24	42			

These cells calculate average weekday peak hour totals. No data entry here.

Requires 24

No Build Alternative

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	687,837	791,013
2045	2,878,370	3,310,126

Average

Roundabout Alternative

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	29,203	33,583
2045	75,128	86,398

Signal Alternative

Average Week Day Peak Hour Totals		
-----------------------------------	--	--

	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	12,267	14,107
2045	70,854	81,483

QUANTITIES													
Intersection Performance-Annual Values (From SIDRA Intersection Summary Reports)													
	Travel Time (pers-hr)			Fuel (gal/yr)			Carbon Monoxide (kg/yr)			Nitrogen Oxide (kg/yr)			
	No Build	Signal	Roundabout	No Build	Signal	Roundabout	No Build	Signal	Roundabout	No Build	Signal	Roundabout	
		Alternative	Alternative		Alternative	Alternative		Alternative	Alternative		Alternative	Alternative	
2018	57,129	1,019	2,425	25,747	14,717	27,318	260	172	275	581	216	638	
2039	239,065	5,885	6,240	42,429	34,179	37,556	418	353	366	853	547	858	
							0.29	0.19	0.30	0.64	0.24	0.70	
							Convert to tons/yr	0.46	0.39	0.40	0.94	0.60	0.95

	Travel Time (pers-hr)			Fuel (gal/yr)			Carbon Monoxide (ton/yr)			Nitrogen Oxide (kg/yr)			
	No Build	Signal Alternative	Roundabout Alternative	No Build	Signal Alternative	Roundabout Alternative	No Build	Signal Alternative	Roundabout Alternative	No Build	Signal Alternative	Roundabout Alternative	
Year 0	2018	57129	1019	2425	25747	14717.00	27318.00	0.29	0.19	0.30	0.64	0.24	0.70
Year 1	2019	65792	1251	2607	26541.38	15643.76	27805.52	0.29	0.20	0.31	0.65	0.26	0.71
Year 2	2020	74456	1482	2789	27335.76	16570.52	28293.05	0.30	0.21	0.31	0.67	0.27	0.73
Year 3	2021	83120	1714	2970	28130.14	17497.29	28780.57	0.31	0.22	0.32	0.68	0.29	0.74
Year 4	2022	91783	1946	3152	28924.52	18424.05	29268.10	0.32	0.23	0.32	0.70	0.31	0.75
Year 5	2023	100447	2177	3334	29718.90	19350.81	29755.62	0.33	0.24	0.33	0.71	0.32	0.76
Year 6	2024	109110	2409	3515	30513.29	20277.57	30243.14	0.34	0.25	0.33	0.73	0.34	0.77
Year 7	2025	117774	2641	3697	31307.67	21204.33	30730.67	0.34	0.26	0.34	0.74	0.36	0.78
Year 8	2026	126438	2873	3879	32102.05	22131.10	31218.19	0.35	0.27	0.34	0.75	0.38	0.80
Year 9	2027	135101	3104	4060	32896.43	23057.86	31705.71	0.36	0.28	0.35	0.77	0.39	0.81
Year 10	2028	143765	3336	4242	33690.81	23984.62	32193.24	0.37	0.28	0.35	0.78	0.41	0.82
Year 11	2029	152428	3568	4423	34485.19	24911.38	32680.76	0.38	0.29	0.36	0.80	0.43	0.83
Year 12	2030	161092	3799	4605	35279.57	25838.14	33168.29	0.39	0.30	0.36	0.81	0.45	0.84
Year 13	2031	169756	4031	4787	36073.95	26764.90	33655.81	0.39	0.31	0.37	0.83	0.46	0.85
Year 14	2032	178419	4263	4968	36868.33	27691.67	34143.33	0.40	0.32	0.37	0.84	0.48	0.86
Year 15	2033	187083	4495	5150	37662.71	28618.43	34630.86	0.41	0.33	0.37	0.85	0.50	0.88
Year 16	2034	195747	4726	5332	38457.10	29545.19	35118.38	0.42	0.34	0.38	0.87	0.52	0.89
Year 17	2035	204410	4958	5513	39251.48	30471.95	35605.90	0.43	0.35	0.38	0.88	0.53	0.90
Year 18	2036	213074	5190	5695	40045.86	31398.71	36093.43	0.44	0.36	0.39	0.90	0.55	0.91
Year 19	2037	221737	5421	5877	40840.24	32325.48	36580.95	0.44	0.37	0.39	0.91	0.57	0.92
Year 20	2038	230401	5653	6058	41634.62	33252.24	37068.48	0.45	0.38	0.40	0.93	0.59	0.93
Year 21	2039	239065	5885	6240	42429.00	34179.00	37556.00	0.46	0.39	0.40	0.94	0.60	0.95
Year 22	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 23	1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 24	2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 25	3	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 26	4	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 27	5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 28	6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 29	7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 30	8	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 31	9	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 32	10	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 33	11	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 34	12	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 35	13	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 36	14	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 37	15	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 38	16	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 39	17	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 40	18	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 41	19	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 42	20	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 43	21	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 44	22	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 45	23	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 46	24	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 47	25	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 48	26	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year 49	27	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		3258127	75940	95318	749936.00	537856.00	713614.00	8.22	6.37	7.77	17.39	9.25	18.14
Average		148097	3452	4333	34088.00	24448.00	32437.00	0.37	0.29	0.35	0.79	0.42	0.82

0 1.00000
1 0.96154
2 0.92456
3 0.88900
4 0.85480
5 0.82193
6 0.79031
7 0.75992
8 0.73069
9 0.70259
10 0.67556
11 0.64958
12 0.62460
13 0.60057
14 0.57748
15 0.55526
16 0.53391
17 0.51337
18 0.49363
19 0.47464
20 0.45639
21 0.43883
22 0.42196
23 0.40573
24 0.39012
25 0.37512
26 0.36069
27 0.34682
28 0.33348
29 0.32065
30 0.30832
31 0.29646
32 0.28506
33 0.27409
34 0.26355
35 0.25342
36 0.24367
37 0.23430
38 0.22529
39 0.21662
40 0.20829
41 0.20028
42 0.19257
43 0.18517
44 0.17805
45 0.17120
46 0.16461
47 0.15828
48 0.15219
49 0.14634

Intersection Control Evaluation Collision Cost Analysis and B/C

-- Fill in tan boxes along with 'Area' --

County	Rte	Postmile	Location Description			
SLO	N/A	N/A	US 101 & 46W			
Existing Condition			# of Years for Analysis	Rate Group		
Traffic Signal, Type F, M or S			27	I9		
Existing ADT (x1000)		Future ADT (x1000)				
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF	
20.7	6.2	29.1	9.5	32.7	1.22	
Est. Capital Cost (x1000) for Desired Improvement				Existing Collision Data		
Desired Improvement	Const	R/W	Total	Number of Years	Total Collisions	
Yield Control (Roundabout 1-Lane)	\$ 17,000	\$ -	\$ 17,000	6	73	
Signal Control	\$ -	\$ -	\$ -	Injury	3	
				Fatal	1	
					PDO	69
					Fat + Inj	4

Area

Rural

Suburban

Urban

Intersection Types:

F - Four-Legged

M - Multi-Legged

S - Offset-Tee

Y - "Y" Wye

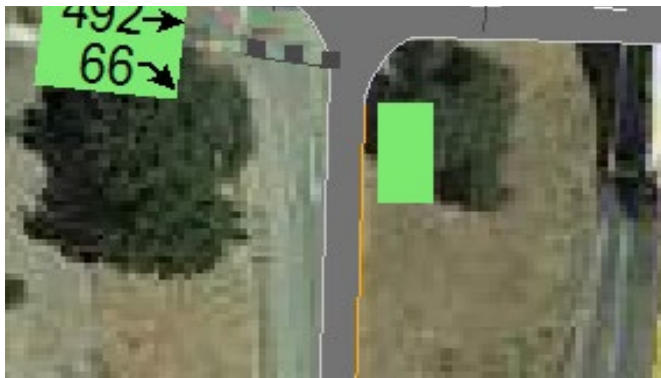
	Collision Cost (x1000)			B/C
	Existing Condition	Desired Improvement	Projected Savings	
1	Traffic Signal, Type F, M or S \$41,040	Yield Control (Roundabout 1-Lane) \$10,716	\$30,324	1.78
2	Traffic Signal, Type F, M or S	Signal Control	\$0	0.00

NOTE: Only average collision costs are used for calculation purposes.

ADT determined to be 1/10th of PM peak hour.

Existing PM





Year 2045 AM





Existing
46W 20700
US 101 6170

Year 2045
46W 29100
US 101 9450



Existing Intersection														
Existing Travel (MV)	Collision Rate (Cols/MV)	Anticipated # of Future Collisions		Avg Collision Cost (x1000)	Total Collision Cost (x1000)	Area	Rate Group	Base Rate	Base # of Collisions	CMF	Anticipated # of Future Collisions	Collisions Used for Estimating	Avg Collision Cost (x1000)	After Collision Cost (x1000)
58.85	1.24	400												
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 31	0.22	71	0.29	116	116	\$ 35.8	\$ 4,153
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 32	0.22	71	0.22	88	88	\$ 36.7	\$ 3,230
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 33	0.32	103	0.61	244	244	\$ 35.7	\$ 8,711
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 34	0.55	177	0.8	320	320	\$ 35.8	\$ 11,456
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 35	0.55	177	0.8	320	320	\$ 36.7	\$ 11,744
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 36	0.55	177	0.8	320	320	\$ 35.7	\$ 11,424
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Traffic Signal -(F, M, S)*								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 04	0.58	187	0.8	320	320	\$ 176.0	\$ 56,320
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 09	0.43	139	0.8	320	320	\$ 102.6	\$ 32,832
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 14	0.24	77	0.8	320	320	\$ 123.3	\$ 39,456
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to All Way Stop -(F, M, S)*								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 03	0.55	177	0.5	208	208	\$ 147.3	\$ 30,638
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 08	0.27	87	0.3	120	120	\$ 248.3	\$ 29,796
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 13	0.19	61	0.3	120	120	\$ 93.4	\$ 11,208
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 31	0.22	71	0.29	116	116	\$ 35.8	\$ 4,153
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 32	0.22	71	0.22	88	88	\$ 36.7	\$ 3,230
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 33	0.32	103	0.61	244	244	\$ 35.7	\$ 8,711
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 34	0.55	177	0.8	320	320	\$ 35.8	\$ 11,456
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 35	0.55	177	0.8	320	320	\$ 36.7	\$ 11,744
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 36	0.55	177	0.8	320	320	\$ 35.7	\$ 11,424
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Traffic Signal -(T, Y, Z)*								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 19	0.22	71	0.8	320	320	\$ 156.6	\$ 50,112
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 24	0.28	90	0.8	320	320	\$ 102.8	\$ 32,896
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 29	0.19	61	0.8	320	320	\$ 114.6	\$ 36,672
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to All Way Stop -(T, Y, Z)*								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 18	0.33	106	0.5	208	208	\$ 615.6	\$ 128,045
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 23	0.28	90	0.3	120	120	\$ 223.3	\$ 26,796
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 28	0.04	13	0.3	120	120	\$ 151.6	\$ 18,192
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Traffic Signal -(F, M, S)*								

Existing Intersection														
Existing Travel (MV)	Collision Rate (Cols/MV)	Anticipated # of Future Collisions		Avg Collision Cost (x1000)	Total Collision Cost (x1000)	Area	Rate Group	Base Rate	Base # of Collisions	CMF	Anticipated # of Future Collisions	Collisions Used for Estimating	Avg Collision Cost (x1000)	After Collision Cost (x1000)
58.85	1.24	400												
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 04	0.58	187	0.84	336	336	\$ 176.0	\$ 59,136
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 09	0.43	139	1.25	500	500	\$ 102.6	\$ 51,300
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 14	0.24	77	1.22	488	488	\$ 123.3	\$ 60,170
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 31	0.22	71	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 32	0.22	71	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 33	0.32	103	1.0	400	400	\$ 35.7	\$ 14,280

Existing Intersection														
Existing Travel (MV)	Collision Rate (Cols/MV)	Anticipated # of Future Collisions		Avg Collision Cost (x1000)	Total Collision Cost (x1000)	Area	Rate Group	Base Rate	Base # of Collisions	CMF	Anticipated # of Future Collisions	Collisions Used for Estimating	Avg Collision Cost (x1000)	After Collision Cost (x1000)
58.85	1.24	400												
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 34	0.55	177	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 35	0.55	177	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 36	0.55	177	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Traffic Signal -(T, Y, Z)*								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 19	0.22	71	0.84	336	336	\$ 156.6	\$ 52,618
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 24	0.28	90	1.25	500	500	\$ 102.8	\$ 51,400
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 29	0.19	61	1.22	488	488	\$ 114.6	\$ 55,925
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 31	0.22	71	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 32	0.22	71	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 33	0.32	103	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 34	0.55	177	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 35	0.55	177	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 36	0.55	177	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 04	0.58	187	\$ 176.0	\$ 70,400	Rural	I 31	0.22	71	0.73	292	292	\$ 35.8	\$ 10,454
Suburban	I 09	0.43	139	\$ 102.6	\$ 41,040	Suburban	I 32	0.22	71	0.73	292	292	\$ 36.7	\$ 10,716
Urban	I 14	0.24	77	\$ 123.3	\$ 49,320	Urban	I 33	0.32	103	0.73	292	292	\$ 35.7	\$ 10,424
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 04	0.58	187	\$ 176.0	\$ 70,400	Rural	I 34	0.55	177	1.00	400	400	\$ 35.8	\$ 14,320
Suburban	I 09	0.43	139	\$ 102.6	\$ 41,040	Suburban	I 35	0.55	177	1.00	400	400	\$ 36.7	\$ 14,680
Urban	I 14	0.24	77	\$ 123.3	\$ 49,320	Urban	I 36	0.55	177	1.00	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 19	0.22	71	\$ 156.6	\$ 62,640	Rural	I 31	0.22	71	0.73	292	292	\$ 35.8	\$ 10,454
Suburban	I 24	0.28	90	\$ 102.8	\$ 41,120	Suburban	I 32	0.22	71	0.73	292	292	\$ 36.7	\$ 10,716
Urban	I 29	0.19	61	\$ 114.6	\$ 45,840	Urban	I 33	0.32	103	0.73	292	292	\$ 35.7	\$ 10,424
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 19	0.22	71	\$ 156.6	\$ 62,640	Rural	I 34	0.55	177	1.00	400	400	\$ 35.8	\$ 14,320
Suburban	I 24	0.28	90	\$ 102.8	\$ 41,120	Suburban	I 35	0.55	177	1.00	400	400	\$ 36.7	\$ 14,680
Urban	I 29	0.19	61	\$ 114.6	\$ 45,840	Urban	I 36	0.55	177	1.00	400	400	\$ 35.7	\$ 14,280

NOTE: Only average collision costs are used for calculation purposes.

Annual Costs		No Build Alternative		Roundabout Alternative		Traffic Signal Alternative	
Safety	Predicted Fatal/Injury Crashes	Predicted Annual Crashes	Safety Cost	Predicted Annual Crashes	Safety Cost	Predicted Annual Crashes	Safety Cost
	Predicted PDO Crashes	Safety Data Omitted	0	Safety Data Omitted	0	Safety Data Omitted	0
		Safety Data Omitted	0	Safety Data Omitted	0	Safety Data Omitted	0
		Annual Costs of Predicted Crashes	\$ 2,925,336	Annual Costs of Predicted Crashes	\$ 763,866	Annual Costs of Predicted Crashes	\$ 498,847
Delay	Average Annual Person (in Vehicle) Delay	Annual Intersection Delay (person-hrs)	Delay Cost	Annual Intersection Delay (person-hrs)	Delay Cost	Annual Intersection Delay (person-hrs)	Delay Cost
			\$ 1,596,000	4333	\$ 49,000	3452	\$ 37,000
Operation and Maintenance	Annualized Cost of Signal Retiming	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost
	Annual Cost of Power for Signal		\$ 500.00		\$ -	Signal Retiming Every 3 Years	\$ 1,000
	Annual Cost of Illumination	Intersection Illumination	\$ -	Intersection Illumination	\$ 750	Power for Signal	\$ 750
	Annual Cost of Maintenance	Signal Maintenance Cost	\$ 16,000	Landscaping Costs	\$ 1,500	Signal Maintenance Costs (power outage, detection, etc.)	\$ 1,500
		Total Annual Operation and Maintenance Costs	\$ -	Total Annual Operation and Maintenance Costs	\$ 2,250	Total Annual Operation and Maintenance Costs	\$ 4,000
Initial Capital Costs		Total Capital Costs		Total Capital Costs		Total Capital Costs	
	Preliminary Engineering		\$ -		\$ -		\$ -
	Right-of-way and Utilities		\$ -		\$ -		\$ -
	Construction		\$ -		\$ 19,750,000		\$ 3,890,000

*Delay cost is based upon an average of the AM and PM peak hours.

Total Discounted Life Cycle Costs (2018 - 2039)		No Build		Roundabout Alternative		Traffic Signal Alternative	
Safety	Predicted Fatal/Injury Crashes	Total Predicted Crashes	Safety Cost	Total Predicted Crashes	Safety Cost	Total Predicted Crashes	Safety Cost
	Predicted PDO Crashes	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -
		Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -
		Total Costs of Predicted Crashes	\$41,040,000	Total Costs of Predicted Crashes	\$10,716,400	Total Costs of Predicted Crashes	\$6,998,400
Delay	Total Person (in Vehicle) Delay	Total Intersection Delay (person-hrs)	Delay Cost	Total Intersection Delay (person-hrs)	Delay Cost	Total Intersection Delay (person-hrs)	Delay Cost
			3258127	\$ 35,100,000	95318	\$ 1,060,000	75940
Fuel and GHG Cost		Fuel and Green House Gas Cost		Fuel and Green House Gas Cost		Fuel and Green House Gas Cost	
			\$ 2,100,407		\$ 2,040,390		\$ 1,433,309
Operation and Maintenance	Annualized Cost of Signal Retiming	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost
	Annual Cost of Power for Signal		\$ 7,000.00		\$ -	Signal Retiming Every 3 Years	\$ 14,029
	Annual Cost of Illumination	Intersection Illumination	\$ -	Intersection Illumination	\$ 11,000	Power for Signal	\$ 10,522
	Annual Cost of Maintenance	Signal Maintenance Cost	\$ 224,000	Landscaping Costs	\$ 21,000	Signal Maintenance Costs (power outage, detection, etc.)	\$ 21,044
		Total Annual Operation and Maintenance Costs	\$ 239,000	Total Annual Operation and Maintenance Costs	\$ 32,000	Total Annual Operation and Maintenance Costs	\$ 56,117
Initial Capital Costs		Total Capital Costs		Total Capital Costs		Total Capital Costs	
	Preliminary Engineering		\$ -		\$ -		\$ -
	Right-of-way and Utilities		\$ -		\$ -		\$ -
	Construction		\$ -		\$ 19,750,000		\$ 3,890,000
		Total Initial Capital Costs	\$ -	Total Initial Capital Costs	\$ 19,750,000	Total Initial Capital Costs	\$ 3,890,000
Total Life Cycle Costs (Opening Year \$)		\$ 76,379,000		Net Present Value \$ 31,558,400		Net Present Value \$ 11,754,517	
Annualized Net Present Value		\$ 5,444,303		\$ 2,249,486			

*Delay cost is based upon an average of the AM and PM peak hours.

No Build Alternative

Roundabout Alternative

Traffic Signal Alternative

Life Cycle Benefit/Cost Ratio	
Roundabout Alt vs. No Build Alt	
Safety Benefit	\$ 30,323,600
Delay Reduction Benefit	\$ 34,040,000
Fuel and GHG Benefit	-
Total Benefits	\$ 64,363,600
Added Operations&Maintenance Costs	\$ (207,000)
Added Capital Costs	\$ 19,750,000
Total Costs	\$ 19,543,000
Life Cycle Benefit/Cost Ratio	3.3

Roundabout Preferred

Life Cycle Cost Analysis

Life Cycle Costs (27 year design)	No Build Alternative (Signal Controlled)	Roundabout Alternative
Mobility Costs		
Delay Costs	\$35,100,000	\$1,060,000
Fuel and GHG Costs	\$2,101,000	\$2,041,000
Total Life Cycle Costs (Opening Year \$ - Net Present Value)	\$37,201,000	\$3,101,000

Life Cycle Cost Analysis - Annual Cost

Life Cycle Costs (27 year design)	No Build Alternative (Signal Controlled)	Roundabout Alternative
Collision and Mobility Costs		
Delay Costs	\$1,300,000	\$39,259
Fuel and GHG Costs	\$77,815	\$75,593
Total Life Cycle Costs - Annual Cost	\$1,377,815	\$114,852

Fill in Orange Cells.

Delay Entry

Enter average vehicle occupancy. This is used to convert vehicle delay to person delay.

Vehicle Occupancy From Caltrans Life-Cycle Benefit-Cost Analysis - Economic Parameters 2016

Enter the duration in hours of each time period of the day. If delay data is not available for a time period, enter a duration of (

Weekday		Weekend	
AM	<input type="text" value="1"/>	AM	<input type="text"/>
PM	<input type="text" value="1"/>	PM	<input type="text"/>
Midday	<input type="text"/>	Midday	<input type="text"/>
Off-Peak1	<input type="text"/>	Off-Peak1	<input type="text"/>
Off-Peak2	<input type="text"/>	Off-Peak2	<input type="text"/>
Total	<input type="text" value="2"/>	Total	<input type="text" value="0"/>

This could be u:
This could be u:

Total for weekday and weekend should equal 24 for analysis of all hours of the week, or should equal less than 24 for analysis of certain time periods only. Full day analysis for weekdays and weekends is recommended if sufficient data is available.

Enter the hourly volume (total entering vehicles) for each time period of the day. This is used to convert average delay per ve
If analysis of certain time periods is not desired, leave cells for that time period blank

	Weekday			Weekend	
	Existing Year	Design Year		Opening Year	Design Year
AM	<input type="text" value="1204"/>	<input type="text" value="1445"/>	AM	<input type="text"/>	<input type="text"/>
PM	<input type="text" value="1336"/>	<input type="text" value="1603"/>	PM	<input type="text"/>	<input type="text"/>
Midday	<input type="text"/>	<input type="text"/>	Midday	<input type="text"/>	<input type="text"/>
Off-Peak1	<input type="text"/>	<input type="text"/>	Off-Peak1	<input type="text"/>	<input type="text"/>
Off-Peak2	<input type="text"/>	<input type="text"/>	Off-Peak2	<input type="text"/>	<input type="text"/>
ADT	Requires 24 hour data		ADT	Requires 24 hour data	

Orange cells in tables below can be left blank if consideration of time period is not desired.
For example, if it is desired to only analyze peak hours, delay entries for midday and off-peak may be left blank.

Enter the delay from SIDRA outputs.

No Build Alternative	Weekday				
	(from SIDRA)				
	AM	PM	Midday	Off-Peak1	Off-Peak2
	Delay	Delay	Delay	Delay	Delay
	sec/veh	sec/veh	sec/veh	sec/veh	sec/veh
2019	<input type="text" value="92.0"/>	<input type="text" value="109.0"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2039	<input type="text" value="429.0"/>	<input type="text" value="537.0"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Roundabout Alternative	Weekday				
	AM	PM	Midday	Off-Peak1	Off-Peak2
	Delay	Delay	Delay	Delay	Delay
sec/veh	sec/veh	sec/veh	sec/veh	sec/veh	
2019	<input type="text" value="8"/>	<input type="text" value="8"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2039	<input type="text" value="9"/>	<input type="text" value="11"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

These cells calculate average weekday peak hour totals. No data entry here.

Requires 24

No Build Alternative

Average Week Day Peak Hour Totals		
Vehicle Delay	Person Delay	
(in sec)	(in sec)	
2018	128,196	147,425
2045	616,974	709,520

Average

Roundabout Alternative

Average Week Day Peak Hour Totals		
Vehicle Delay	Person Delay	
(in sec)	(in sec)	
2018	10,160	11,684
2045	15,319	17,617

Signal Alternative

Average Week Day Peak Hour Totals		
Vehicle Delay	Person Delay	
(in sec)	(in sec)	
2018	8,370	9,625
2045	48,453	55,721

Fill in Orange Cells.

Delay Entry

Enter average vehicle occupancy. This is used to convert vehicle delay to person delay.

Vehicle Occupancy From Caltrans Life-Cycle Benefit-Cost Analysis - Economic Parameters 2016

Enter the duration in hours of each time period of the day. If delay data is not available for a time period, enter a duration of 0

Weekday		Weekend	
AM	<input type="text" value="1"/>	AM	<input type="text" value="0"/>
PM	<input type="text" value="1"/>	PM	<input type="text" value="0"/>
Midday	<input type="text" value="0"/>	Midday	<input type="text" value="0"/>
Off-Peak1	<input type="text" value="0"/>	Off-Peak1	<input type="text" value="0"/>
Off-Peak2	<input type="text" value="0"/>	Off-Peak2	<input type="text" value="0"/>
Total	<input type="text" value="2"/>	Total	<input type="text" value="0"/>

This could be used
This could be used

Total for weekday and weekend should equal 24 for analysis of all hours of the week, or should equal less than 24 for analysis of certain time periods only. Full day analysis for weekdays and weekends is recommended if sufficient data is available.

Enter the hourly volume (total entering vehicles) for each time period of the day. This is used to convert average delay per vehicle. If analysis of certain time periods is not desired, leave cells for that time period blank

	Weekday		Weekend	
	Existing Year	Design Year	Opening Year	Design Year
AM	<input type="text" value="1040"/>	<input type="text" value="1248"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
PM	<input type="text" value="1104"/>	<input type="text" value="1325"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Midday	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Off-Peak1	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Off-Peak2	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
ADT	Requires 24 hour data		Requires 24 hour data	

Orange cells in tables below can be left blank if consideration of time period is not desired. For example, if it is desired to only analyze peak hours, delay entries for midday and off-peak may be left blank. Enter the delay from SIDRA outputs.

		Weekday				
No Build Alternative		(from SIDRA)				
		AM	PM	Midday	Off-Peak1	Off-Peak2
		Delay	Delay	Delay	Delay	Delay
		sec/veh	sec/veh	sec/veh	sec/veh	sec/veh
2019		<input type="text" value="29.0"/>	<input type="text" value="115.0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
2039		<input type="text" value="52.0"/>	<input type="text" value="457.0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Roundabout Alternative		AM	PM	Midday	Off-Peak1	Off-Peak2
		Delay	Delay	Delay	Delay	Delay
		sec/veh	sec/veh	sec/veh	sec/veh	sec/veh
2019		<input type="text" value="7"/>	<input type="text" value="7"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
2039		<input type="text" value="8"/>	<input type="text" value="8"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>

These cells calculate average weekday peak hour totals. No data entry here.

**Requires 24
No Build Alternative**

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	78,560	90,344
2045	279,304	321,200

Average

Roundabout Alternative

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	7,504	8,630
2045	10,292	11,836

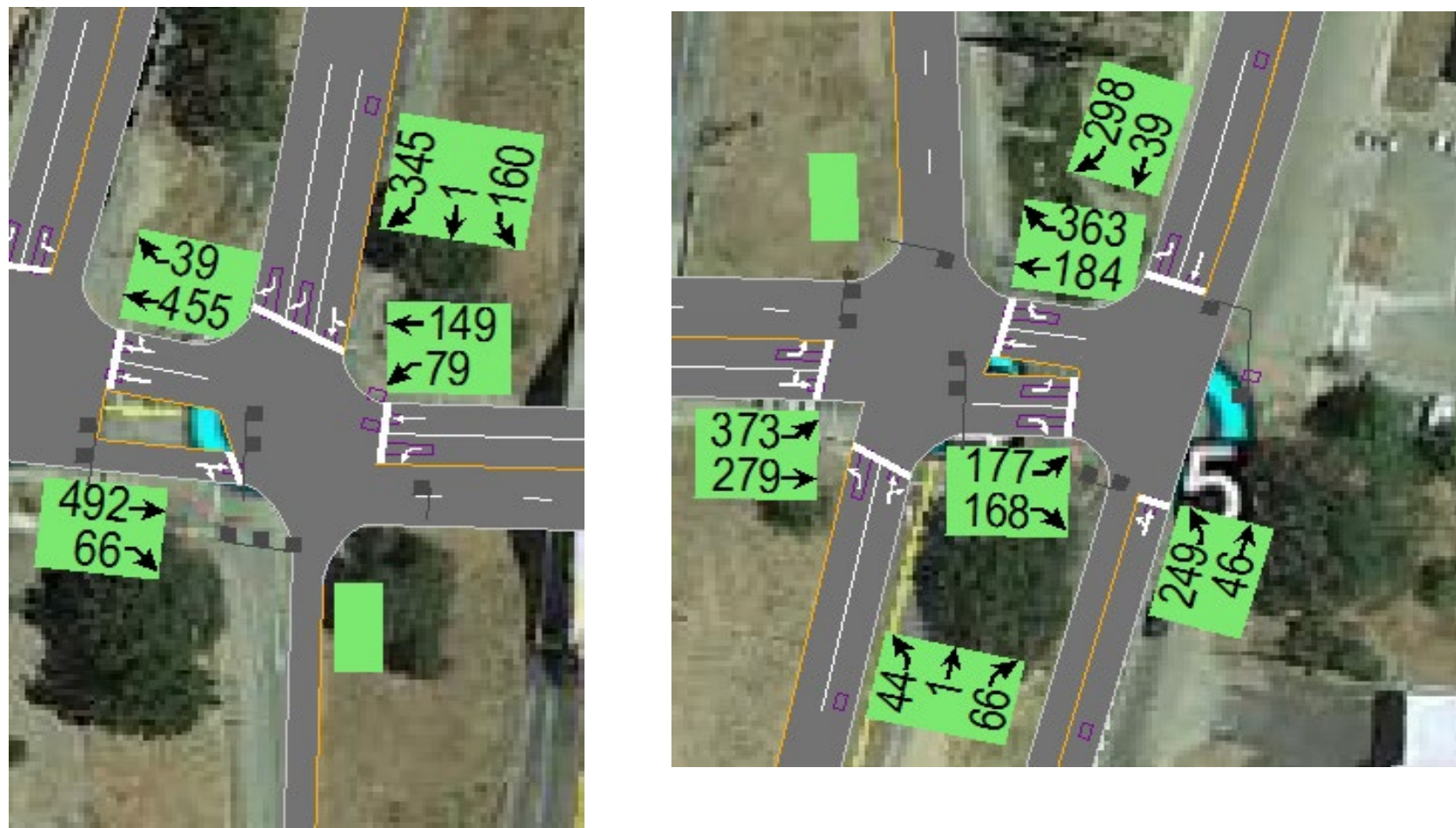
Signal Alternative

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	7,092	8,156
2045	41,232	47,417

Intersection Control Evaluation						
Collision Cost Analysis and B/C						
-- Fill in tan boxes along with 'Area' --						
County	Rte	Postmile	Location Description			
SLO	N/A	N/A	US 101 & 46W			
Existing Condition		# of Years for Analysis	Rate Group			
Traffic Signal, Type F, M or S		27	I9			
Existing ADT (x1000)		Future ADT (x1000)				
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF	
20.7	6.2	29.1	9.5	32.7	1.22	
Est. Capital Cost (x1000) for Desired Improvement			Existing Collision Data			
Desired Improvement	Const	R/W	Total	Number of Years	6	Total Collisions
Yield Control (Roundabout 1-Lane)	\$ 17,000	\$ -	\$ 17,000	Injury	3	PDO
Signal Control	\$ -	\$ -	\$ -	Fatal	1	Fat + Inj
						73
						69
						4
Collision Cost (x1000)						
Existing Condition		Desired Improvement		Projected Savings		B/C
1	Traffic Signal, Type F, M or S	\$41,040	Yield Control (Roundabout 1-Lane)	\$10,716	\$30,324	1.78
2	Traffic Signal, Type F, M or S		Signal Control		\$0	0.00

NOTE: Only average collision costs are used for calculation purposes.
ADT determined to be 1/10th of PM peak hour.

Existing PM



Existing	46W	20700
	US 101	6170
Year 2045	46W	29100
	US 101	9450

Year 2045 AM



Existing Intersection														
Existing Travel (MV)	Collision Rate (Cols/MV)	Anticipated # of Future Collisions		Avg Collision Cost (x1000)	Total Collision Cost (x1000)	Area	Rate Group	Base Rate	Base # of Collisions	CMF	Anticipated # of Future Collisions	Collisions Used for Estimating	Avg Collision Cost (x1000)	After Collision Cost (x1000)
58.85	1.24	400												
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 31	0.22	71	0.29	116	116	\$ 35.8	\$ 4,153
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 32	0.22	71	0.22	88	88	\$ 36.7	\$ 3,230
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 33	0.32	103	0.61	244	244	\$ 35.7	\$ 8,711
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 34	0.55	177	0.8	320	320	\$ 35.8	\$ 11,456
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 35	0.55	177	0.8	320	320	\$ 36.7	\$ 11,744
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 36	0.55	177	0.8	320	320	\$ 35.7	\$ 11,424
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Traffic Signal -(F, M, S)*								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 04	0.58	187	0.8	320	320	\$ 176.0	\$ 56,320
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 09	0.43	139	0.8	320	320	\$ 102.6	\$ 32,832
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 14	0.24	77	0.8	320	320	\$ 123.3	\$ 39,456
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to All Way Stop -(F, M, S)*								
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 03	0.55	177	0.5	208	208	\$ 147.3	\$ 30,638
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 08	0.27	87	0.3	120	120	\$ 248.3	\$ 29,796
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 13	0.19	61	0.3	120	120	\$ 93.4	\$ 11,208
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 31	0.22	71	0.29	116	116	\$ 35.8	\$ 4,153
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 32	0.22	71	0.22	88	88	\$ 36.7	\$ 3,230
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 33	0.32	103	0.61	244	244	\$ 35.7	\$ 8,711
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 34	0.55	177	0.8	320	320	\$ 35.8	\$ 11,456
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 35	0.55	177	0.8	320	320	\$ 36.7	\$ 11,744
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 36	0.55	177	0.8	320	320	\$ 35.7	\$ 11,424
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Traffic Signal -(T, Y, Z)*								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 19	0.22	71	0.8	320	320	\$ 156.6	\$ 50,112
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 24	0.28	90	0.8	320	320	\$ 102.8	\$ 32,896
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 29	0.19	61	0.8	320	320	\$ 114.6	\$ 36,672
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to All Way Stop -(T, Y, Z)*								
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 18	0.33	106	0.5	208	208	\$ 615.6	\$ 128,045
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 23	0.28	90	0.3	120	120	\$ 223.3	\$ 26,796
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 28	0.04	13	0.3	120	120	\$ 151.6	\$ 18,192
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Traffic Signal -(F, M, S)*								

Existing Intersection														
Existing Travel (MV)	Collision Rate (Cols/MV)	Anticipated # of Future Collisions		Avg Collision Cost (x1000)	Total Collision Cost (x1000)	Area	Rate Group	Base Rate	Base # of Collisions	CMF	Anticipated # of Future Collisions	Collisions Used for Estimating	Avg Collision Cost (x1000)	After Collision Cost (x1000)
58.85	1.24	400												
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 04	0.58	187	0.84	336	336	\$ 176.0	\$ 59,136
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 09	0.43	139	1.25	500	500	\$ 102.6	\$ 51,300
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 14	0.24	77	1.22	488	488	\$ 123.3	\$ 60,170
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 31	0.22	71	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 32	0.22	71	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 33	0.32	103	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 34	0.55	177	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 35	0.55	177	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 36	0.55	177	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Traffic Signal -(T, Y, Z)*								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 19	0.22	71	0.84	336	336	\$ 156.6	\$ 52,618
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 24	0.28	90	1.25	500	500	\$ 102.8	\$ 51,400
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 29	0.19	61	1.22	488	488	\$ 114.6	\$ 55,925
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 31	0.22	71	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 32	0.22	71	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 33	0.32	103	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 34	0.55	177	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 35	0.55	177	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 36	0.55	177	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 04	0.58	187	\$ 176.0	\$ 70,400	Rural	I 31	0.22	71	0.73	292	292	\$ 35.8	\$ 10,454
Suburban	I 09	0.43	139	\$ 102.6	\$ 41,040	Suburban	I 32	0.22	71	0.73	292	292	\$ 36.7	\$ 10,716
Urban	I 14	0.24	77	\$ 123.3	\$ 49,320	Urban	I 33	0.32	103	0.73	292	292	\$ 35.7	\$ 10,424
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 04	0.58	187	\$ 176.0	\$ 70,400	Rural	I 34	0.55	177	1.00	400	400	\$ 35.8	\$ 14,320
Suburban	I 09	0.43	139	\$ 102.6	\$ 41,040	Suburban	I 35	0.55	177	1.00	400	400	\$ 36.7	\$ 14,680
Urban	I 14	0.24	77	\$ 123.3	\$ 49,320	Urban	I 36	0.55	177	1.00	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 19	0.22	71	\$ 156.6	\$ 62,640	Rural	I 31	0.22	71	0.73	292	292	\$ 35.8	\$ 10,454
Suburban	I 24	0.28	90	\$ 102.8	\$ 41,120	Suburban	I 32	0.22	71	0.73	292	292	\$ 36.7	\$ 10,716
Urban	I 29	0.19	61	\$ 114.6	\$ 45,840	Urban	I 33	0.32	103	0.73	292	292	\$ 35.7	\$ 10,424
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 19	0.22	71	\$ 156.6	\$ 62,640	Rural	I 34	0.55	177	1.00	400	400	\$ 35.8	\$ 14,320
Suburban	I 24	0.28	90	\$ 102.8	\$ 41,120	Suburban	I 35	0.55	177	1.00	400	400	\$ 36.7	\$ 14,680
Urban	I 29	0.19	61	\$ 114.6	\$ 45,840	Urban	I 36	0.55	177	1.00	400	400	\$ 35.7	\$ 14,280

NOTE: Only average collision costs are used for calculation purposes.

Annual Costs		No Build Alternative		Roundabout Alternative		Traffic Signal Alternative		
Safety	Predicted Fatal/Injury Crashes	Predicted Annual Crashes	Safety Cost	Predicted Annual Crashes	Safety Cost	Predicted Annual Crashes	Safety Cost	
	Predicted PDO Crashes	Safety Data Omitted	0	Safety Data Omitted	0	Safety Data Omitted	0	
		Safety Data Omitted	0	Safety Data Omitted	0	Safety Data Omitted	0	
		Annual Costs of Predicted Crashes	\$ 2,925,336	Annual Costs of Predicted Crashes	\$ 763,866	Annual Costs of Predicted Crashes	\$ 498,847	
Delay	Average Annual Person (in Vehicle) Delay	Annual Intersection Delay (person-hrs)	Delay Cost	Annual Intersection Delay (person-hrs)	Delay Cost	Annual Intersection Delay (person-hrs)	Delay Cost	
			\$ 162,000	739	\$ 9,000	2007	\$ 22,000	
Operation and Maintenance	Annualized Cost of Signal Retiming	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	
	Annual Cost of Power for Signal		\$ 500.00		\$ -	Signal Retiming Every 3 Years	\$ 1,000	
	Annual Cost of Illumination		\$ 600.00		\$ -	Power for Signal	\$ 750	
	Annual Cost of Maintenance	Intersection Illumination		\$ -	Intersection Illumination	\$ 750	Intersection Illumination	\$ 750
		Signal Maintenance Cost		\$ 16,000	Landscaping Costs	\$ 1,500	Signal Maintenance Costs (power outage, detection, etc.)	\$ 1,500
			Total Annual Operation and Maintenance Costs	\$ -	Total Annual Operation and Maintenance Costs	\$ 2,250	Total Annual Operation and Maintenance Costs	\$ 4,000
Initial Capital Costs		Total Capital Costs		Total Capital Costs		Total Capital Costs		
	Preliminary Engineering		\$ -		\$ -		\$ -	
	Right-of-way and Utilities		\$ -		\$ -		\$ -	
	Construction		\$ -		\$ 19,750,000		\$ 3,890,000	

*Delay cost is based upon an average of the AM and PM peak hours.

Total Discounted Life Cycle Costs (2018 - 2039)		No Build		Roundabout Alternative		Traffic Signal Alternative		
Safety	Predicted Fatal/Injury Crashes	Total Predicted Crashes	Safety Cost	Total Predicted Crashes	Safety Cost	Total Predicted Crashes	Safety Cost	
	Predicted PDO Crashes	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	
		Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	
		Total Costs of Predicted Crashes	\$41,040,000	Total Costs of Predicted Crashes	\$10,716,400	Total Costs of Predicted Crashes	\$6,998,400	
Delay	Total Person (in Vehicle) Delay	Total Intersection Delay (person-hrs)	Delay Cost	Total Intersection Delay (person-hrs)	Delay Cost	Total Intersection Delay (person-hrs)	Delay Cost	
			326949	\$ 3,560,000	16259	\$ 190,000	44149	\$ 470,000
Fuel and GHG Cost		Fuel and Green House Gas Cost		Fuel and Green House Gas Cost		Fuel and Green House Gas Cost		
			\$ 432,099		\$ 608,125		\$ 1,433,309	
Operation and Maintenance	Annualized Cost of Signal Retiming	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	
	Annual Cost of Power for Signal		\$ 7,000.00		\$ -	Signal Retiming Every 3 Years	\$ 14,029	
	Annual Cost of Illumination		\$ 8,000.00		\$ -	Power for Signal	\$ 10,522	
	Annual Cost of Maintenance	Intersection Illumination		\$ -	Intersection Illumination	\$ 11,000	Intersection Illumination	\$ 10,522
		Signal Maintenance Cost		\$ 224,000	Landscaping Costs	\$ 21,000	Signal Maintenance Costs (power outage, detection, etc.)	\$ 21,044
			Total Annual Operation and Maintenance Costs	\$ 239,000	Total Annual Operation and Maintenance Costs	\$ 32,000	Total Annual Operation and Maintenance Costs	\$ 56,117
Initial Capital Costs		Total Capital Costs		Total Capital Costs		Total Capital Costs		
	Preliminary Engineering		\$ -		\$ -		\$ -	
	Right-of-way and Utilities		\$ -		\$ -		\$ -	
	Construction		\$ -		\$ 19,750,000		\$ 3,890,000	
		Total Initial Capital Costs	\$ -	Total Initial Capital Costs	\$ 19,750,000	Total Initial Capital Costs	\$ 3,890,000	
Total Life Cycle Costs (Opening Year \$)		\$ 44,839,000		Net Present Value \$ 30,688,400		Net Present Value \$ 11,414,517		
Annualized Net Present Value		\$ 3,196,129		\$ 2,187,472				

*Delay cost is based upon an average of the AM and PM peak hours.

No Build Alternative

Roundabout Alternative

Traffic Signal Alternative

Life Cycle Benefit/Cost Ratio	
Roundabout Alt vs. No Build Alt	
Safety Benefit	\$ 30,323,600
Delay Reduction Benefit	\$ 3,370,000
Fuel and GHG Benefit	-
Total Benefits	\$ 33,693,600
Added Operations&Maintenance Costs	\$ (207,000)
Added Capital Costs	\$ 19,750,000
Total Costs	\$ 19,543,000
Life Cycle Benefit/Cost Ratio	1.7

Roundabout Preferred

Life Cycle Cost Analysis

Life Cycle Costs (20 year design)	No Build Alternative (Signal Controlled)	Roundabout Alternative
Mobility Costs		
Delay Costs	\$3,560,000	\$190,000
Fuel and GHG Costs	\$433,000	\$609,000
Total Life Cycle Costs (Opening Year \$ - Net Present Value)	\$3,993,000	\$799,000

Life Cycle Cost Analysis - Annual Cost

Life Cycle Costs (27 year design)	No Build Alternative (Signal Controlled)	Roundabout Alternative
Collision and Mobility Costs		
Delay Costs	\$131,852	\$7,037
Fuel and GHG Costs	\$16,037	\$22,556
Total Life Cycle Costs - Annual Cost	\$147,889	\$29,593

Fill in Orange Cells.

Delay Entry

Enter average vehicle occupancy. This is used to convert vehicle delay to person delay.

Vehicle Occupancy From Caltrans Life-Cycle Benefit-Cost Analysis - Economic Parameters 2016

Enter the duration in hours of each time period of the day. If delay data is not available for a time period, enter a duration of 0

	Weekday
AM	1
PM	1
Midday	
Off-Peak1	
Off-Peak2	
Total	2

	Weekend
AM	
PM	
Midday	
Off-Peak1	
Off-Peak2	
Total	0

This could be used for...
This could be used for...

Total for weekday and weekend should equal 24 for analysis of all hours of the week, or should equal less than 24 for analysis of certain time periods only. Full day analysis for weekdays and weekends is recommended if sufficient data is available.

Enter the hourly volume (total entering vehicles) for each time period of the day. This is used to convert average delay per vehicle to person delay. If analysis of certain time periods is not desired, leave cells for that time period blank

	Weekday	
	Existing Year	Design Year
AM	700	840
PM	1074	1289
Midday		
Off-Peak1		
Off-Peak2		
ADT	Requires 24 hour data	

	Weekend	
	Opening Year	Design Year
AM		
PM		
Midday		
Off-Peak1		
Off-Peak2		
ADT	Requires 24 hour data	

Orange cells in tables below can be left blank if consideration of time period is not desired. For example, if it is desired to only analyze peak hours, delay entries for midday and off-peak may be left blank.

Enter the delay from SIDRA outputs.

Weekday

No Build Alternative (from SIDRA)

	AM	PM	Midday	Off-Peak1	Off-Peak2
	Delay	Delay	Delay	Delay	Delay
	sec/veh	sec/veh	sec/veh	sec/veh	sec/veh
2019	17.0	35.0			
2039	22.0	97.0			

Roundabout Alternative

	AM	PM	Midday	Off-Peak1	Off-Peak2
	Delay	Delay	Delay	Delay	Delay
	sec/veh	sec/veh	sec/veh	sec/veh	sec/veh
2019	5	7			
2039	6	8			

These cells calculate average weekday peak hour totals. No data entry here.

**Requires 24
No Build Alternative**

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	24,745	28,457
2045	59,789	68,757

Average

Roundabout Alternative

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	5,509	6,335
2045	7,676	8,827

Signal Alternative

Average Week Day Peak Hour Totals		
	Vehicle Delay	Person Delay
	(in sec)	(in sec)
2018	5,684	6,536
2045	31,863	36,643

Intersection Control Evaluation						
Collision Cost Analysis and B/C						
-- Fill in tan boxes along with 'Area' --						
County	Rte	Postmile	Location Description			
SLO	N/A	N/A	US 101 & 46W			
Existing Condition		# of Years for Analysis		Rate Group		
Traffic Signal, Type F, M or S		27		I9		
Existing ADT (x1000)			Future ADT (x1000)			
Mainline	Cross St	Mainline	Cross St	Average ADT	VCF	
20.7	6.2	29.1	9.5	32.7	1.22	
Est. Capital Cost (x1000) for Desired Improvement				Existing Collision Data		
Desired Improvement	Const	R/W	Total	Number of Years	6	Total Collisions
Yield Control (Roundabout 1-Lane)	\$ 17,000	\$ -	\$ 17,000	Injury	3	PDO
Signal Control	\$ -	\$ -	\$ -	Fatal	1	Fat + Inj
						73
						69
						4
Collision Cost (x1000)						
Existing Condition		Desired Improvement		Projected Savings		B/C
1	Traffic Signal, Type F, M or S	\$41,040	Yield Control (Roundabout 1-Lane)	\$10,716	\$30,324	1.78
2	Traffic Signal, Type F, M or S		Signal Control		\$0	0.00

NOTE: Only average collision costs are used for calculation purposes.
ADT determined to be 1/10th of PM peak hour.

Existing PM



Existing	46W	20700
	US 101	6170
Year 2045	46W	29100
	US 101	9450

Year 2045 AM



Existing Intersection															
Existing Travel (MV)	Collision Rate (Cols/MV)	Anticipated # of Future Collisions		Avg Collision Cost (x1000)	Total Collision Cost (x1000)	Area	Rate Group	Base Rate	Base # of Collisions	CMF	Anticipated # of Future Collisions	Collisions Used for Estimating	Avg Collision Cost (x1000)	After Collision Cost (x1000)	
58.85	1.24	400													
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Yield Control (Roundabout 1-Lane)									
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 31	0.22	71	0.29	116	116	\$ 35.8	\$ 4,153	
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 32	0.22	71	0.22	88	88	\$ 36.7	\$ 3,230	
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 33	0.32	103	0.61	244	244	\$ 35.7	\$ 8,711	
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Yield Control (Roundabout 2-Lane)									
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 34	0.55	177	0.8	320	320	\$ 35.8	\$ 11,456	
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 35	0.55	177	0.8	320	320	\$ 36.7	\$ 11,744	
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 36	0.55	177	0.8	320	320	\$ 35.7	\$ 11,424	
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to Traffic Signal -(F, M, S)*									
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 04	0.58	187	0.8	320	320	\$ 176.0	\$ 56,320	
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 09	0.43	139	0.8	320	320	\$ 102.6	\$ 32,832	
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 14	0.24	77	0.8	320	320	\$ 123.3	\$ 39,456	
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (F, M, S)		to All Way Stop -(F, M, S)*									
Rural	I 02	0.22	71	\$ 353.6	\$ 141,440	Rural	I 03	0.55	177	0.5	208	208	\$ 147.3	\$ 30,638	
Suburban	I 07	0.23	74	\$ 267.5	\$ 107,000	Suburban	I 08	0.27	87	0.3	120	120	\$ 248.3	\$ 29,796	
Urban	I 12	0.13	42	\$ 191.9	\$ 76,760	Urban	I 13	0.19	61	0.3	120	120	\$ 93.4	\$ 11,208	
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Yield Control (Roundabout 1-Lane)									
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 31	0.22	71	0.29	116	116	\$ 35.8	\$ 4,153	
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 32	0.22	71	0.22	88	88	\$ 36.7	\$ 3,230	
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 33	0.32	103	0.61	244	244	\$ 35.7	\$ 8,711	
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Yield Control (Roundabout 2-Lane)									
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 34	0.55	177	0.8	320	320	\$ 35.8	\$ 11,456	
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 35	0.55	177	0.8	320	320	\$ 36.7	\$ 11,744	
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 36	0.55	177	0.8	320	320	\$ 35.7	\$ 11,424	
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to Traffic Signal -(T, Y, Z)*									
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 19	0.22	71	0.8	320	320	\$ 156.6	\$ 50,112	
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 24	0.28	90	0.8	320	320	\$ 102.8	\$ 32,896	
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 29	0.19	61	0.8	320	320	\$ 114.6	\$ 36,672	
Area	Rate Group	Base Rate	Base # of Collisions	Stop Control Minor Leg (T, Y, Z)		to All Way Stop -(T, Y, Z)*									
Rural	I 17	0.16	52	\$ 270.1	\$ 108,040	Rural	I 18	0.33	106	0.5	208	208	\$ 615.6	\$ 128,045	
Suburban	I 22	0.14	45	\$ 187.2	\$ 74,880	Suburban	I 23	0.28	90	0.3	120	120	\$ 223.3	\$ 26,796	
Urban	I 27	0.08	26	\$ 183.6	\$ 73,440	Urban	I 28	0.04	13	0.3	120	120	\$ 151.6	\$ 18,192	
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Traffic Signal -(F, M, S)*									

Existing Intersection														
Existing Travel (MV)	Collision Rate (Cols/MV)	Anticipated # of Future Collisions		Avg Collision Cost (x1000)	Total Collision Cost (x1000)	Area	Rate Group	Base Rate	Base # of Collisions	CMF	Anticipated # of Future Collisions	Collisions Used for Estimating	Avg Collision Cost (x1000)	After Collision Cost (x1000)
58.85	1.24	400												
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 04	0.58	187	0.84	336	336	\$ 176.0	\$ 59,136
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 09	0.43	139	1.25	500	500	\$ 102.6	\$ 51,300
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 14	0.24	77	1.22	488	488	\$ 123.3	\$ 60,170
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 31	0.22	71	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 32	0.22	71	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 33	0.32	103	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 03	0.55	177	\$ 147.3	\$ 58,920	Rural	I 34	0.55	177	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 08	0.27	87	\$ 248.3	\$ 99,320	Suburban	I 35	0.55	177	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 13	0.19	61	\$ 93.4	\$ 37,360	Urban	I 36	0.55	177	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Traffic Signal -(T, Y, Z)*								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 19	0.22	71	0.84	336	336	\$ 156.6	\$ 52,618
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 24	0.28	90	1.25	500	500	\$ 102.8	\$ 51,400
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 29	0.19	61	1.22	488	488	\$ 114.6	\$ 55,925
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 31	0.22	71	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 32	0.22	71	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 33	0.32	103	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	All Way Stop (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 18	0.33	106	\$ 615.6	\$ 246,240	Rural	I 34	0.55	177	1.0	400	400	\$ 35.8	\$ 14,320
Suburban	I 23	0.28	90	\$ 223.3	\$ 89,320	Suburban	I 35	0.55	177	1.0	400	400	\$ 36.7	\$ 14,680
Urban	I 28	0.04	13	\$ 151.6	\$ 60,640	Urban	I 36	0.55	177	1.0	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (F, M, S)		to Yield Control (Roundabout 1-Lane)								
Rural	I 04	0.58	187	\$ 176.0	\$ 70,400	Rural	I 31	0.22	71	0.73	292	292	\$ 35.8	\$ 10,454
Suburban	I 09	0.43	139	\$ 102.6	\$ 41,040	Suburban	I 32	0.22	71	0.73	292	292	\$ 36.7	\$ 10,716
Urban	I 14	0.24	77	\$ 123.3	\$ 49,320	Urban	I 33	0.32	103	0.73	292	292	\$ 35.7	\$ 10,424
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (F, M, S)		to Yield Control (Roundabout 2-Lane)								
Rural	I 04	0.58	187	\$ 176.0	\$ 70,400	Rural	I 34	0.55	177	1.00	400	400	\$ 35.8	\$ 14,320
Suburban	I 09	0.43	139	\$ 102.6	\$ 41,040	Suburban	I 35	0.55	177	1.00	400	400	\$ 36.7	\$ 14,680
Urban	I 14	0.24	77	\$ 123.3	\$ 49,320	Urban	I 36	0.55	177	1.00	400	400	\$ 35.7	\$ 14,280
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (T, Y, Z)		to Yield Control (Roundabout 1-Lane)								
Rural	I 19	0.22	71	\$ 156.6	\$ 62,640	Rural	I 31	0.22	71	0.73	292	292	\$ 35.8	\$ 10,454
Suburban	I 24	0.28	90	\$ 102.8	\$ 41,120	Suburban	I 32	0.22	71	0.73	292	292	\$ 36.7	\$ 10,716
Urban	I 29	0.19	61	\$ 114.6	\$ 45,840	Urban	I 33	0.32	103	0.73	292	292	\$ 35.7	\$ 10,424
Area	Rate Group	Base Rate	Base # of Collisions	Traffic Signal (T, Y, Z)		to Yield Control (Roundabout 2-Lane)								
Rural	I 19	0.22	71	\$ 156.6	\$ 62,640	Rural	I 34	0.55	177	1.00	400	400	\$ 35.8	\$ 14,320
Suburban	I 24	0.28	90	\$ 102.8	\$ 41,120	Suburban	I 35	0.55	177	1.00	400	400	\$ 36.7	\$ 14,680
Urban	I 29	0.19	61	\$ 114.6	\$ 45,840	Urban	I 36	0.55	177	1.00	400	400	\$ 35.7	\$ 14,280

NOTE: Only average collision costs are used for calculation purposes.

Annual Costs		No Build Alternative		Roundabout Alternative		Traffic Signal Alternative	
Safety	Predicted Fatal/Injury Crashes	Predicted Annual Crashes	Safety Cost	Predicted Annual Crashes	Safety Cost	Predicted Annual Crashes	Safety Cost
	Predicted PDO Crashes	Safety Data Omitted	0	Safety Data Omitted	0	Safety Data Omitted	0
		Safety Data Omitted	0	Safety Data Omitted	0	Safety Data Omitted	0
		Annual Costs of Predicted Crashes	\$ 2,925,336	Annual Costs of Predicted Crashes	\$ 763,866	Annual Costs of Predicted Crashes	\$ 498,847
Delay	Average Annual Person (in Vehicle) Delay	Annual Intersection Delay (person-hrs)	Delay Cost	Annual Intersection Delay (person-hrs)	Delay Cost	Annual Intersection Delay (person-hrs)	Delay Cost
			\$ 40,000	548	\$ 7,000	1559	\$ 17,000
Operation and Maintenance	Annualized Cost of Signal Retiming	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost
	Annual Cost of Power for Signal		\$ 500.00		\$ -	Signal Retiming Every 3 Years	\$ 1,000
	Annual Cost of Illumination		\$ 600.00		\$ -	Power for Signal	\$ 750
	Annual Cost of Maintenance	Intersection Illumination	\$ -	Intersection Illumination	\$ 750	Intersection Illumination	\$ 750
		Signal Maintenance Cost	\$ 16,000	Landscaping Costs	\$ 1,500	Signal Maintenance Costs (power outage, detection, etc.)	\$ 1,500
		Total Annual Operation and Maintenance Costs	\$ -	Total Annual Operation and Maintenance Costs	\$ 2,250	Total Annual Operation and Maintenance Costs	\$ 4,000
Initial Capital Costs		Total Capital Costs	Cost	Total Capital Costs	Cost	Total Capital Costs	Cost
	Preliminary Engineering		\$ -		\$ -		\$ -
	Right-of-way and Utilities Construction		\$ -		\$ 19,750,000		\$ 3,890,000

*Delay cost is based upon an average of the AM and PM peak hours.

Total Discounted Life Cycle Costs (2018 - 2039)		No Build		Roundabout Alternative		Traffic Signal Alternative	
Safety	Predicted Fatal/Injury Crashes	Total Predicted Crashes	Safety Cost	Total Predicted Crashes	Safety Cost	Total Predicted Crashes	Safety Cost
	Predicted PDO Crashes	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -
		Safety Data Omitted	\$ -	Safety Data Omitted	\$ -	Safety Data Omitted	\$ -
		Total Costs of Predicted Crashes	\$41,040,000	Total Costs of Predicted Crashes	\$10,716,400	Total Costs of Predicted Crashes	\$6,998,400
Delay	Total Person (in Vehicle) Delay	Total Intersection Delay (person-hrs)	Delay Cost	Total Intersection Delay (person-hrs)	Delay Cost	Total Intersection Delay (person-hrs)	Delay Cost
		77231	\$ 860,000	12046	\$ 140,000	34303	\$ 370,000
Fuel and GHG Cost		Fuel and Green House Gas Cost		Fuel and Green House Gas Cost		Fuel and Green House Gas Cost	
			\$ 461,103		\$ 570,119		\$ 1,433,309
Operation and Maintenance	Annualized Cost of Signal Retiming	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost	Operation and Maintenance	O&M Cost
	Annual Cost of Power for Signal		\$ 7,000.00		\$ -	Signal Retiming Every 3 Years	\$ 14,029
	Annual Cost of Illumination		\$ 8,000.00		\$ -	Power for Signal	\$ 10,522
	Annual Cost of Maintenance	Intersection Illumination	\$ -	Intersection Illumination	\$ 11,000	Intersection Illumination	\$ 10,522
		Signal Maintenance Cost	\$ 224,000	Landscaping Costs	\$ 21,000	Signal Maintenance Costs (power outage, detection, etc.)	\$ 21,044
		Total Annual Operation and Maintenance Costs	\$ 239,000	Total Annual Operation and Maintenance Costs	\$ 32,000	Total Annual Operation and Maintenance Costs	\$ 56,117
Initial Capital Costs		Total Capital Costs	Cost	Total Capital Costs	Cost	Total Capital Costs	Cost
	Preliminary Engineering		\$ -		\$ -		\$ -
	Right-of-way and Utilities Construction		\$ -		\$ 19,750,000		\$ 3,890,000
		Total Initial Capital Costs	\$ -	Total Initial Capital Costs	\$ 19,750,000	Total Initial Capital Costs	\$ 3,890,000
Total Life Cycle Costs (Opening Year \$)		\$ 42,139,000		Net Present Value \$ 30,638,400		Net Present Value \$ 11,314,517	
Annualized Net Present Value		\$ 3,003,672		\$ 2,183,908			

*Delay cost is based upon an average of the AM and PM peak hours.

No Build Alternative

Roundabout Alternative

Traffic Signal Alternative

Life Cycle Benefit/Cost Ratio	
Roundabout Alt vs. No Build Alt	
Safety Benefit	\$ 30,323,600
Delay Reduction Benefit	\$ 720,000
Fuel and GHG Benefit	-
Total Benefits	\$ 31,043,600
Added Operations&Maintenance Costs	\$ (207,000)
Added Capital Costs	\$ 19,750,000
Total Costs	\$ 19,543,000
Life Cycle Benefit/Cost Ratio	1.6

Roundabout Preferred

Life Cycle Cost Analysis

Life Cycle Costs (20 year design)	No Build Alternative (Signal Controlled)	Roundabout Alternative
Mobility Costs		
Delay Costs	\$860,000	\$140,000
Fuel and GHG Costs	\$462,000	\$571,000
Total Life Cycle Costs (Opening Year \$ - Net Present Value)	\$1,322,000	\$711,000

Life Cycle Cost Analysis - Annual Cost

Life Cycle Costs (27 year design)	No Build Alternative (Signal Controlled)	Roundabout Alternative
Collision and Mobility Costs		
Delay Costs	\$43,000	\$7,000
Fuel and GHG Costs	\$23,100	\$28,550
Total Life Cycle Costs - Annual Cost	\$66,100	\$35,550



Appendix G: Improvement Concept Reference Photos

Effective and Cost-Effective Improvement Concepts to make it *safer & easier* to move *across & along* rural highways

Proven and Innovative Countermeasures & Strategies

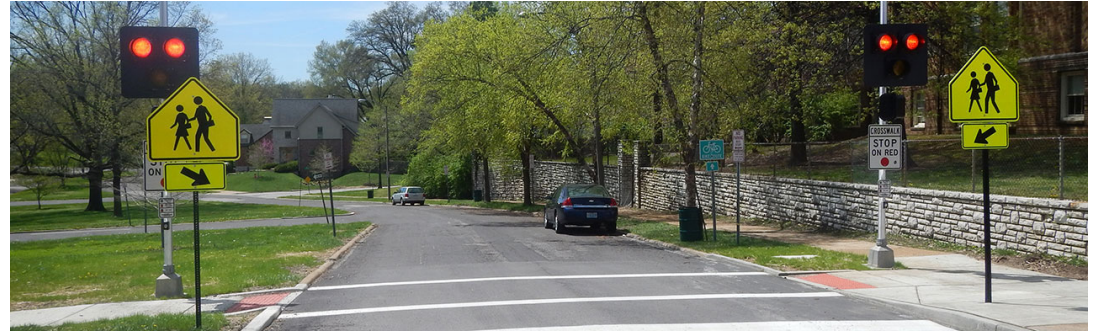
- Pedestrian Crossing Infrastructure (Safety & Traffic Control Devices)
- Traffic Calming



Examples:

Pedestrian Beacons

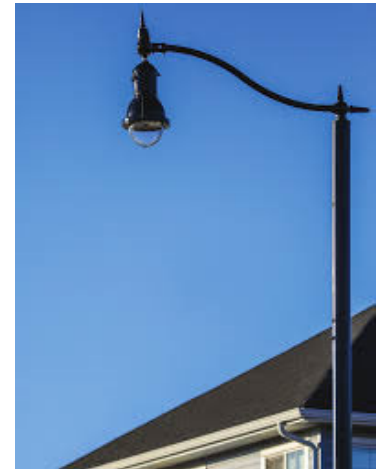
- Rectangular Rapid Flash
- Pedestrian Hybrid (HAWK)



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Examples:
Innovative Street & Crosswalk Lighting
Rural Applications



Traffic Calming (speed management) via Compact Roundabout Spacing



Compact Roundabout | Redding, CA



**INSTANT
ROUNDBABOUTS**

**2017 National Road
Safety Award
(Virginia DOT)**

Poland Rd. / Edgewater St.
South Riding, VA

