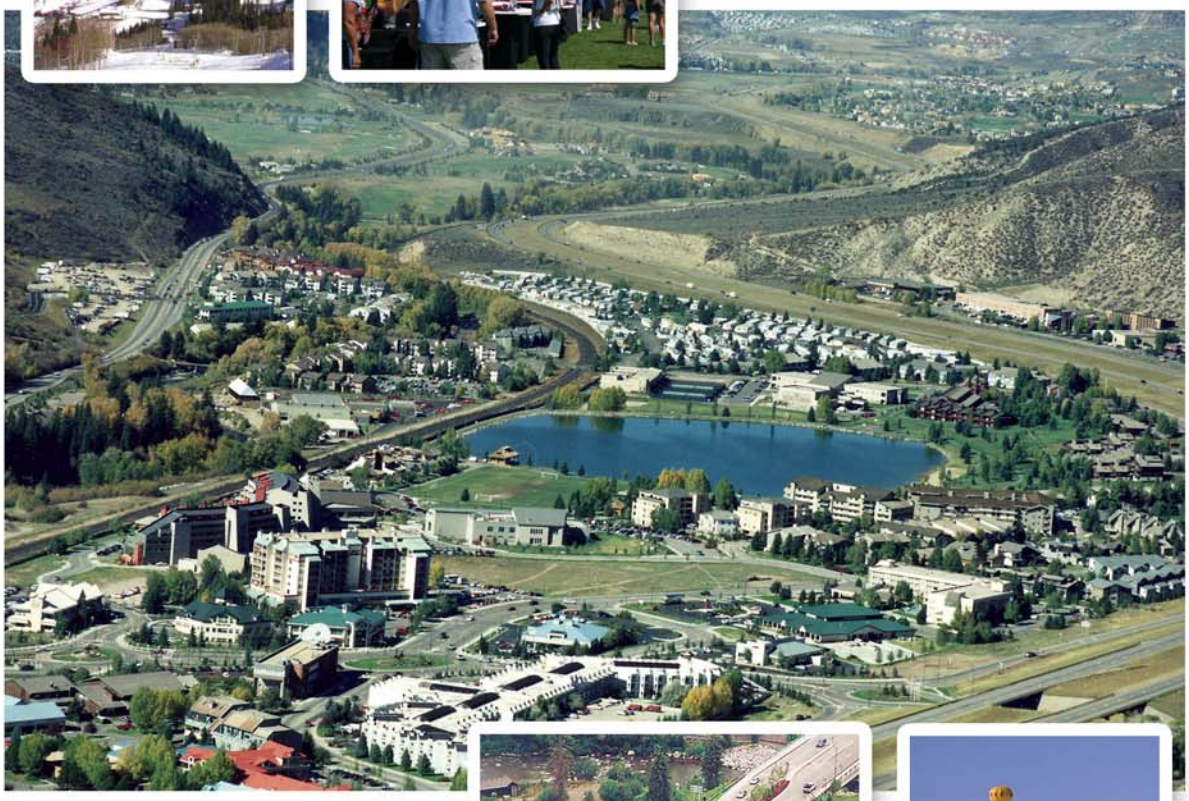
Town of Avon
Comprehensive Transportation Plan

October 2009

APPENDIX



FELSBURG HOLT & ULLEVIG

25 years of engineering paths to transportation solutions

The GreenWay Team

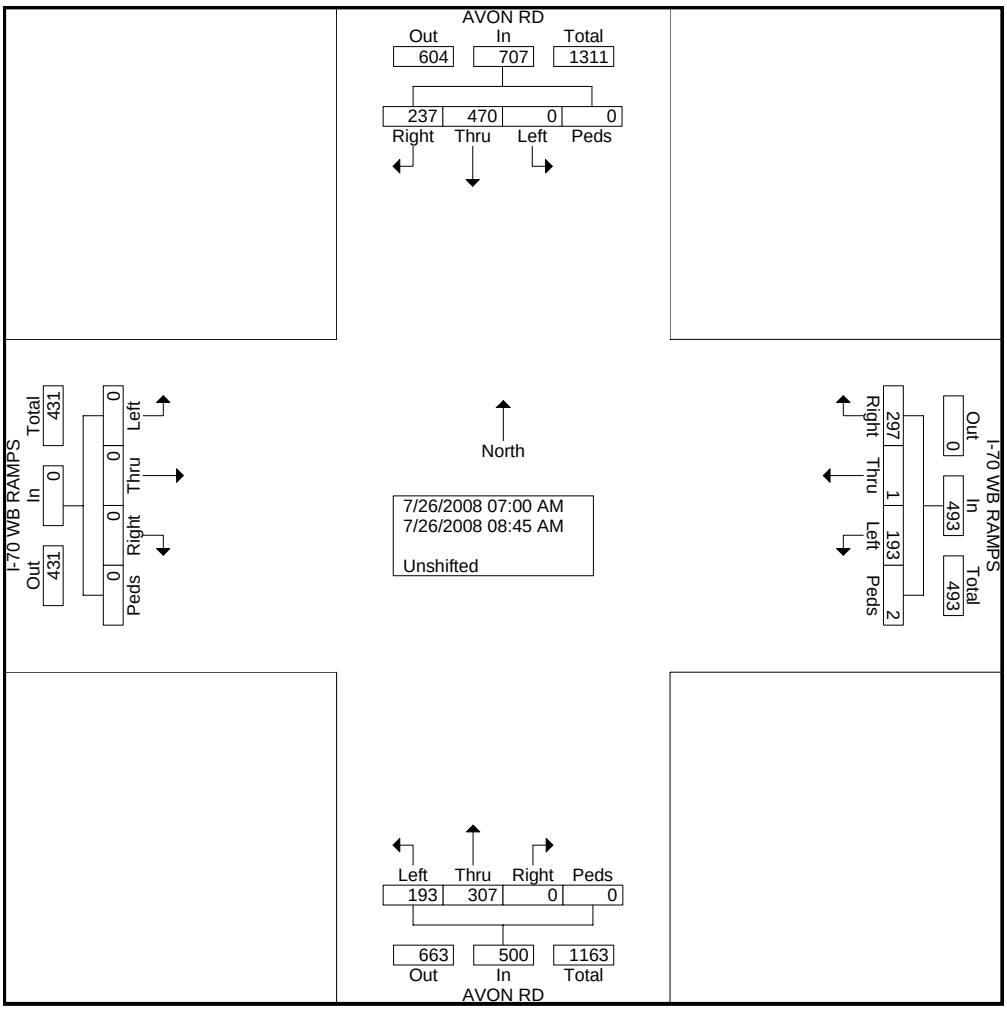
TransitPlus
Moving People & Ideas

APPENDIX A TRAFFIC COUNTS

File Name : #1 AVON&I-70WBRAMPSAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

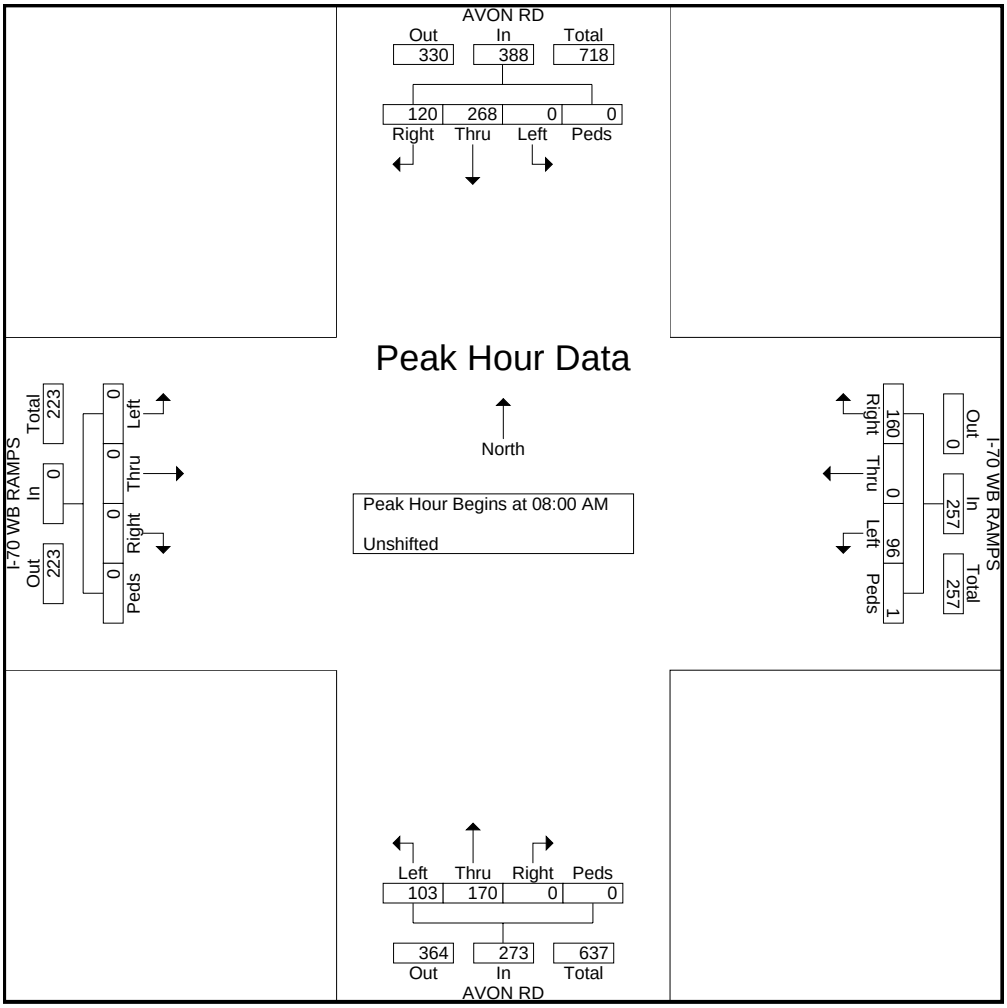
Groups Printed- Unshifted

	AVON RD Southbound				I-70 WB RAMPS Westbound				AVON RD Northbound				I-70 WB RAMPS Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	33	19	0	25	1	20	1	19	39	0	0	0	0	0	0	157
07:15 AM	0	57	28	0	21	0	32	0	11	34	0	0	0	0	0	0	183
07:30 AM	0	43	35	0	28	0	41	0	31	35	0	0	0	0	0	0	213
07:45 AM	0	69	35	0	23	0	44	0	29	29	0	0	0	0	0	0	229
Total	0	202	117	0	97	1	137	1	90	137	0	0	0	0	0	0	782
08:00 AM	0	56	22	0	22	0	42	0	20	40	0	0	0	0	0	0	202
08:15 AM	0	54	35	0	22	0	39	0	29	41	0	0	0	0	0	0	220
08:30 AM	0	77	38	0	27	0	45	0	18	44	0	0	0	0	0	0	249
08:45 AM	0	81	25	0	25	0	34	1	36	45	0	0	0	0	0	0	247
Total	0	268	120	0	96	0	160	1	103	170	0	0	0	0	0	0	918
Grand Total	0	470	237	0	193	1	297	2	193	307	0	0	0	0	0	0	1700
Apprch %	0	66.5	33.5	0	39.1	0.2	60.2	0.4	38.6	61.4	0	0	0	0	0	0	
Total %	0	27.6	13.9	0	11.4	0.1	17.5	0.1	11.4	18.1	0	0	0	0	0	0	



File Name : #1 AVON&I-70WBRAMPSAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

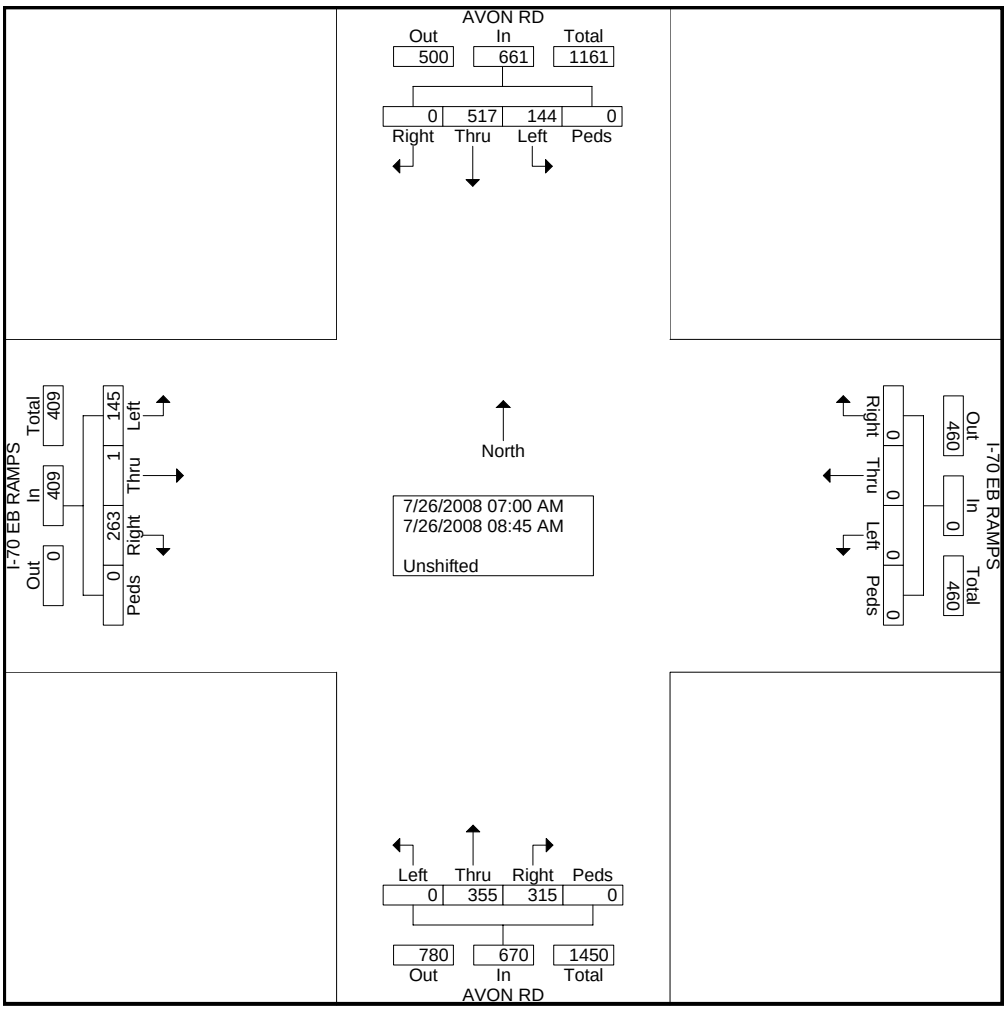
	AVON RD Southbound					I-70 WB RAMPS Westbound					AVON RD Northbound					I-70 WB RAMPS Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	56	22	0	78	22	0	42	0	64	20	40	0	0	60	0	0	0	0	0	202
08:15 AM	0	54	35	0	89	22	0	39	0	61	29	41	0	0	70	0	0	0	0	0	220
08:30 AM	0	77	38	0	115	27	0	45	0	72	18	44	0	0	62	0	0	0	0	0	249
08:45 AM	0	81	25	0	106	25	0	34	1	60	36	45	0	0	81	0	0	0	0	0	247
Total Volume	0	268	120	0	388	96	0	160	1	257	103	170	0	0	273	0	0	0	0	0	918
% App. Total	0	69.1	30.9	0		37.4	0	62.3	0.4		37.7	62.3	0	0		0	0	0	0		
PHF	.000	.827	.789	.000	.843	.889	.000	.889	.250	.892	.715	.944	.000	.000	.843	.000	.000	.000	.000	.000	.922



File Name : #2 AVON&I-70EBRAMPSAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

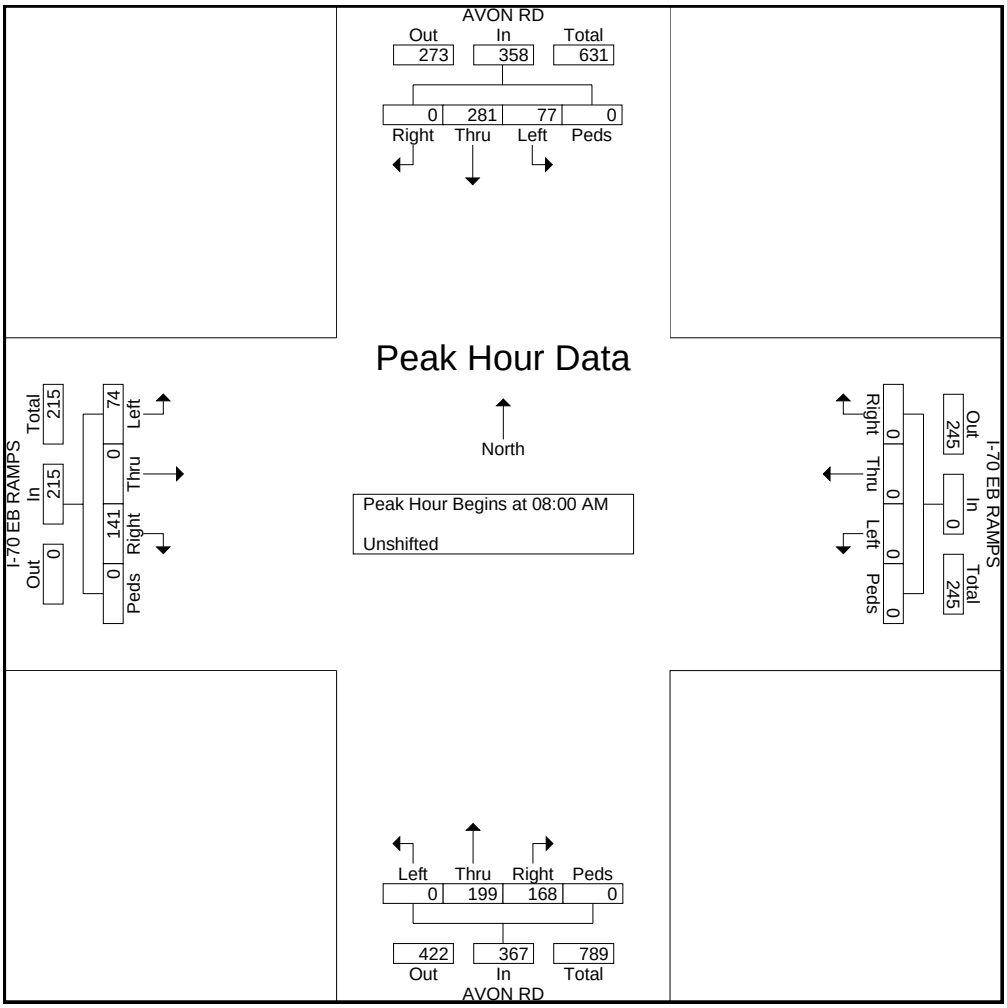
Groups Printed- Unshifted

	AVON RD Southbound				I-70 EB RAMPS Westbound				AVON RD Northbound				I-70 EB RAMPS Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	16	42	0	0	0	0	0	0	0	40	33	0	18	1	22	0	172
07:15 AM	15	63	0	0	0	0	0	0	0	31	35	0	14	0	19	0	177
07:30 AM	14	64	0	0	0	0	0	0	0	45	36	0	21	0	35	0	215
07:45 AM	22	67	0	0	0	0	0	0	0	40	43	0	18	0	46	0	236
Total	67	236	0	0	0	0	0	0	0	156	147	0	71	1	122	0	800
08:00 AM	14	63	0	0	0	0	0	0	0	42	39	0	18	0	35	0	211
08:15 AM	15	57	0	0	0	0	0	0	0	53	34	0	17	0	28	0	204
08:30 AM	22	81	0	0	0	0	0	0	0	43	45	0	19	0	38	0	248
08:45 AM	26	80	0	0	0	0	0	0	0	61	50	0	20	0	40	0	277
Total	77	281	0	0	0	0	0	0	0	199	168	0	74	0	141	0	940
Grand Total	144	517	0	0	0	0	0	0	0	355	315	0	145	1	263	0	1740
Apprch %	21.8	78.2	0	0	0	0	0	0	0	53	47	0	35.5	0.2	64.3	0	
Total %	8.3	29.7	0	0	0	0	0	0	0	20.4	18.1	0	8.3	0.1	15.1	0	



File Name : #2 AVON&I-70EBRAMPSAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

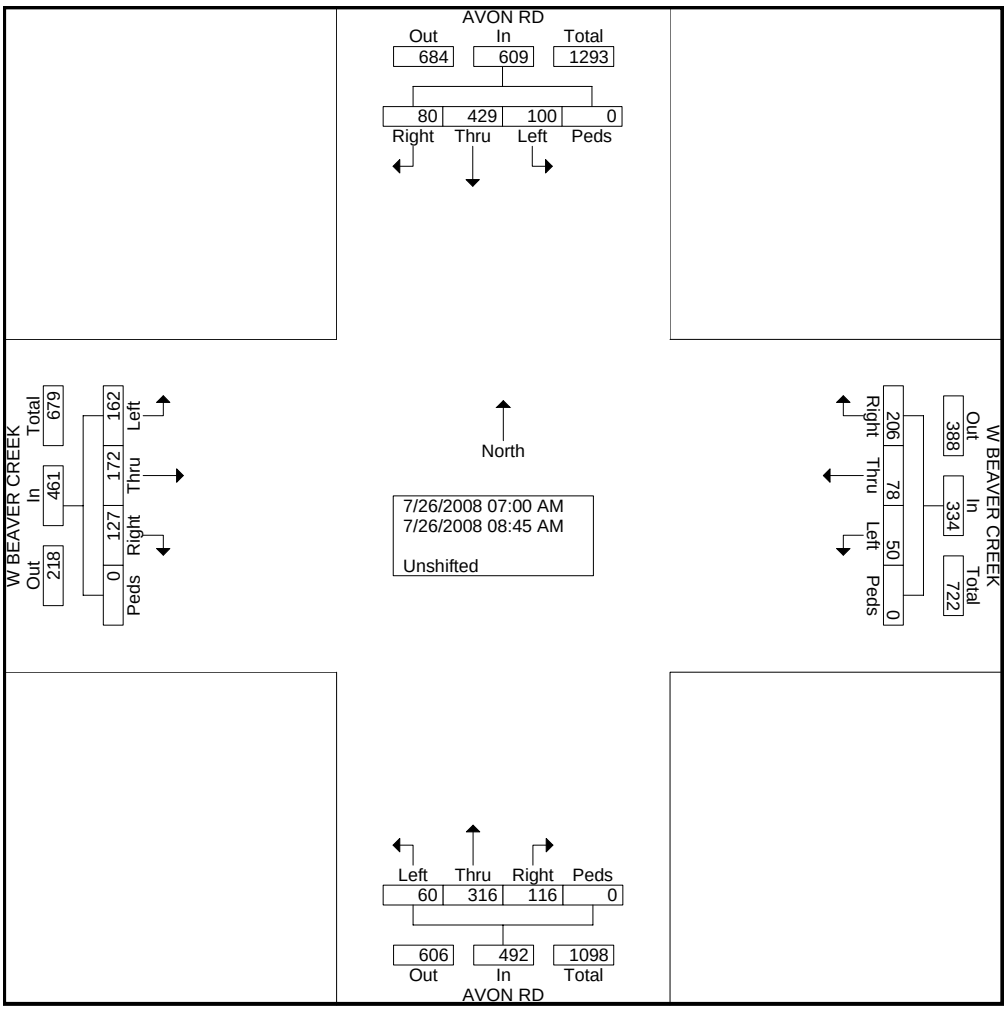
	AVON RD Southbound					I-70 EB RAMPS Westbound					AVON RD Northbound					I-70 EB RAMPS Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	14	63	0	0	77	0	0	0	0	0	0	42	39	0	81	18	0	35	0	53	211
08:15 AM	15	57	0	0	72	0	0	0	0	0	0	53	34	0	87	17	0	28	0	45	204
08:30 AM	22	81	0	0	103	0	0	0	0	0	0	43	45	0	88	19	0	38	0	57	248
08:45 AM	26	80	0	0	106	0	0	0	0	0	0	61	50	0	111	20	0	40	0	60	277
Total Volume	77	281	0	0	358	0	0	0	0	0	0	199	168	0	367	74	0	141	0	215	940
% App. Total	21.5	78.5	0	0		0	0	0	0		0	54.2	45.8	0		34.4	0	65.6	0		
PHF	.740	.867	.000	.000	.844	.000	.000	.000	.000	.000	.000	.816	.840	.000	.827	.925	.000	.881	.000	.896	.848



File Name : #3 WBEAVER&AVONAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

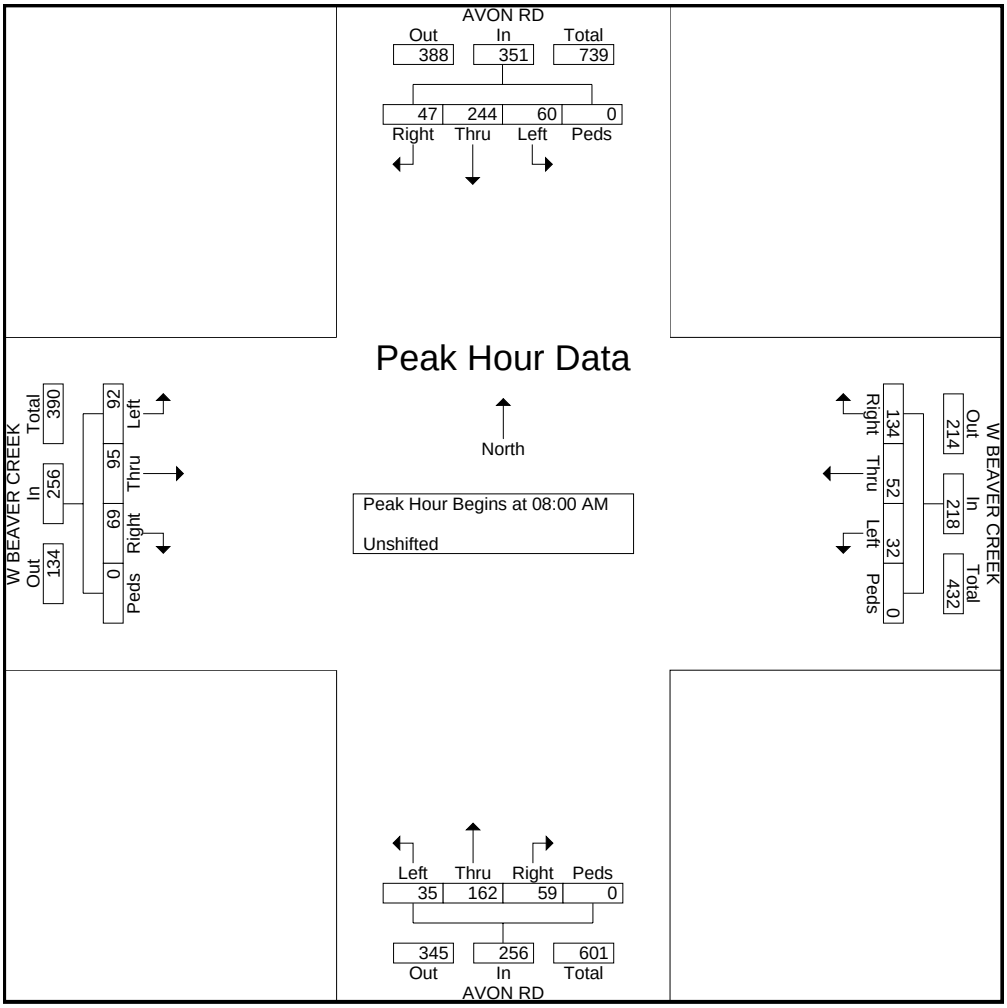
Groups Printed- Unshifted

	AVON RD Southbound				W BEAVER CREEK Westbound				AVON RD Northbound				W BEAVER CREEK Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	11	51	4	0	2	4	7	0	2	39	16	0	11	15	10	0	172
07:15 AM	10	39	7	0	5	11	10	0	5	41	16	0	15	14	16	0	189
07:30 AM	7	47	9	0	5	5	28	0	9	40	11	0	21	19	17	0	218
07:45 AM	12	48	13	0	6	6	27	0	9	34	14	0	23	29	15	0	236
Total	40	185	33	0	18	26	72	0	25	154	57	0	70	77	58	0	815
08:00 AM	12	52	10	0	7	13	28	0	9	34	15	0	24	29	14	0	247
08:15 AM	17	46	7	0	8	6	38	0	9	39	13	0	16	13	17	0	229
08:30 AM	14	64	8	0	9	12	33	0	10	42	17	0	28	15	17	0	269
08:45 AM	17	82	22	0	8	21	35	0	7	47	14	0	24	38	21	0	336
Total	60	244	47	0	32	52	134	0	35	162	59	0	92	95	69	0	1081
Grand Total	100	429	80	0	50	78	206	0	60	316	116	0	162	172	127	0	1896
Apprch %	16.4	70.4	13.1	0	15	23.4	61.7	0	12.2	64.2	23.6	0	35.1	37.3	27.5	0	
Total %	5.3	22.6	4.2	0	2.6	4.1	10.9	0	3.2	16.7	6.1	0	8.5	9.1	6.7	0	



File Name : #3 WBEAVER&AVONAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

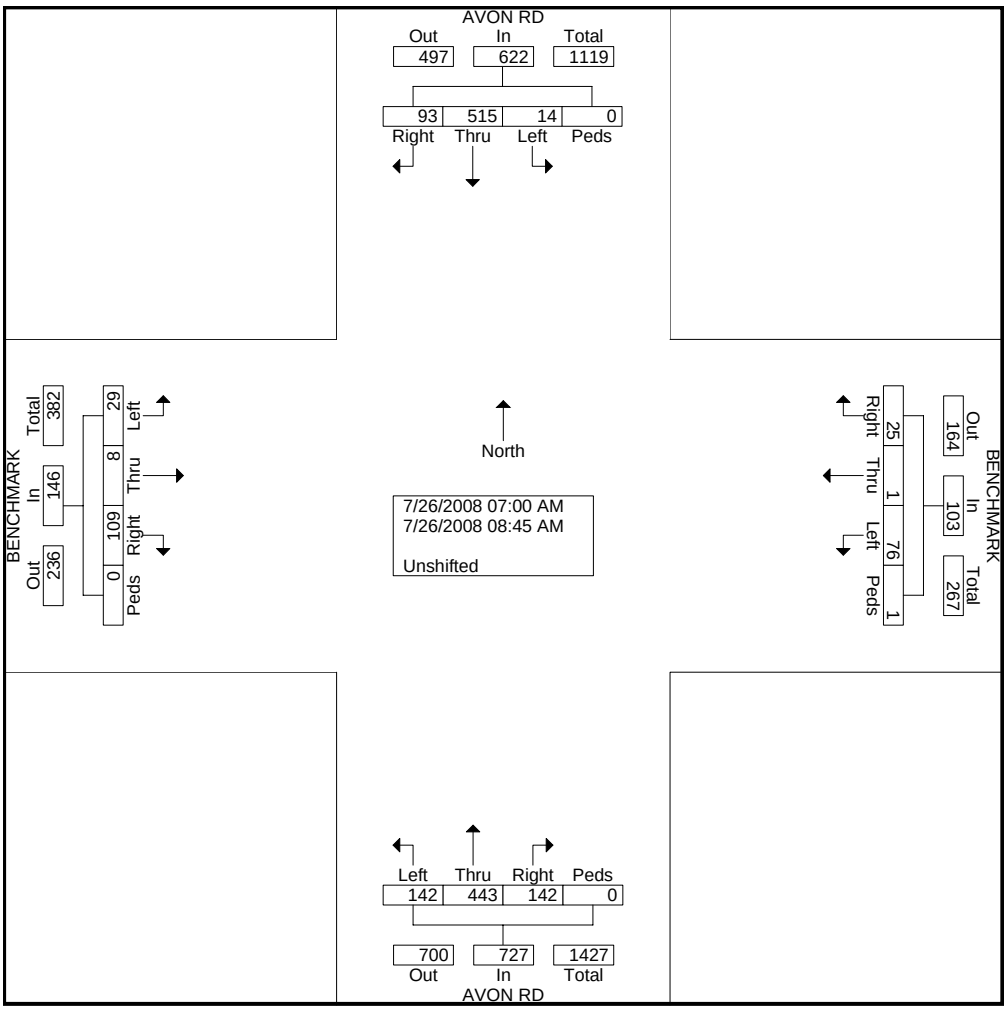
	AVON RD Southbound					W BEAVER CREEK Westbound					AVON RD Northbound					W BEAVER CREEK Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	12	52	10	0	74	7	13	28	0	48	9	34	15	0	58	24	29	14	0	67	247
08:15 AM	17	46	7	0	70	8	6	38	0	52	9	39	13	0	61	16	13	17	0	46	229
08:30 AM	14	64	8	0	86	9	12	33	0	54	10	42	17	0	69	28	15	17	0	60	269
08:45 AM	17	82	22	0	121	8	21	35	0	64	7	47	14	0	68	24	38	21	0	83	336
Total Volume	60	244	47	0	351	32	52	134	0	218	35	162	59	0	256	92	95	69	0	256	1081
% App. Total	17.1	69.5	13.4	0		14.7	23.9	61.5	0		13.7	63.3	23	0		35.9	37.1	27	0		
PHF	.882	.744	.534	.000	.725	.889	.619	.882	.000	.852	.875	.862	.868	.000	.928	.821	.625	.821	.000	.771	.804



File Name : #4 AVON&BENCHMARKAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

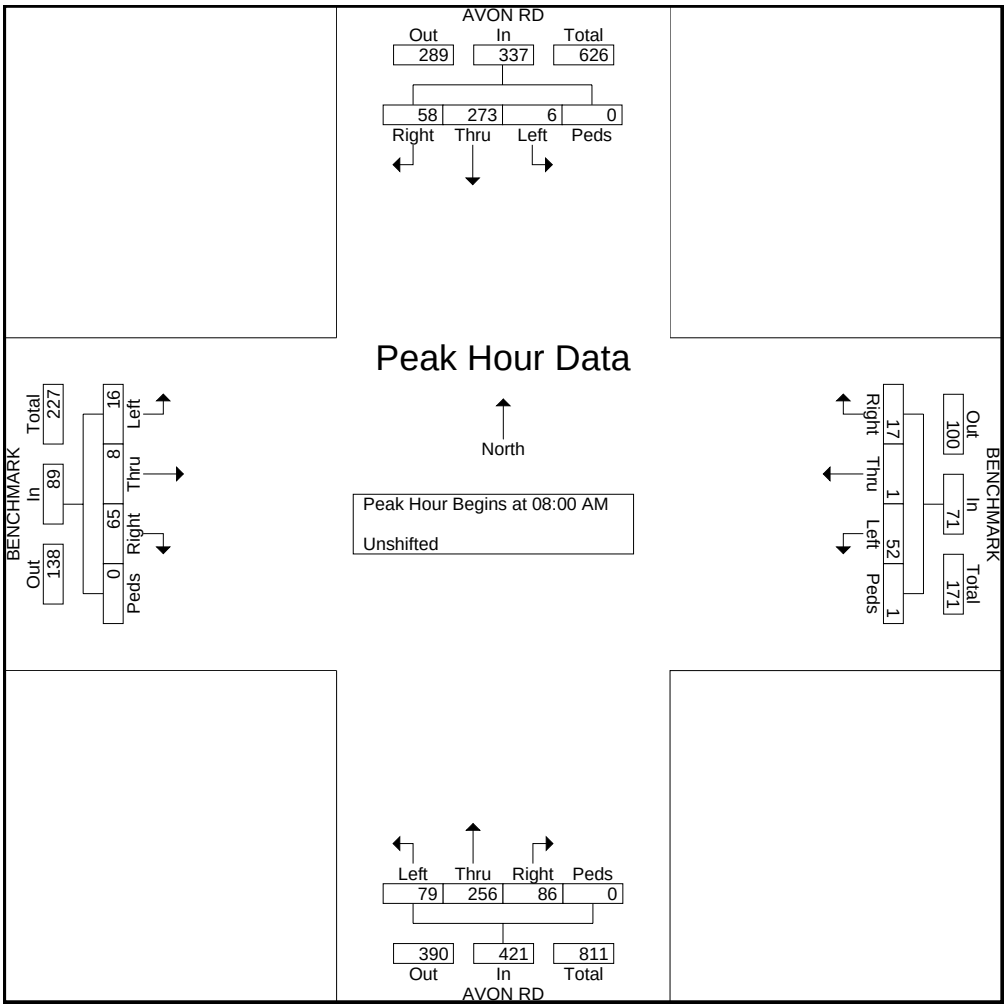
Groups Printed- Unshifted

	AVON RD Southbound				BENCHMARK Westbound				AVON RD Northbound				BENCHMARK Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	1	60	8	0	7	0	0	0	13	45	14	0	1	0	6	0	155
07:15 AM	2	62	7	0	2	0	3	0	15	44	15	0	1	0	10	0	161
07:30 AM	3	63	6	0	9	0	2	0	16	44	14	0	10	0	11	0	178
07:45 AM	2	57	14	0	6	0	3	0	19	54	13	0	1	0	17	0	186
Total	8	242	35	0	24	0	8	0	63	187	56	0	13	0	44	0	680
08:00 AM	2	65	15	0	11	1	7	0	11	43	18	0	2	2	18	0	195
08:15 AM	0	45	10	0	10	0	4	0	18	58	17	0	7	3	19	0	191
08:30 AM	1	81	13	0	14	0	3	1	22	62	26	0	4	2	14	0	243
08:45 AM	3	82	20	0	17	0	3	0	28	93	25	0	3	1	14	0	289
Total	6	273	58	0	52	1	17	1	79	256	86	0	16	8	65	0	918
Grand Total	14	515	93	0	76	1	25	1	142	443	142	0	29	8	109	0	1598
Apprch %	2.3	82.8	15	0	73.8	1	24.3	1	19.5	60.9	19.5	0	19.9	5.5	74.7	0	
Total %	0.9	32.2	5.8	0	4.8	0.1	1.6	0.1	8.9	27.7	8.9	0	1.8	0.5	6.8	0	



File Name : #4 AVON&BENCHMARKAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

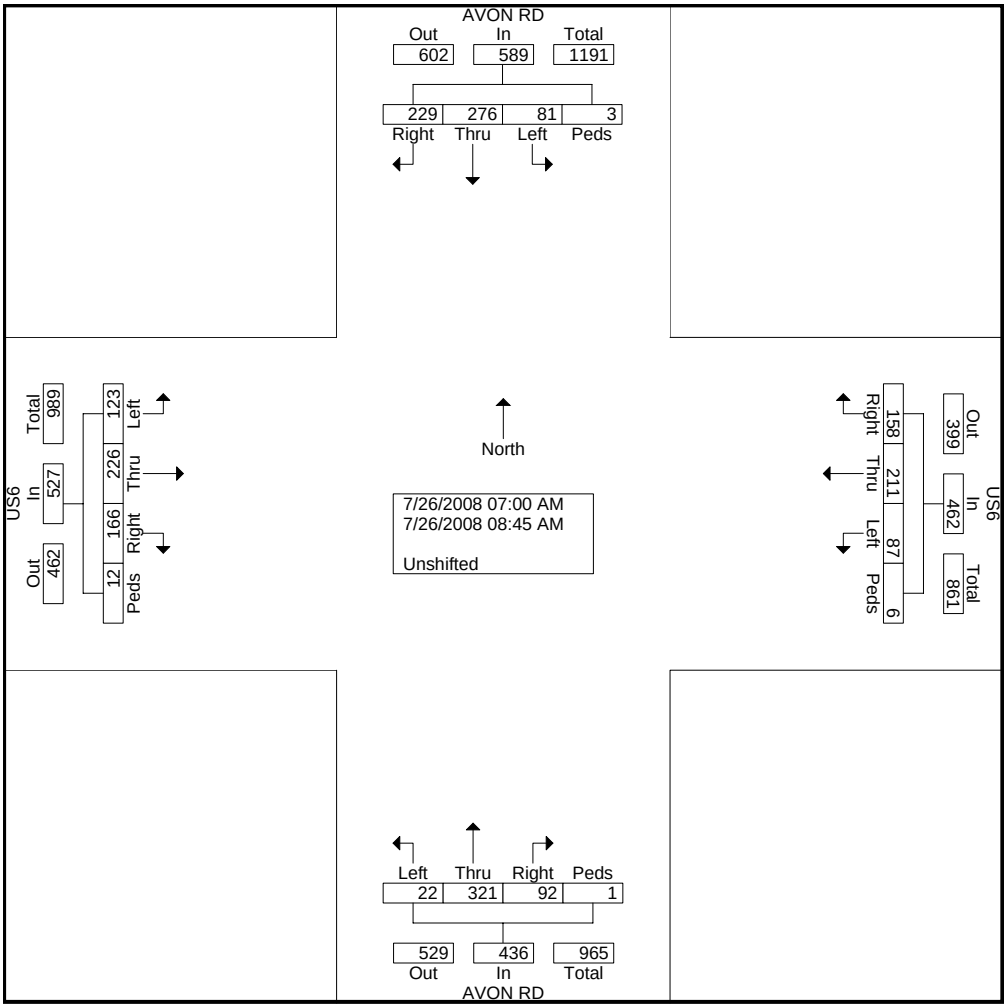
	AVON RD Southbound					BENCHMARK Westbound					AVON RD Northbound					BENCHMARK Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	2	65	15	0	82	11	1	7	0	19	11	43	18	0	72	2	2	18	0	22	195
08:15 AM	0	45	10	0	55	10	0	4	0	14	18	58	17	0	93	7	3	19	0	29	191
08:30 AM	1	81	13	0	95	14	0	3	1	18	22	62	26	0	110	4	2	14	0	20	243
08:45 AM	3	82	20	0	105	17	0	3	0	20	28	93	25	0	146	3	1	14	0	18	289
Total Volume	6	273	58	0	337	52	1	17	1	71	79	256	86	0	421	16	8	65	0	89	918
% App. Total	1.8	81	17.2	0		73.2	1.4	23.9	1.4		18.8	60.8	20.4	0		18	9	73	0		
PHF	.500	.832	.725	.000	.802	.765	.250	.607	.250	.888	.705	.688	.827	.000	.721	.571	.667	.855	.000	.767	.794



File Name : #5 AVON&US6AM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

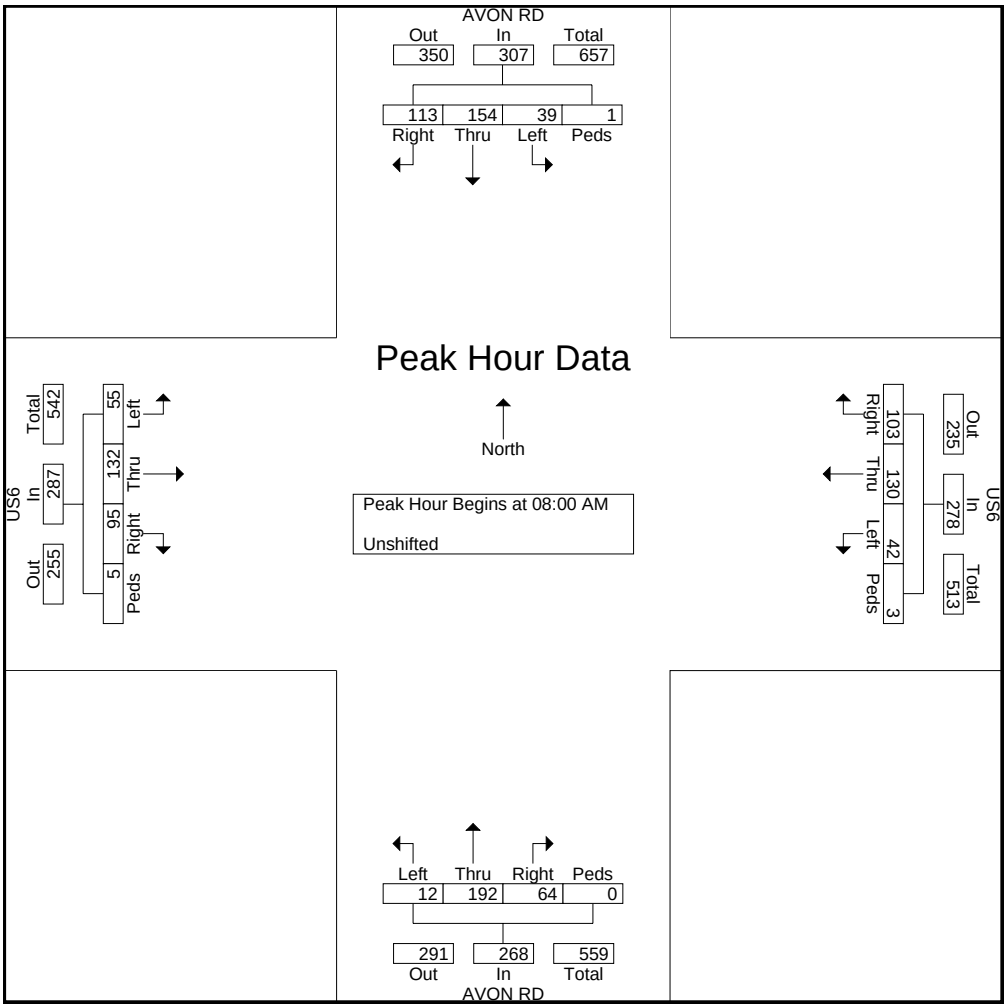
Groups Printed- Unshifted

	AVON RD Southbound				US6 Westbound				AVON RD Northbound				US6 Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	12	21	38	0	11	15	16	0	0	24	5	0	8	5	16	0	171
07:15 AM	8	32	26	2	9	14	10	2	3	33	8	1	25	22	14	3	212
07:30 AM	8	23	28	0	8	22	15	1	2	30	4	0	19	34	17	1	212
07:45 AM	14	46	24	0	17	30	14	0	5	42	11	0	16	33	24	3	279
Total	42	122	116	2	45	81	55	3	10	129	28	1	68	94	71	7	874
08:00 AM	13	34	23	0	13	27	19	0	0	32	20	0	17	31	20	2	251
08:15 AM	5	21	31	1	7	24	23	2	5	38	11	0	12	32	22	2	236
08:30 AM	13	42	26	0	9	38	26	0	3	56	12	0	15	39	25	0	304
08:45 AM	8	57	33	0	13	41	35	1	4	66	21	0	11	30	28	1	349
Total	39	154	113	1	42	130	103	3	12	192	64	0	55	132	95	5	1140
Grand Total	81	276	229	3	87	211	158	6	22	321	92	1	123	226	166	12	2014
Apprch %	13.8	46.9	38.9	0.5	18.8	45.7	34.2	1.3	5	73.6	21.1	0.2	23.3	42.9	31.5	2.3	
Total %	4	13.7	11.4	0.1	4.3	10.5	7.8	0.3	1.1	15.9	4.6	0	6.1	11.2	8.2	0.6	



File Name : #5 AVON&US6AM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

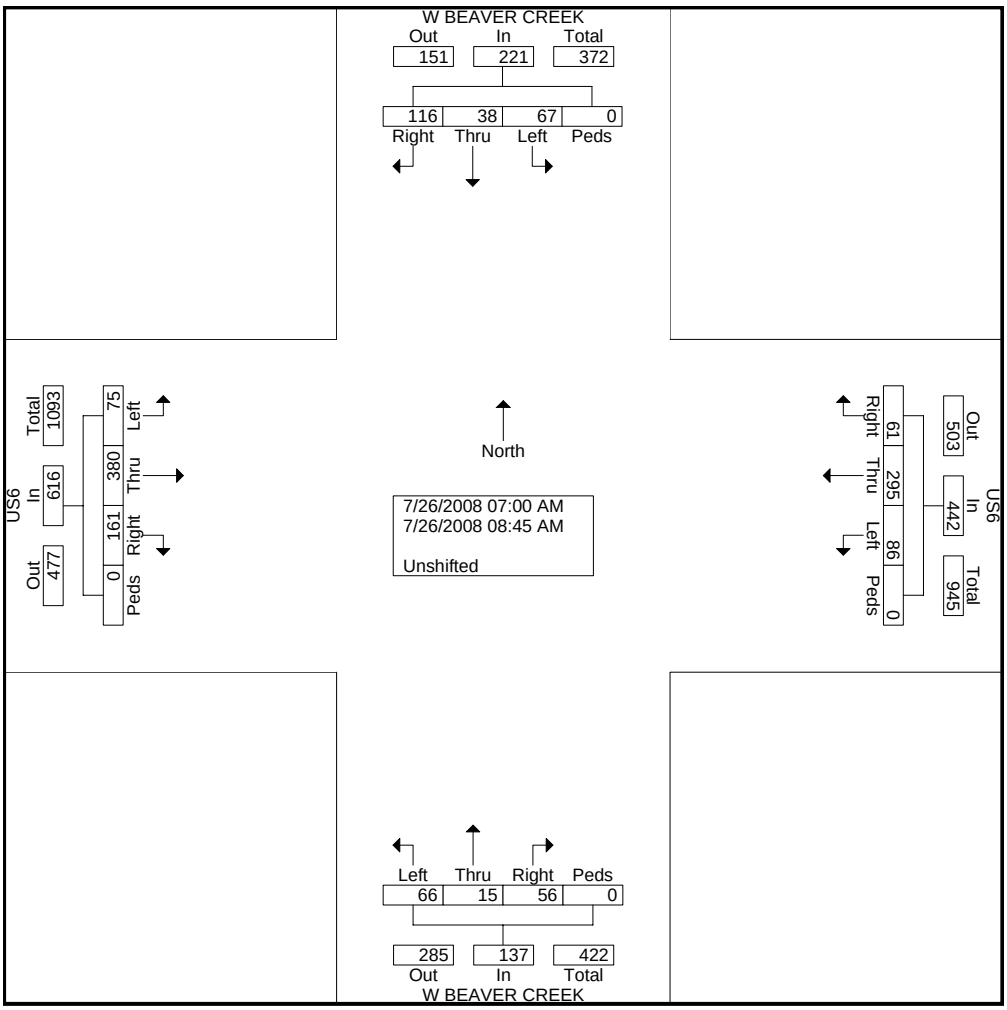
	AVON RD Southbound					US6 Westbound					AVON RD Northbound					US6 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	13	34	23	0	70	13	27	19	0	59	0	32	20	0	52	17	31	20	2	70	251
08:15 AM	5	21	31	1	58	7	24	23	2	56	5	38	11	0	54	12	32	22	2	68	236
08:30 AM	13	42	26	0	81	9	38	26	0	73	3	56	12	0	71	15	39	25	0	79	304
08:45 AM	8	57	33	0	98	13	41	35	1	90	4	66	21	0	91	11	30	28	1	70	349
Total Volume	39	154	113	1	307	42	130	103	3	278	12	192	64	0	268	55	132	95	5	287	1140
% App. Total	12.7	50.2	36.8	0.3		15.1	46.8	37.1	1.1		4.5	71.6	23.9	0		19.2	46	33.1	1.7		
PHF	.750	.675	.856	.250	.783	.808	.793	.736	.375	.772	.600	.727	.762	.000	.736	.809	.846	.848	.625	.908	.817



File Name : #6 WBEAVER&US6AM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

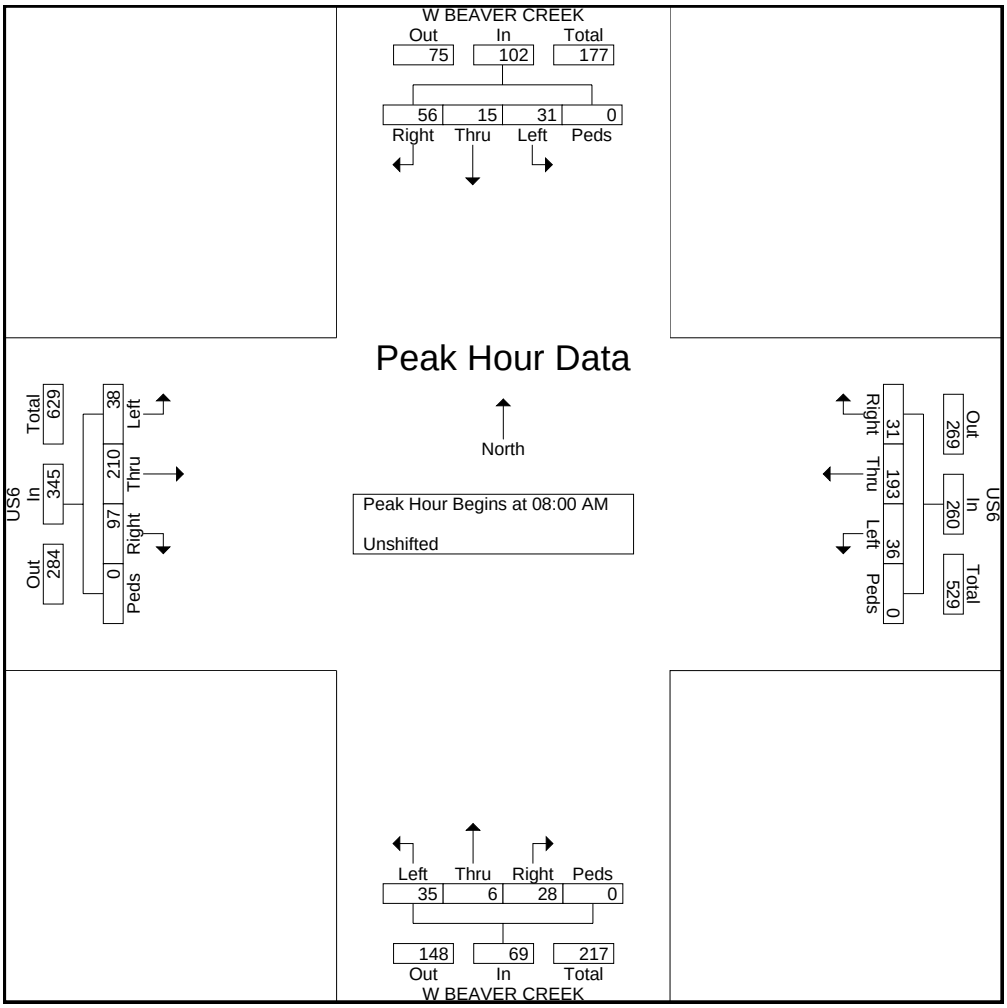
Groups Printed- Unshifted

	W BEAVER CREEK Southbound				US6 Westbound				W BEAVER CREEK Northbound				US6 Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	6	2	4	0	9	22	6	0	3	2	5	0	11	26	5	0	101
07:15 AM	11	2	7	0	9	26	2	0	6	3	8	0	9	45	14	0	142
07:30 AM	8	13	18	0	17	20	12	0	14	1	9	0	9	40	19	0	180
07:45 AM	11	6	31	0	15	34	10	0	8	3	6	0	8	59	26	0	217
Total	36	23	60	0	50	102	30	0	31	9	28	0	37	170	64	0	640
08:00 AM	13	2	16	0	13	30	12	0	13	2	7	0	7	49	9	0	173
08:15 AM	2	1	17	0	6	44	10	0	7	0	5	0	9	39	19	0	159
08:30 AM	7	4	11	0	14	62	3	0	6	2	7	0	11	59	33	0	219
08:45 AM	9	8	12	0	3	57	6	0	9	2	9	0	11	63	36	0	225
Total	31	15	56	0	36	193	31	0	35	6	28	0	38	210	97	0	776
Grand Total	67	38	116	0	86	295	61	0	66	15	56	0	75	380	161	0	1416
Apprch %	30.3	17.2	52.5	0	19.5	66.7	13.8	0	48.2	10.9	40.9	0	12.2	61.7	26.1	0	
Total %	4.7	2.7	8.2	0	6.1	20.8	4.3	0	4.7	1.1	4	0	5.3	26.8	11.4	0	



File Name : #6 WBEAVER&US6AM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

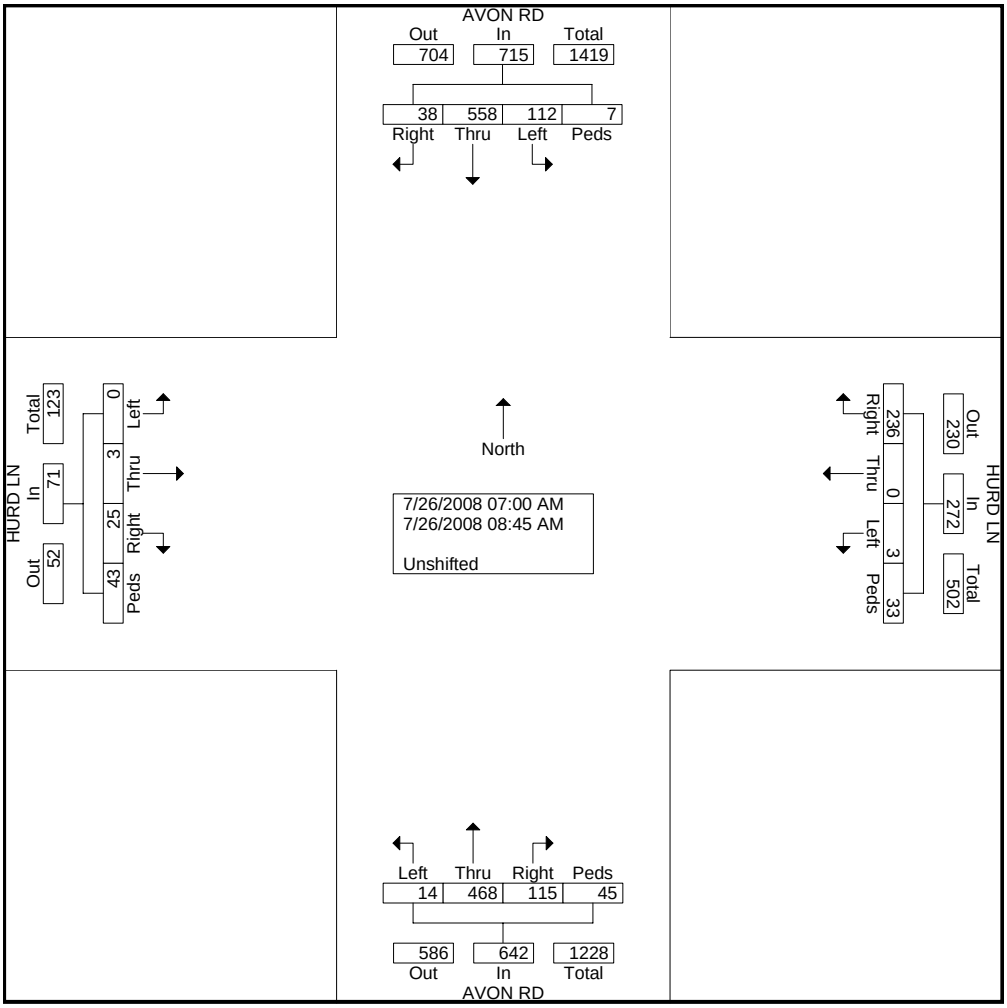
	W BEAVER CREEK Southbound					US6 Westbound					W BEAVER CREEK Northbound					US6 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	13	2	16	0	31	13	30	12	0	55	13	2	7	0	22	7	49	9	0	65	173
08:15 AM	2	1	17	0	20	6	44	10	0	60	7	0	5	0	12	9	39	19	0	67	159
08:30 AM	7	4	11	0	22	14	62	3	0	79	6	2	7	0	15	11	59	33	0	103	219
08:45 AM	9	8	12	0	29	3	57	6	0	66	9	2	9	0	20	11	63	36	0	110	225
Total Volume	31	15	56	0	102	36	193	31	0	260	35	6	28	0	69	38	210	97	0	345	776
% App. Total	30.4	14.7	54.9	0		13.8	74.2	11.9	0		50.7	8.7	40.6	0		11	60.9	28.1	0		
PHF	.596	.469	.824	.000	.823	.643	.778	.646	.000	.823	.673	.750	.778	.000	.784	.864	.833	.674	.000	.784	.862



File Name : #7 AVON&HURDAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

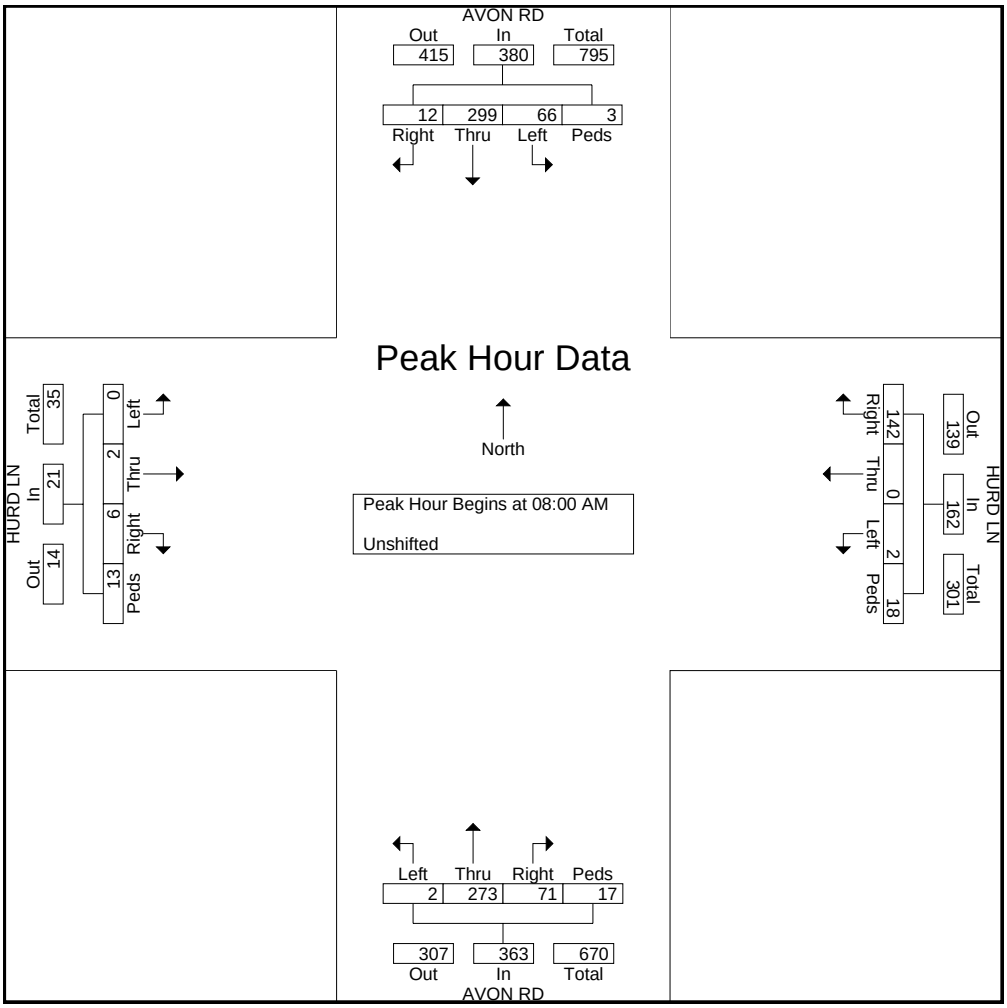
Groups Printed- Unshifted

	AVON RD Southbound				HURD LN Westbound				AVON RD Northbound				HURD LN Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	11	64	6	2	1	0	20	5	7	36	12	19	0	0	6	14	203
07:15 AM	6	60	7	1	0	0	24	4	2	54	10	1	0	0	5	4	178
07:30 AM	18	55	10	1	0	0	21	3	1	45	13	2	0	0	4	10	183
07:45 AM	11	80	3	0	0	0	29	3	2	60	9	6	0	1	4	2	210
Total	46	259	26	4	1	0	94	15	12	195	44	28	0	1	19	30	774
08:00 AM	16	69	3	0	1	0	24	4	0	52	14	2	0	1	1	3	190
08:15 AM	17	54	3	0	0	0	30	4	1	57	16	5	0	0	3	5	195
08:30 AM	15	80	5	1	0	0	39	6	1	68	24	3	0	0	1	1	244
08:45 AM	18	96	1	2	1	0	49	4	0	96	17	7	0	1	1	4	297
Total	66	299	12	3	2	0	142	18	2	273	71	17	0	2	6	13	926
Grand Total	112	558	38	7	3	0	236	33	14	468	115	45	0	3	25	43	1700
Apprch %	15.7	78	5.3	1	1.1	0	86.8	12.1	2.2	72.9	17.9	7	0	4.2	35.2	60.6	
Total %	6.6	32.8	2.2	0.4	0.2	0	13.9	1.9	0.8	27.5	6.8	2.6	0	0.2	1.5	2.5	



File Name : #7 AVON&HURDAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

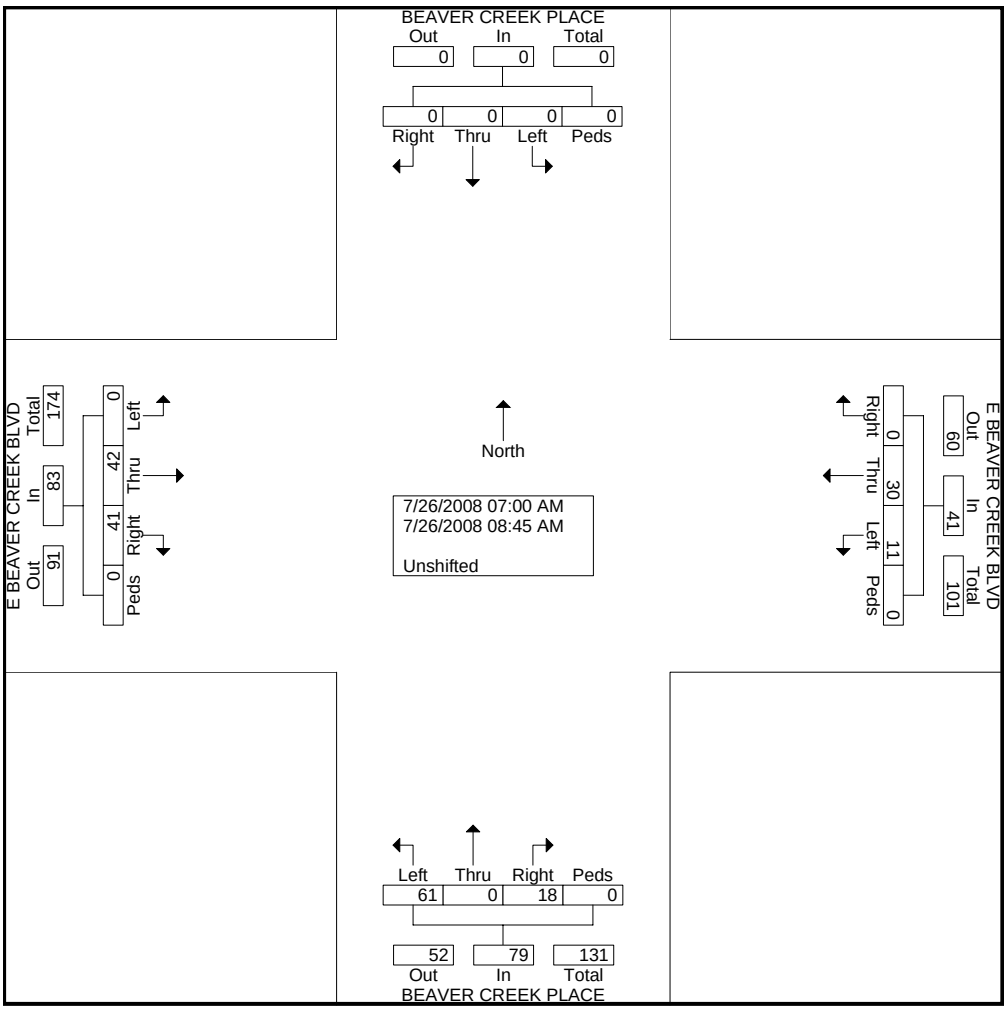
	AVON RD Southbound					HURD LN Westbound					AVON RD Northbound					HURD LN Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	16	69	3	0	88	1	0	24	4	29	0	52	14	2	68	0	1	1	3	5	190
08:15 AM	17	54	3	0	74	0	0	30	4	34	1	57	16	5	79	0	0	3	5	8	195
08:30 AM	15	80	5	1	101	0	0	39	6	45	1	68	24	3	96	0	0	1	1	2	244
08:45 AM	18	96	1	2	117	1	0	49	4	54	0	96	17	7	120	0	1	1	4	6	297
Total Volume	66	299	12	3	380	2	0	142	18	162	2	273	71	17	363	0	2	6	13	21	926
% App. Total	17.4	78.7	3.2	0.8		1.2	0	87.7	11.1		0.6	75.2	19.6	4.7		0	9.5	28.6	61.9		
PHF	.917	.779	.600	.375	.812	.500	.000	.724	.750	.750	.500	.711	.740	.607	.756	.000	.500	.500	.650	.656	.779



File Name : #8 EBEAVER&BEAVERPLAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

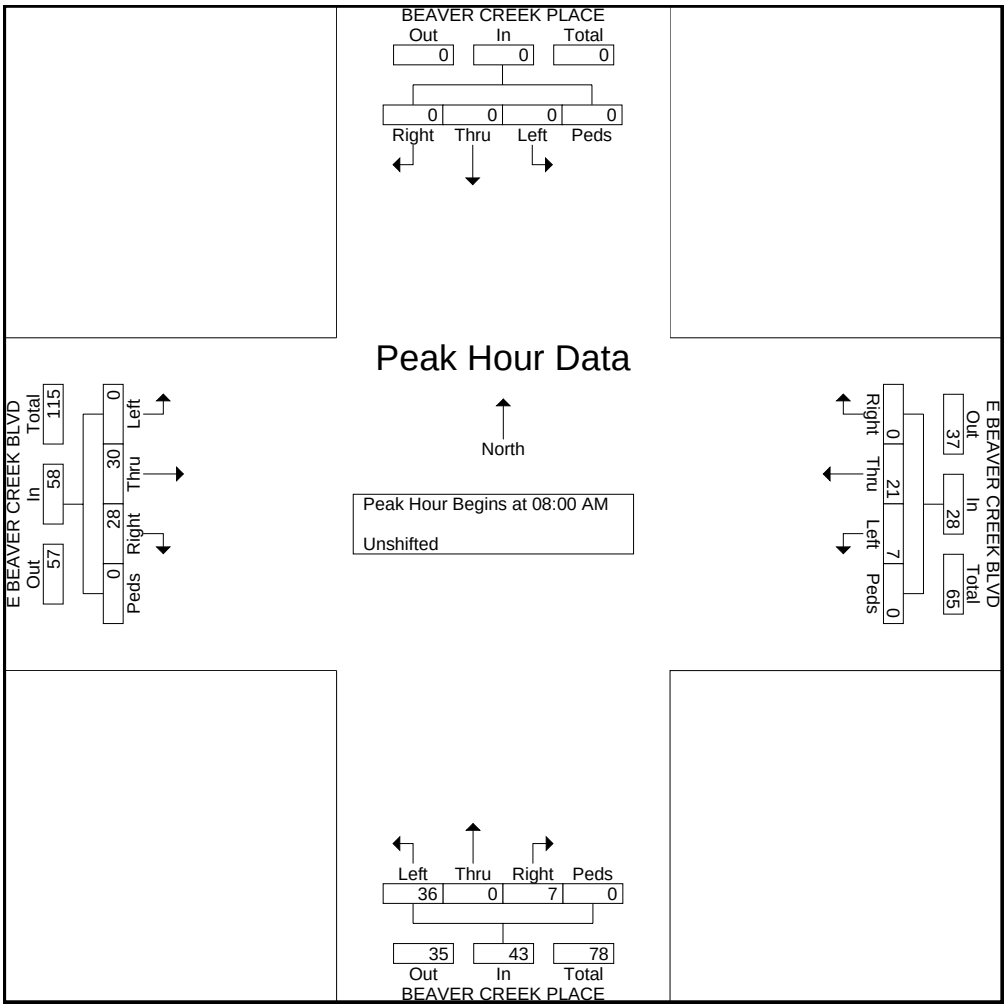
Groups Printed- Unshifted

	BEAVER CREEK PLACE Southbound				E BEAVER CREEK BLVD Westbound				BEAVER CREEK PLACE Northbound				E BEAVER CREEK BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	0	0	0	0	4	0	0	5	0	2	0	0	1	3	0	15
07:15 AM	0	0	0	0	0	2	0	0	4	0	3	0	0	6	2	0	17
07:30 AM	0	0	0	0	1	1	0	0	7	0	4	0	0	3	3	0	19
07:45 AM	0	0	0	0	3	2	0	0	9	0	2	0	0	2	5	0	23
Total	0	0	0	0	4	9	0	0	25	0	11	0	0	12	13	0	74
08:00 AM	0	0	0	0	4	5	0	0	11	0	1	0	0	3	5	0	29
08:15 AM	0	0	0	0	0	1	0	0	7	0	0	0	0	7	5	0	20
08:30 AM	0	0	0	0	1	9	0	0	8	0	4	0	0	8	11	0	41
08:45 AM	0	0	0	0	2	6	0	0	10	0	2	0	0	12	7	0	39
Total	0	0	0	0	7	21	0	0	36	0	7	0	0	30	28	0	129
Grand Total	0	0	0	0	11	30	0	0	61	0	18	0	0	42	41	0	203
Apprch %	0	0	0	0	26.8	73.2	0	0	77.2	0	22.8	0	0	50.6	49.4	0	
Total %	0	0	0	0	5.4	14.8	0	0	30	0	8.9	0	0	20.7	20.2	0	



File Name : #8 EBEAVER&BEAVERPLAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

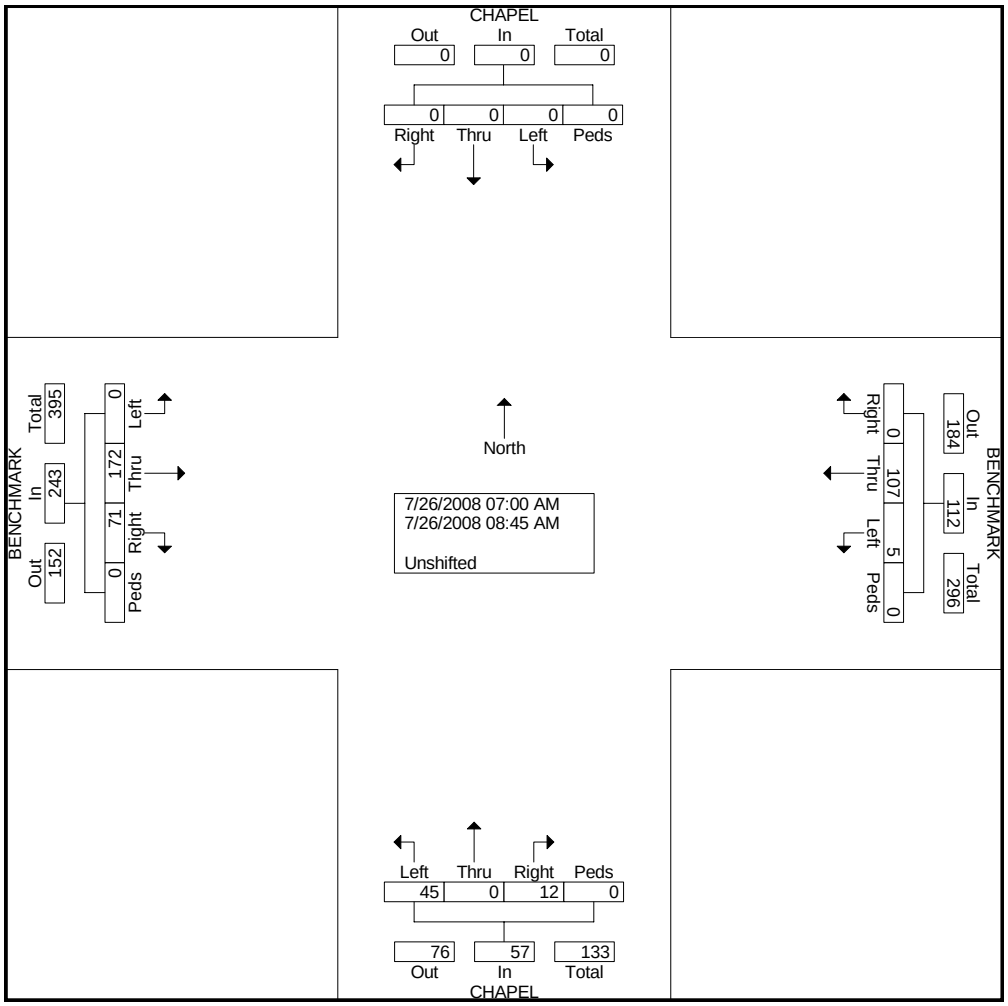
	BEAVER CREEK PLACE Southbound					E BEAVER CREEK BLVD Westbound					BEAVER CREEK PLACE Northbound					E BEAVER CREEK BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	4	5	0	0	9	11	0	1	0	12	0	3	5	0	8	29
08:15 AM	0	0	0	0	0	0	1	0	0	1	7	0	0	0	7	0	7	5	0	12	20
08:30 AM	0	0	0	0	0	1	9	0	0	10	8	0	4	0	12	0	8	11	0	19	41
08:45 AM	0	0	0	0	0	2	6	0	0	8	10	0	2	0	12	0	12	7	0	19	39
Total Volume	0	0	0	0	0	7	21	0	0	28	36	0	7	0	43	0	30	28	0	58	129
% App. Total	0	0	0	0		25	75	0	0		83.7	0	16.3	0		0	51.7	48.3	0		
PHF	.000	.000	.000	.000	.000	.438	.583	.000	.000	.700	.818	.000	.438	.000	.896	.000	.625	.636	.000	.763	.787



File Name : #9 BENCHMARK&CHAPELAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

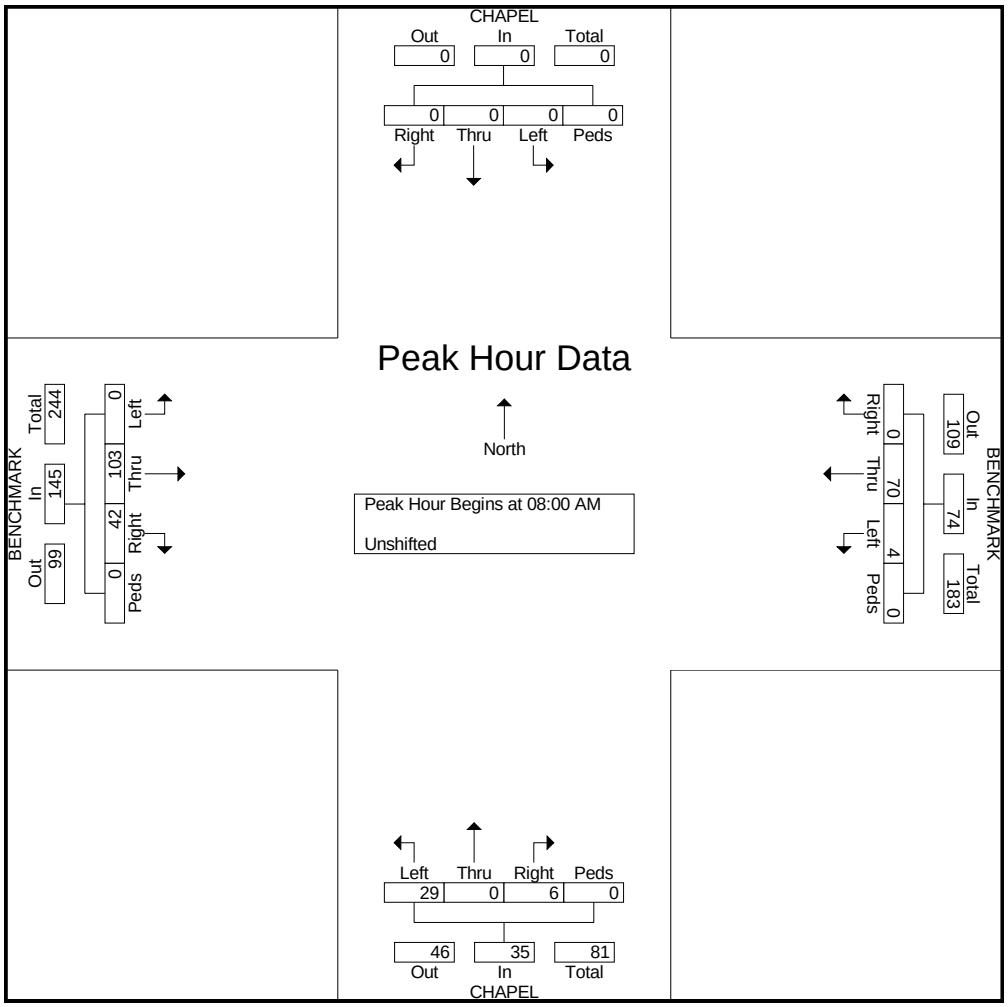
Groups Printed- Unshifted

	CHAPEL Southbound				BENCHMARK Westbound				CHAPEL Northbound				BENCHMARK Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	0	0	0	0	6	0	0	3	0	0	0	0	14	5	0	28
07:15 AM	0	0	0	0	1	7	0	0	5	0	3	0	0	18	8	0	42
07:30 AM	0	0	0	0	0	12	0	0	4	0	0	0	0	19	9	0	44
07:45 AM	0	0	0	0	0	12	0	0	4	0	3	0	0	18	7	0	44
Total	0	0	0	0	1	37	0	0	16	0	6	0	0	69	29	0	158
08:00 AM	0	0	0	0	1	12	0	0	6	0	0	0	0	21	8	0	48
08:15 AM	0	0	0	0	0	15	0	0	6	0	1	0	0	24	5	0	51
08:30 AM	0	0	0	0	1	19	0	0	5	0	1	0	0	32	13	0	71
08:45 AM	0	0	0	0	2	24	0	0	12	0	4	0	0	26	16	0	84
Total	0	0	0	0	4	70	0	0	29	0	6	0	0	103	42	0	254
Grand Total	0	0	0	0	5	107	0	0	45	0	12	0	0	172	71	0	412
Apprch %	0	0	0	0	4.5	95.5	0	0	78.9	0	21.1	0	0	70.8	29.2	0	
Total %	0	0	0	0	1.2	26	0	0	10.9	0	2.9	0	0	41.7	17.2	0	



File Name : #9 BENCHMARK&CHAPELAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

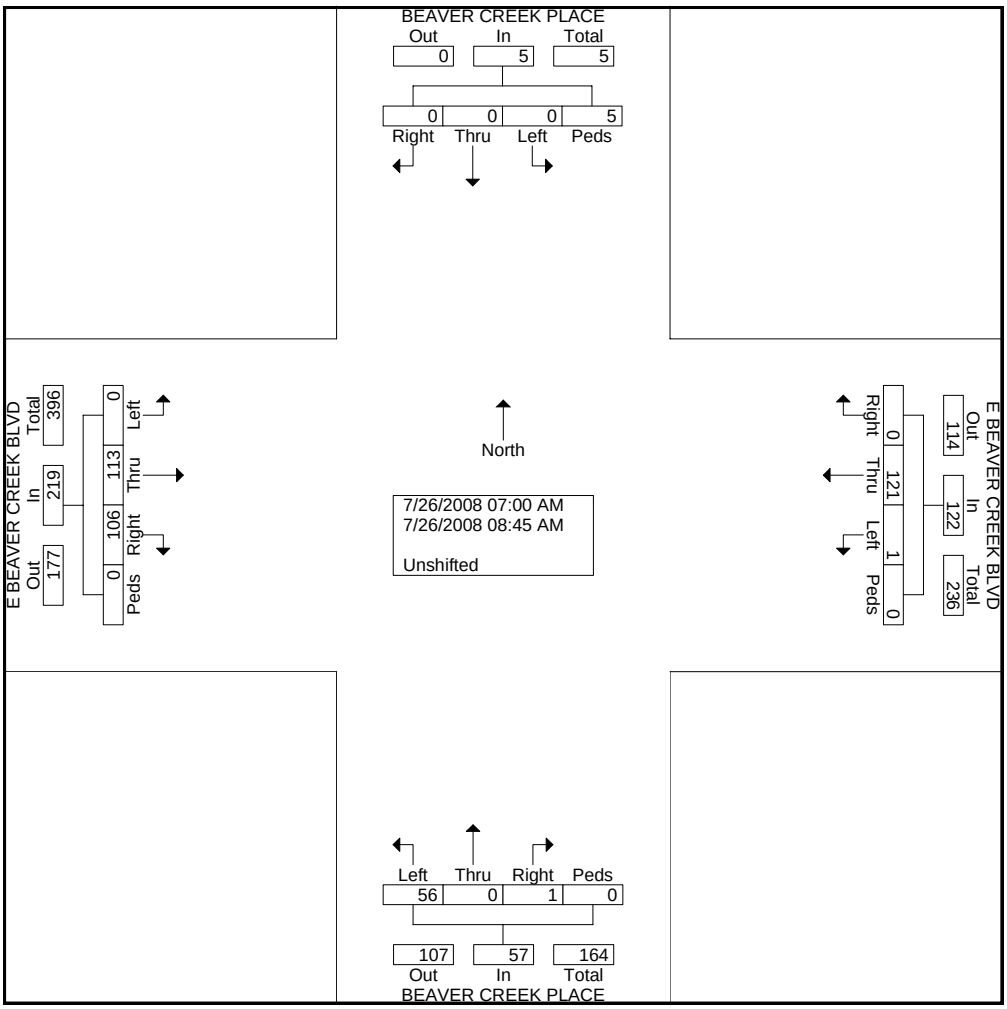
	CHAPEL Southbound					BENCHMARK Westbound					CHAPEL Northbound					BENCHMARK Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	1	12	0	0	13	6	0	0	0	6	0	21	8	0	29	48
08:15 AM	0	0	0	0	0	0	15	0	0	15	6	0	1	0	7	0	24	5	0	29	51
08:30 AM	0	0	0	0	0	1	19	0	0	20	5	0	1	0	6	0	32	13	0	45	71
08:45 AM	0	0	0	0	0	2	24	0	0	26	12	0	4	0	16	0	26	16	0	42	84
Total Volume	0	0	0	0	0	4	70	0	0	74	29	0	6	0	35	0	103	42	0	145	254
% App. Total	0	0	0	0		5.4	94.6	0	0		82.9	0	17.1	0		0	71	29	0		
PHF	.000	.000	.000	.000	.000	.500	.729	.000	.000	.712	.604	.000	.375	.000	.547	.000	.805	.656	.000	.806	.756



File Name : #10 EBEAVER&EBEAVERAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

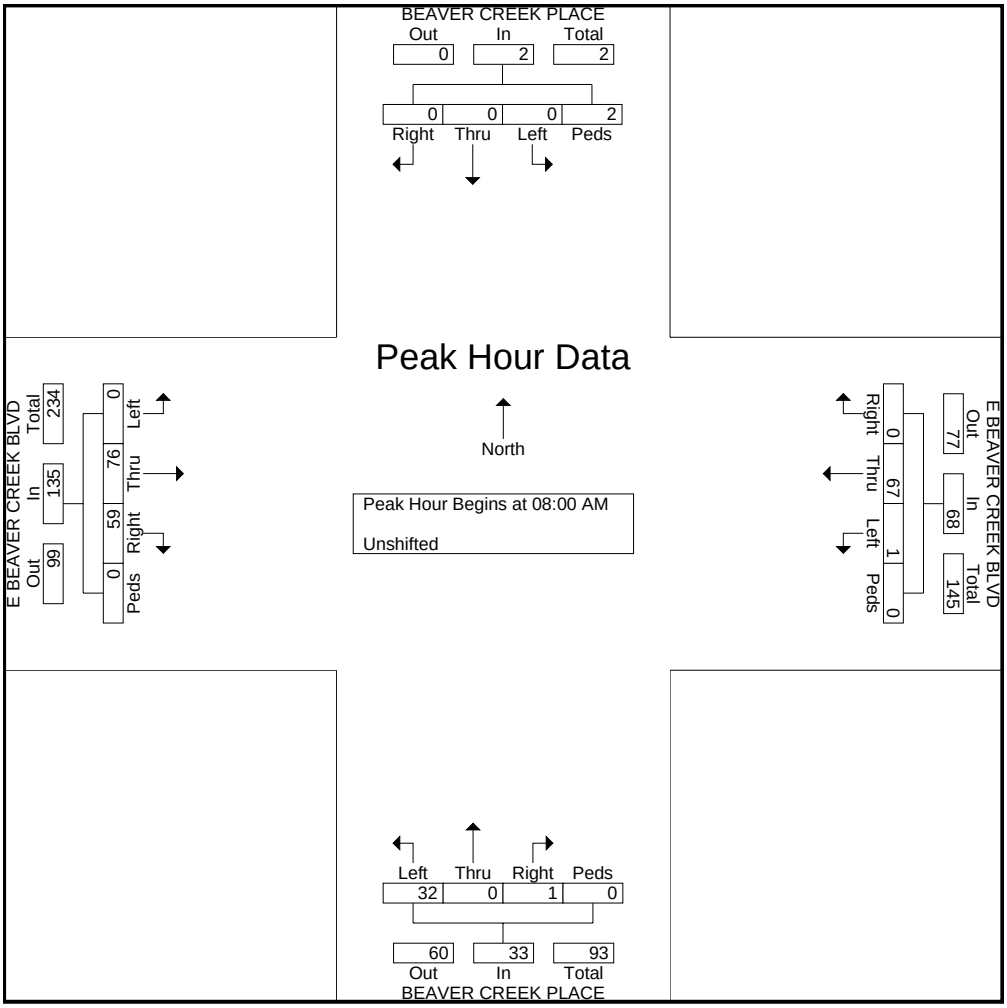
Groups Printed- Unshifted

	BEAVER CREEK PLACE Southbound				E BEAVER CREEK BLVD Westbound				BEAVER CREEK PLACE Northbound				E BEAVER CREEK BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	0	0	1	0	14	0	0	4	0	0	0	0	8	9	0	36
07:15 AM	0	0	0	0	0	17	0	0	8	0	0	0	0	14	14	0	53
07:30 AM	0	0	0	2	0	11	0	0	5	0	0	0	0	6	12	0	36
07:45 AM	0	0	0	0	0	12	0	0	7	0	0	0	0	9	12	0	40
Total	0	0	0	3	0	54	0	0	24	0	0	0	0	37	47	0	165
08:00 AM	0	0	0	0	0	20	0	0	7	0	1	0	0	11	16	0	55
08:15 AM	0	0	0	0	0	12	0	0	12	0	0	0	0	13	13	0	50
08:30 AM	0	0	0	2	1	20	0	0	7	0	0	0	0	30	19	0	79
08:45 AM	0	0	0	0	0	15	0	0	6	0	0	0	0	22	11	0	54
Total	0	0	0	2	1	67	0	0	32	0	1	0	0	76	59	0	238
Grand Total	0	0	0	5	1	121	0	0	56	0	1	0	0	113	106	0	403
Apprch %	0	0	0	100	0.8	99.2	0	0	98.2	0	1.8	0	0	51.6	48.4	0	
Total %	0	0	0	1.2	0.2	30	0	0	13.9	0	0.2	0	0	28	26.3	0	



File Name : #10 EBEAVER&EBEAVERAM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

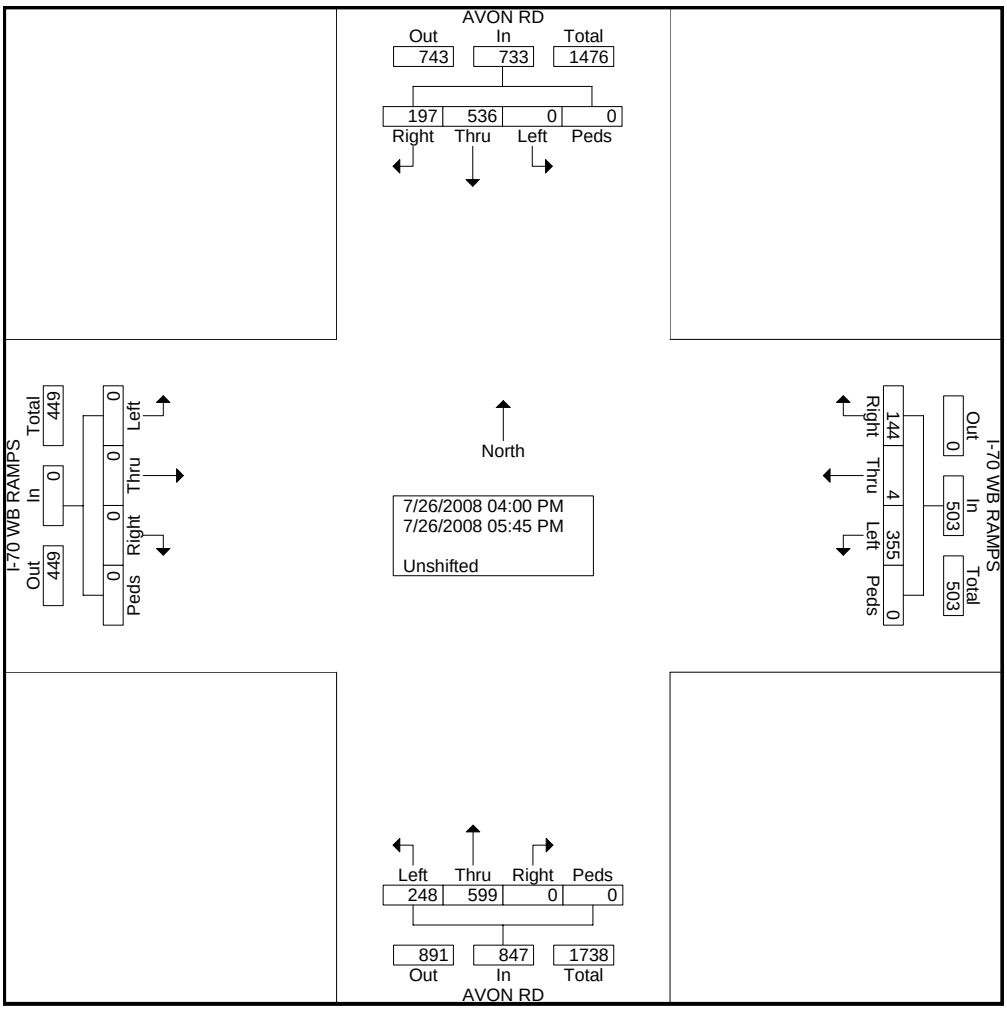
	BEAVER CREEK PLACE Southbound					E BEAVER CREEK BLVD Westbound					BEAVER CREEK PLACE Northbound					E BEAVER CREEK BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	0	20	0	0	20	7	0	1	0	8	0	11	16	0	27	55
08:15 AM	0	0	0	0	0	0	12	0	0	12	12	0	0	0	12	0	13	13	0	26	50
08:30 AM	0	0	0	2	2	1	20	0	0	21	7	0	0	0	7	0	30	19	0	49	79
08:45 AM	0	0	0	0	0	0	15	0	0	15	6	0	0	0	6	0	22	11	0	33	54
Total Volume	0	0	0	2	2	1	67	0	0	68	32	0	1	0	33	0	76	59	0	135	238
% App. Total	0	0	0	100		1.5	98.5	0	0		97	0	3	0		0	56.3	43.7	0		
PHF	.000	.000	.000	.250	.250	.250	.838	.000	.000	.810	.667	.000	.250	.000	.688	.000	.633	.776	.000	.689	.753



File Name : #1 AVON&I-70WBRAMPSPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

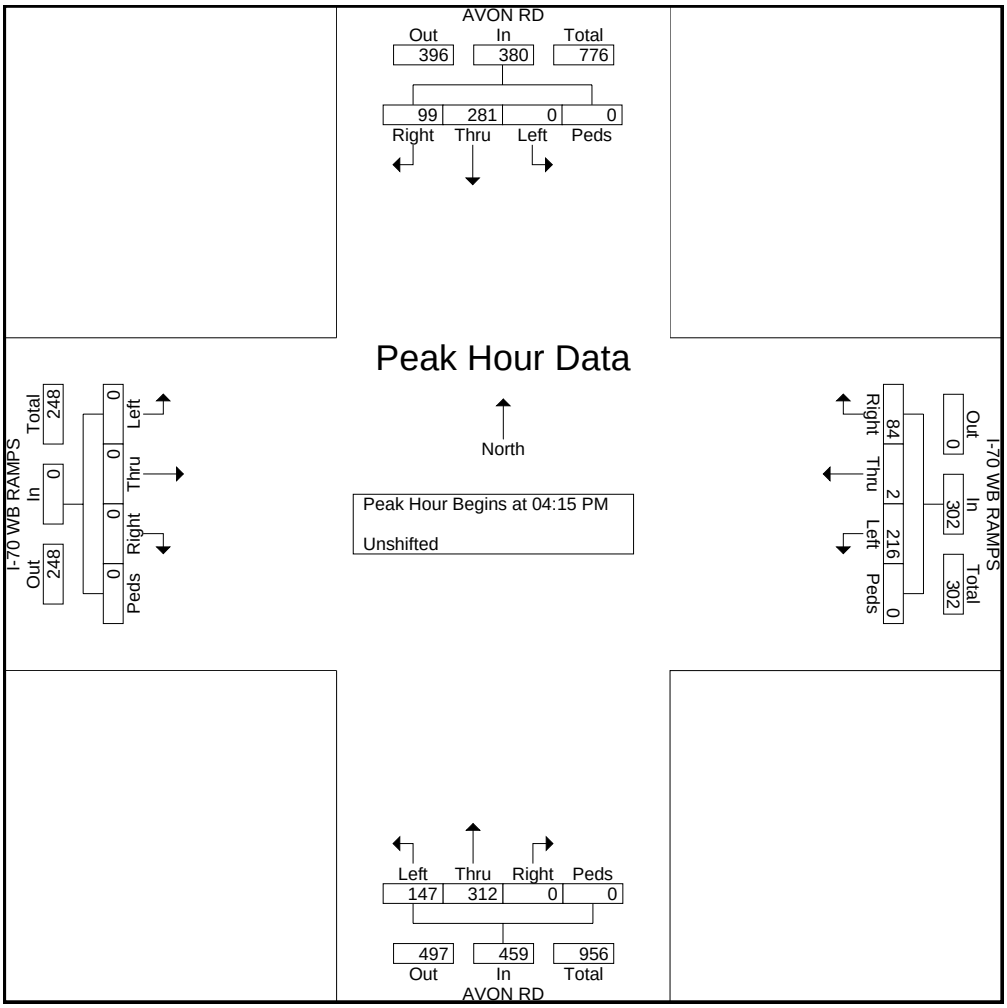
Groups Printed- Unshifted

	AVON RD Southbound				I-70 WB RAMPS Westbound				AVON RD Northbound				I-70 WB RAMPS Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	0	60	16	0	44	0	16	0	19	90	0	0	0	0	0	0	245
04:15 PM	0	74	23	0	60	0	12	0	33	83	0	0	0	0	0	0	285
04:30 PM	0	57	29	0	63	1	23	0	38	74	0	0	0	0	0	0	285
04:45 PM	0	76	29	0	53	1	25	0	39	85	0	0	0	0	0	0	308
Total	0	267	97	0	220	2	76	0	129	332	0	0	0	0	0	0	1123
05:00 PM	0	74	18	0	40	0	24	0	37	70	0	0	0	0	0	0	263
05:15 PM	0	73	29	0	42	1	11	0	32	72	0	0	0	0	0	0	260
05:30 PM	0	74	32	0	27	0	16	0	28	65	0	0	0	0	0	0	242
05:45 PM	0	48	21	0	26	1	17	0	22	60	0	0	0	0	0	0	195
Total	0	269	100	0	135	2	68	0	119	267	0	0	0	0	0	0	960
Grand Total	0	536	197	0	355	4	144	0	248	599	0	0	0	0	0	0	2083
Apprch %	0	73.1	26.9	0	70.6	0.8	28.6	0	29.3	70.7	0	0	0	0	0	0	
Total %	0	25.7	9.5	0	17	0.2	6.9	0	11.9	28.8	0	0	0	0	0	0	



File Name : #1 AVON&I-70WBRAMPSPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

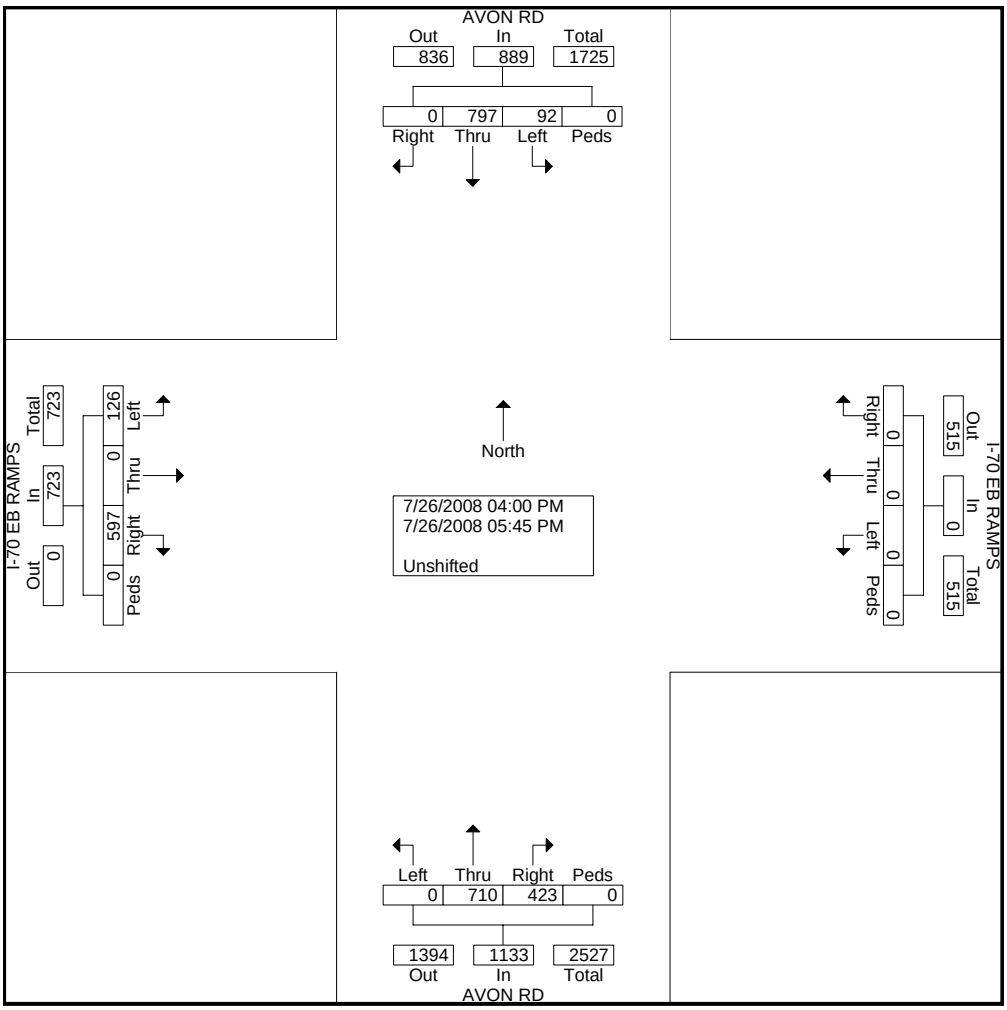
	AVON RD Southbound					I-70 WB RAMPS Westbound					AVON RD Northbound					I-70 WB RAMPS Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	74	23	0	97	60	0	12	0	72	33	83	0	0	116	0	0	0	0	0	285
04:30 PM	0	57	29	0	86	63	1	23	0	87	38	74	0	0	112	0	0	0	0	0	285
04:45 PM	0	76	29	0	105	53	1	25	0	79	39	85	0	0	124	0	0	0	0	0	308
05:00 PM	0	74	18	0	92	40	0	24	0	64	37	70	0	0	107	0	0	0	0	0	263
Total Volume	0	281	99	0	380	216	2	84	0	302	147	312	0	0	459	0	0	0	0	0	1141
% App. Total	0	73.9	26.1	0		71.5	0.7	27.8	0		32	68	0	0		0	0	0	0		
PHF	.000	.924	.853	.000	.905	.857	.500	.840	.000	.868	.942	.918	.000	.000	.925	.000	.000	.000	.000	.000	.926



File Name : #2 AVON&I-70EBRAMPSPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

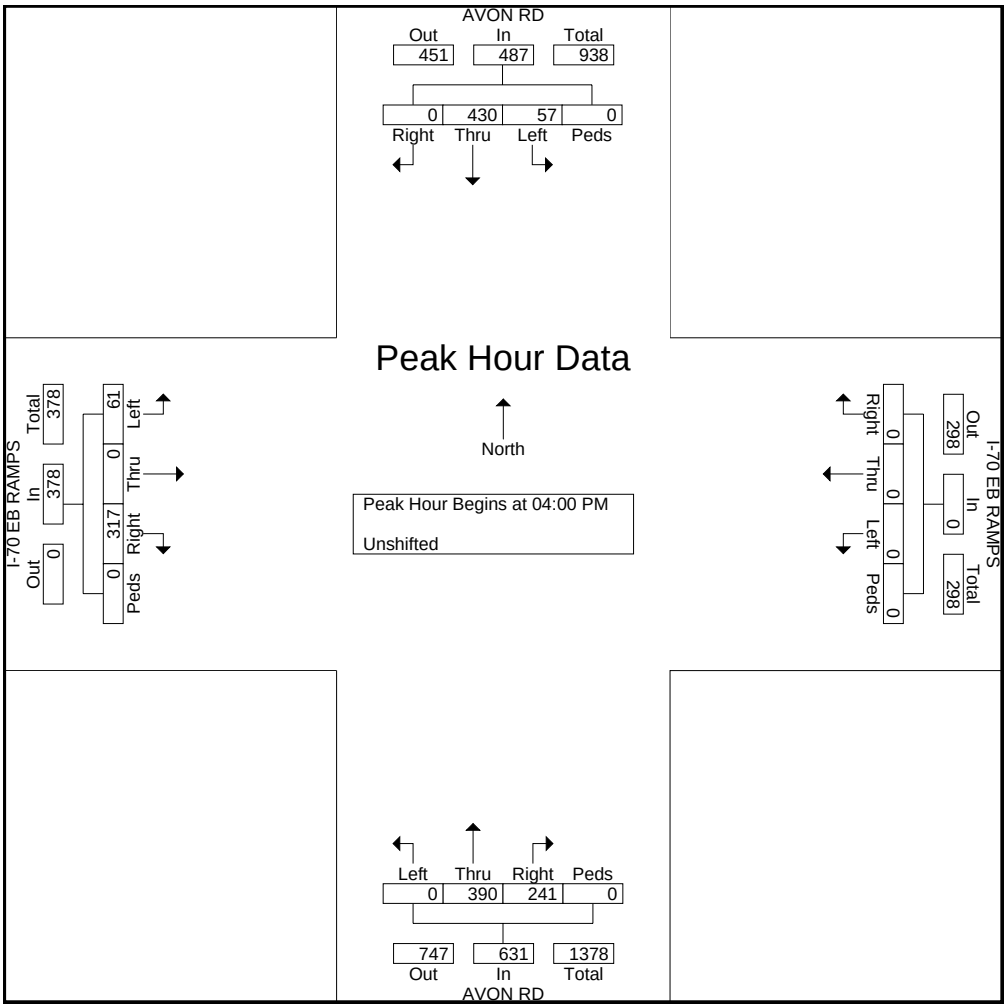
Groups Printed- Unshifted

	AVON RD Southbound				I-70 EB RAMPS Westbound				AVON RD Northbound				I-70 EB RAMPS Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	12	92	0	0	0	0	0	0	0	97	66	0	14	0	66	0	347
04:15 PM	17	119	0	0	0	0	0	0	0	104	66	0	12	0	93	0	411
04:30 PM	13	107	0	0	0	0	0	0	0	88	64	0	13	0	83	0	368
04:45 PM	15	112	0	0	0	0	0	0	0	101	45	0	22	0	75	0	370
Total	57	430	0	0	0	0	0	0	0	390	241	0	61	0	317	0	1496
05:00 PM	13	101	0	0	0	0	0	0	0	87	44	0	20	0	66	0	331
05:15 PM	12	102	0	0	0	0	0	0	0	89	44	0	15	0	68	0	330
05:30 PM	6	94	0	0	0	0	0	0	0	80	52	0	13	0	73	0	318
05:45 PM	4	70	0	0	0	0	0	0	0	64	42	0	17	0	73	0	270
Total	35	367	0	0	0	0	0	0	0	320	182	0	65	0	280	0	1249
Grand Total	92	797	0	0	0	0	0	0	0	710	423	0	126	0	597	0	2745
Apprch %	10.3	89.7	0	0	0	0	0	0	0	62.7	37.3	0	17.4	0	82.6	0	
Total %	3.4	29	0	0	0	0	0	0	0	25.9	15.4	0	4.6	0	21.7	0	



File Name : #2 AVON&I-70EBRAMPSPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

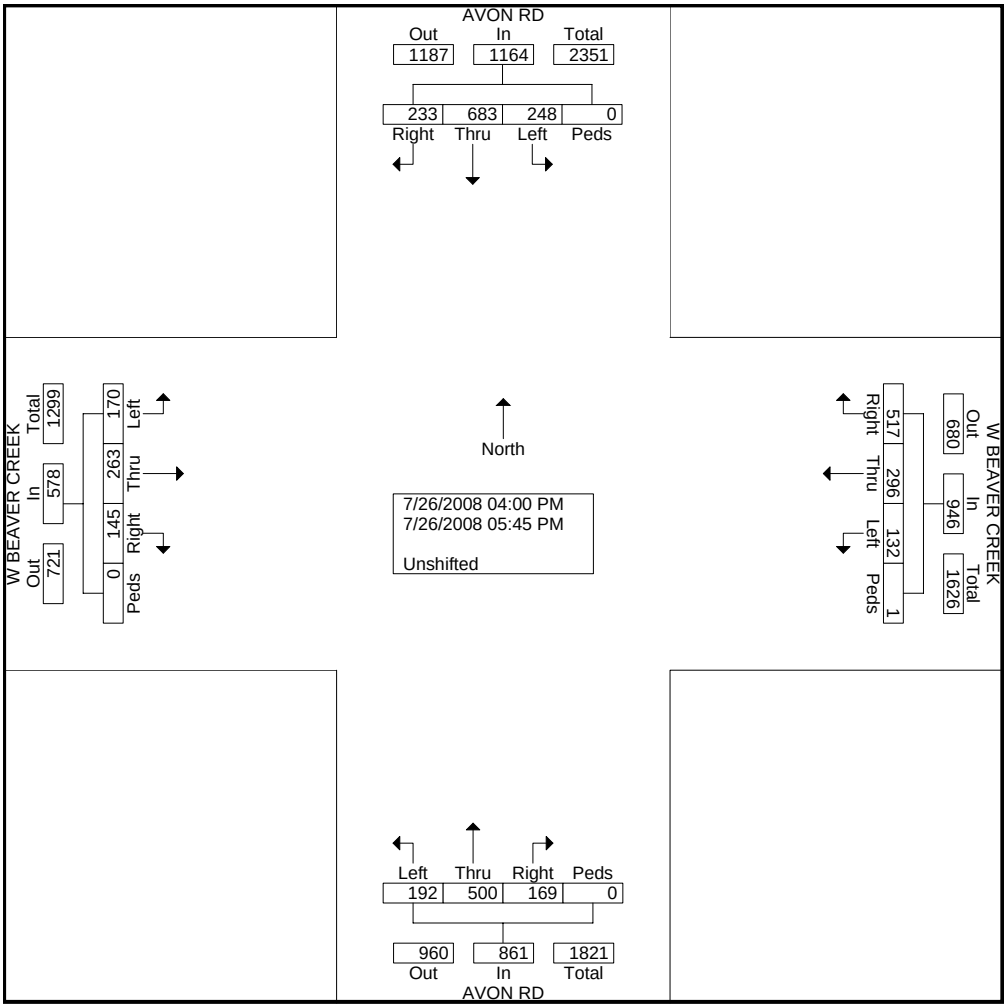
	AVON RD Southbound					I-70 EB RAMPS Westbound					AVON RD Northbound					I-70 EB RAMPS Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	12	92	0	0	104	0	0	0	0	0	0	97	66	0	163	14	0	66	0	80	347
04:15 PM	17	119	0	0	136	0	0	0	0	0	0	104	66	0	170	12	0	93	0	105	411
04:30 PM	13	107	0	0	120	0	0	0	0	0	0	88	64	0	152	13	0	83	0	96	368
04:45 PM	15	112	0	0	127	0	0	0	0	0	0	101	45	0	146	22	0	75	0	97	370
Total Volume	57	430	0	0	487	0	0	0	0	0	0	390	241	0	631	61	0	317	0	378	1496
% App. Total	11.7	88.3	0	0		0	0	0	0		0	61.8	38.2	0		16.1	0	83.9	0		
PHF	.838	.903	.000	.000	.895	.000	.000	.000	.000	.000	.000	.938	.913	.000	.928	.693	.000	.852	.000	.900	.910



File Name : #3 WBEAVER&AVONPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

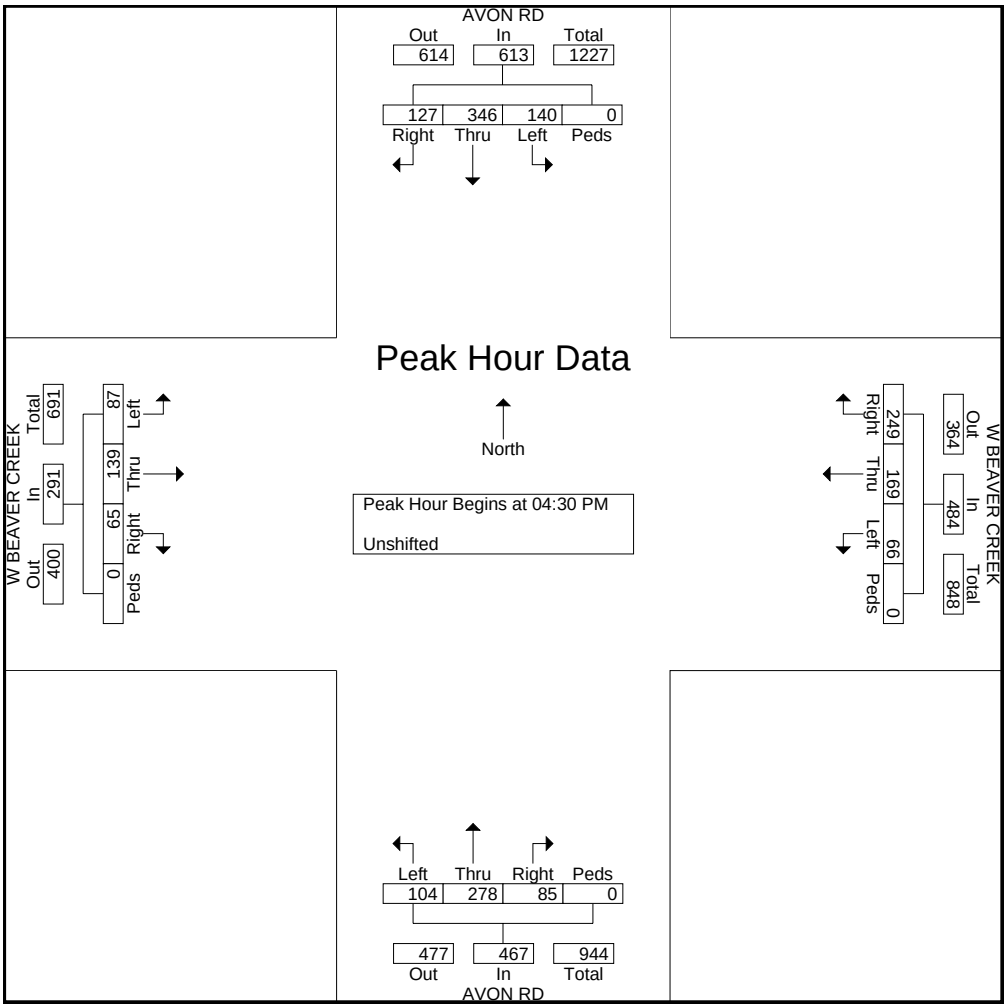
Groups Printed- Unshifted

	AVON RD Southbound				W BEAVER CREEK Westbound				AVON RD Northbound				W BEAVER CREEK Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	25	87	30	0	25	39	96	1	16	57	18	0	21	25	15	0	455
04:15 PM	18	82	22	0	12	23	70	0	17	52	21	0	17	24	16	0	374
04:30 PM	30	96	36	0	19	48	69	0	22	63	16	0	22	30	16	0	467
04:45 PM	27	83	37	0	9	52	46	0	29	72	19	0	26	33	21	0	454
Total	100	348	125	0	65	162	281	1	84	244	74	0	86	112	68	0	1750
05:00 PM	39	87	29	0	13	31	52	0	22	72	26	0	18	32	12	0	433
05:15 PM	44	80	25	0	25	38	82	0	31	71	24	0	21	44	16	0	501
05:30 PM	31	76	24	0	14	29	53	0	30	65	25	0	26	46	28	0	447
05:45 PM	34	92	30	0	15	36	49	0	25	48	20	0	19	29	21	0	418
Total	148	335	108	0	67	134	236	0	108	256	95	0	84	151	77	0	1799
Grand Total	248	683	233	0	132	296	517	1	192	500	169	0	170	263	145	0	3549
Apprch %	21.3	58.7	20	0	14	31.3	54.7	0.1	22.3	58.1	19.6	0	29.4	45.5	25.1	0	
Total %	7	19.2	6.6	0	3.7	8.3	14.6	0	5.4	14.1	4.8	0	4.8	7.4	4.1	0	



File Name : #3 WBEAVER&AVONPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

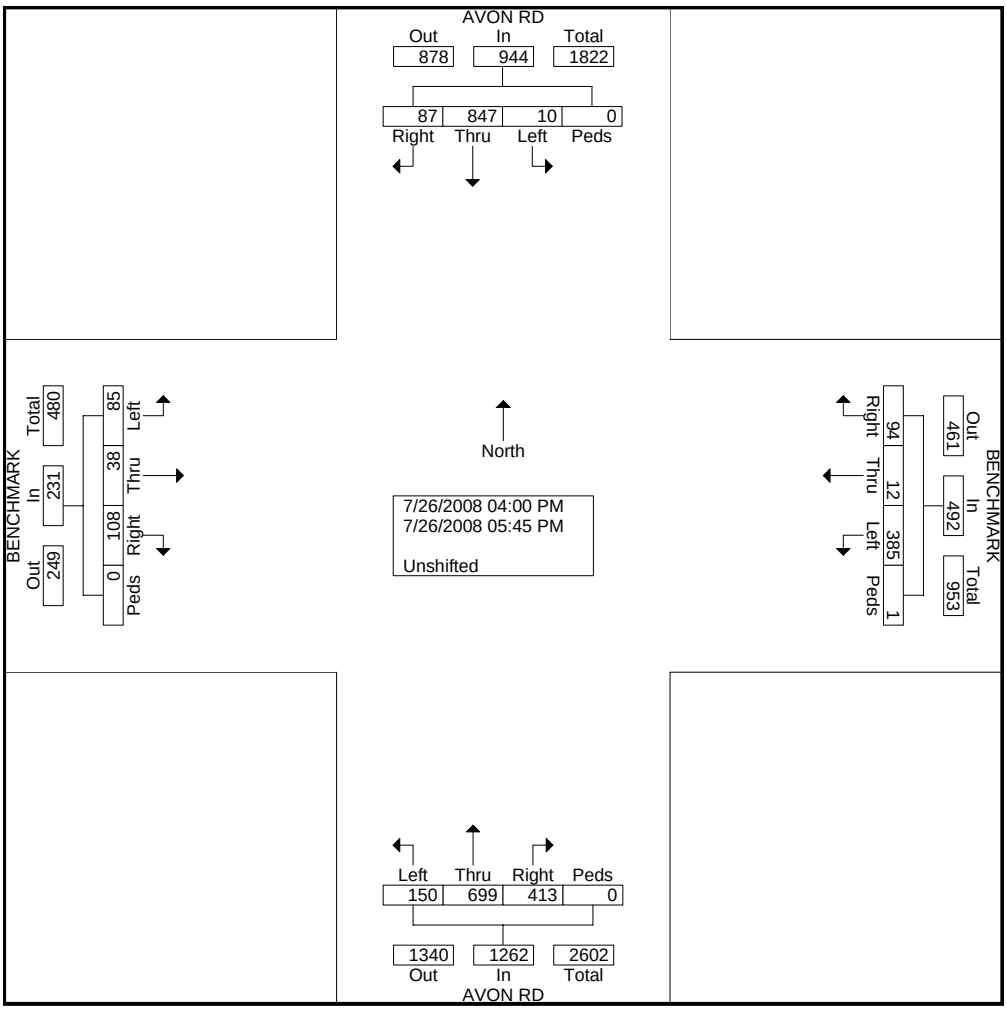
	AVON RD Southbound					W BEAVER CREEK Westbound					AVON RD Northbound					W BEAVER CREEK Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	30	96	36	0	162	19	48	69	0	136	22	63	16	0	101	22	30	16	0	68	467
04:45 PM	27	83	37	0	147	9	52	46	0	107	29	72	19	0	120	26	33	21	0	80	454
05:00 PM	39	87	29	0	155	13	31	52	0	96	22	72	26	0	120	18	32	12	0	62	433
05:15 PM	44	80	25	0	149	25	38	82	0	145	31	71	24	0	126	21	44	16	0	81	501
Total Volume	140	346	127	0	613	66	169	249	0	484	104	278	85	0	467	87	139	65	0	291	1855
% App. Total	22.8	56.4	20.7	0		13.6	34.9	51.4	0		22.3	59.5	18.2	0		29.9	47.8	22.3	0		
PHF	.795	.901	.858	.000	.946	.660	.813	.759	.000	.834	.839	.965	.817	.000	.927	.837	.790	.774	.000	.898	.926



File Name : #4 AVON&BENCHMARKPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

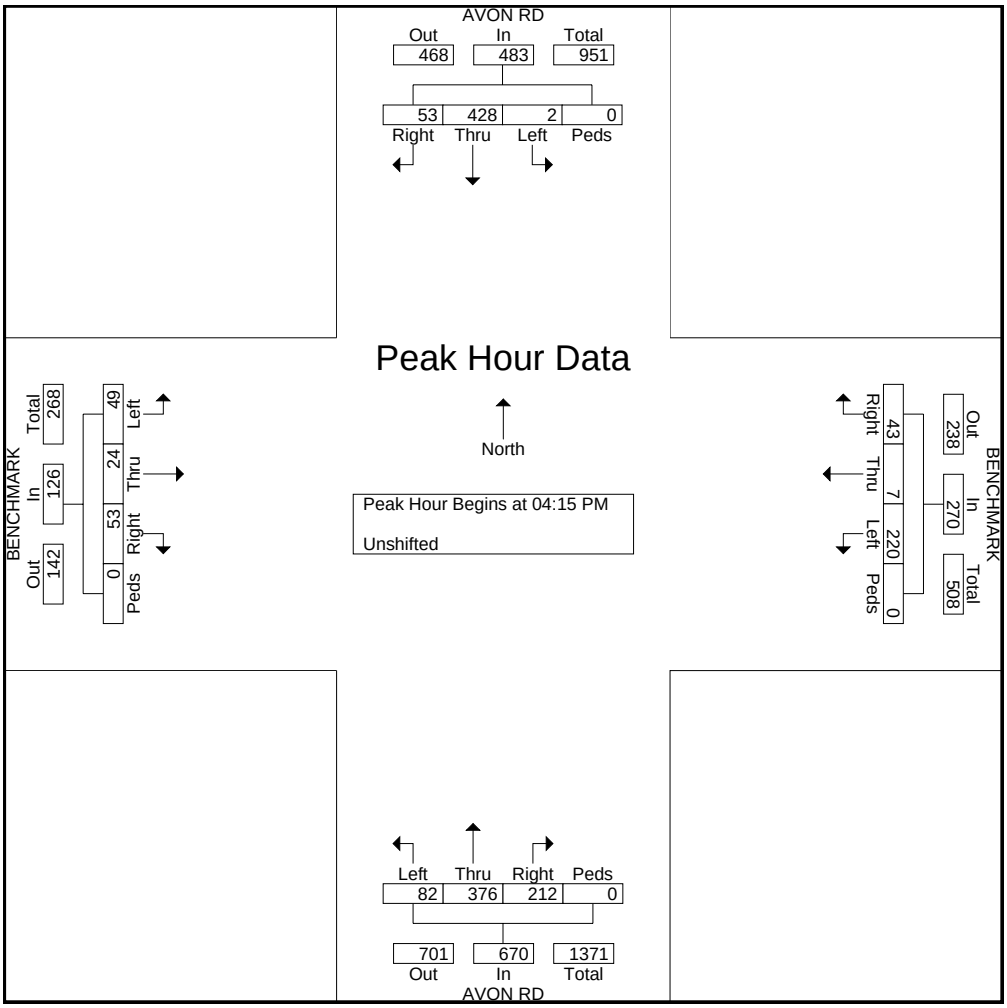
Groups Printed- Unshifted

	AVON RD Southbound				BENCHMARK Westbound				AVON RD Northbound				BENCHMARK Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	5	101	10	0	47	1	11	0	19	73	39	0	14	5	25	0	350
04:15 PM	2	108	16	0	58	1	14	0	13	89	50	0	15	8	8	0	382
04:30 PM	0	99	18	0	37	3	10	0	22	98	64	0	14	4	16	0	385
04:45 PM	0	112	12	0	62	1	12	0	21	96	46	0	11	5	15	0	393
Total	7	420	56	0	204	6	47	0	75	356	199	0	54	22	64	0	1510
05:00 PM	0	109	7	0	63	2	7	0	26	93	52	0	9	7	14	0	389
05:15 PM	0	108	5	0	42	4	14	0	19	87	57	0	9	4	12	0	361
05:30 PM	2	94	9	0	42	0	13	1	15	85	53	0	4	4	10	0	332
05:45 PM	1	116	10	0	34	0	13	0	15	78	52	0	9	1	8	0	337
Total	3	427	31	0	181	6	47	1	75	343	214	0	31	16	44	0	1419
Grand Total	10	847	87	0	385	12	94	1	150	699	413	0	85	38	108	0	2929
Apprch %	1.1	89.7	9.2	0	78.3	2.4	19.1	0.2	11.9	55.4	32.7	0	36.8	16.5	46.8	0	
Total %	0.3	28.9	3	0	13.1	0.4	3.2	0	5.1	23.9	14.1	0	2.9	1.3	3.7	0	



File Name : #4 AVON&BENCHMARKPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

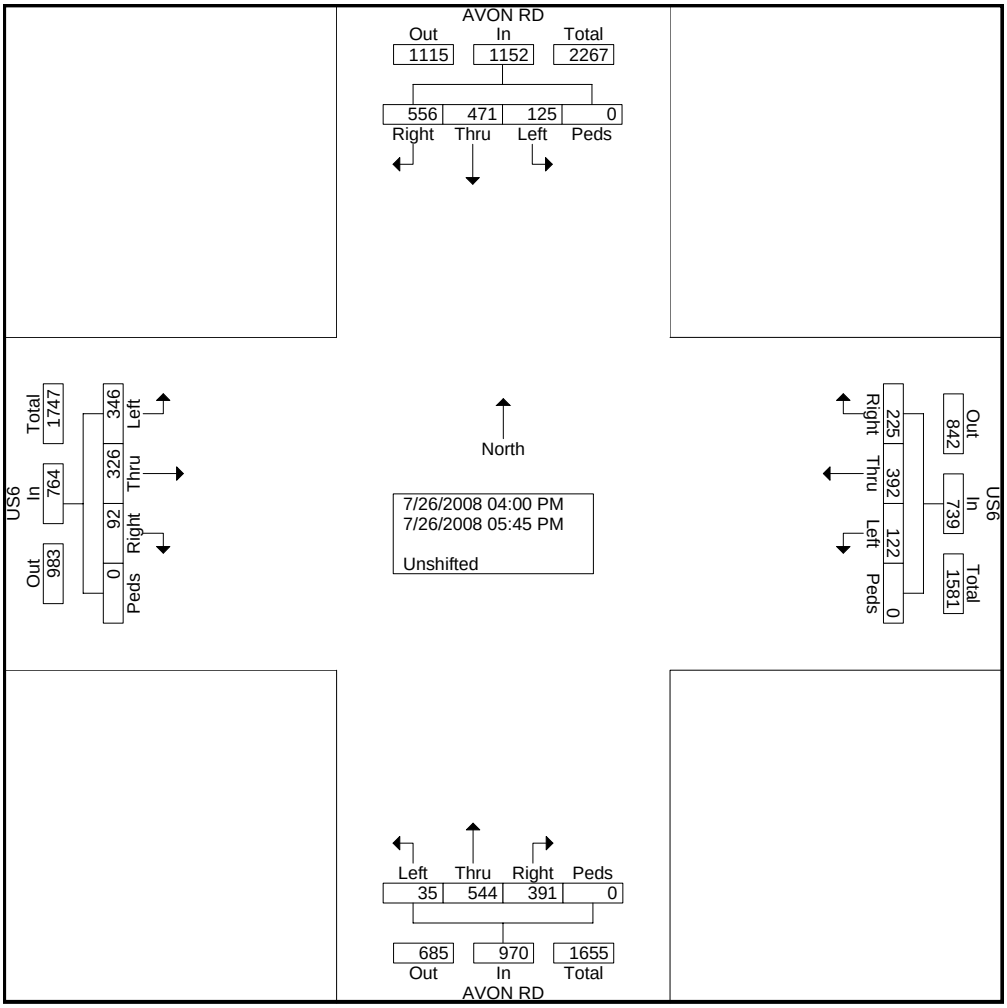
	AVON RD Southbound					BENCHMARK Westbound					AVON RD Northbound					BENCHMARK Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	2	108	16	0	126	58	1	14	0	73	13	89	50	0	152	15	8	8	0	31	382
04:30 PM	0	99	18	0	117	37	3	10	0	50	22	98	64	0	184	14	4	16	0	34	385
04:45 PM	0	112	12	0	124	62	1	12	0	75	21	96	46	0	163	11	5	15	0	31	393
05:00 PM	0	109	7	0	116	63	2	7	0	72	26	93	52	0	171	9	7	14	0	30	389
Total Volume	2	428	53	0	483	220	7	43	0	270	82	376	212	0	670	49	24	53	0	126	1549
% App. Total	0.4	88.6	11	0		81.5	2.6	15.9	0		12.2	56.1	31.6	0		38.9	19	42.1	0		
PHF	.250	.955	.736	.000	.958	.873	.583	.768	.000	.900	.788	.959	.828	.000	.910	.817	.750	.828	.000	.926	.985



File Name : #5 AVON&US6PM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

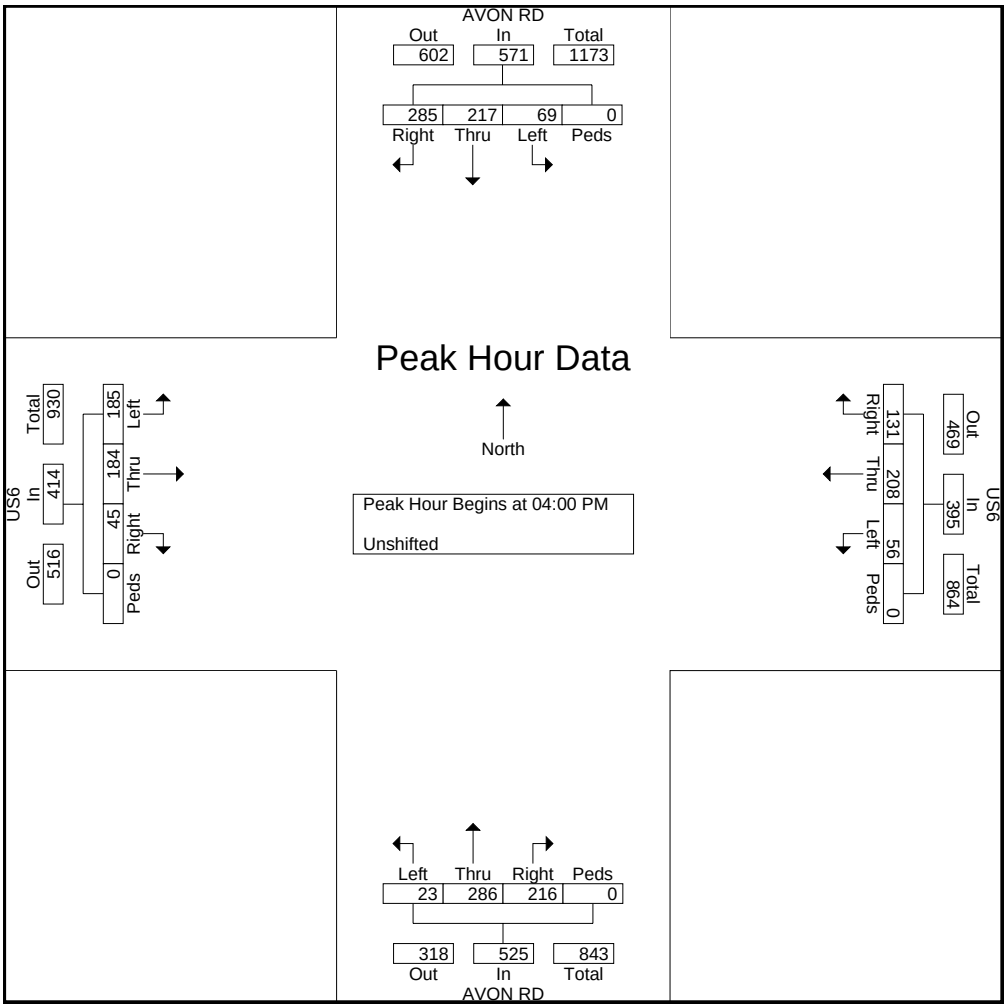
Groups Printed- Unshifted

	AVON RD Southbound				US6 Westbound				AVON RD Northbound				US6 Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	14	49	85	0	21	46	19	0	6	88	62	0	44	44	12	0	490
04:15 PM	17	70	71	0	8	53	23	0	9	75	45	0	57	46	9	0	483
04:30 PM	16	52	55	0	12	61	32	0	7	64	48	0	43	50	13	0	453
04:45 PM	22	46	74	0	15	48	57	0	1	59	61	0	41	44	11	0	479
Total	69	217	285	0	56	208	131	0	23	286	216	0	185	184	45	0	1905
05:00 PM	22	59	73	0	14	39	26	0	3	56	59	0	39	37	9	0	436
05:15 PM	9	64	83	0	15	42	20	0	1	60	34	0	42	29	15	0	414
05:30 PM	14	63	63	0	15	51	19	0	6	73	48	0	35	37	13	0	437
05:45 PM	11	68	52	0	22	52	29	0	2	69	34	0	45	39	10	0	433
Total	56	254	271	0	66	184	94	0	12	258	175	0	161	142	47	0	1720
Grand Total	125	471	556	0	122	392	225	0	35	544	391	0	346	326	92	0	3625
Apprch %	10.9	40.9	48.3	0	16.5	53	30.4	0	3.6	56.1	40.3	0	45.3	42.7	12	0	
Total %	3.4	13	15.3	0	3.4	10.8	6.2	0	1	15	10.8	0	9.5	9	2.5	0	



File Name : #5 AVON&US6PM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

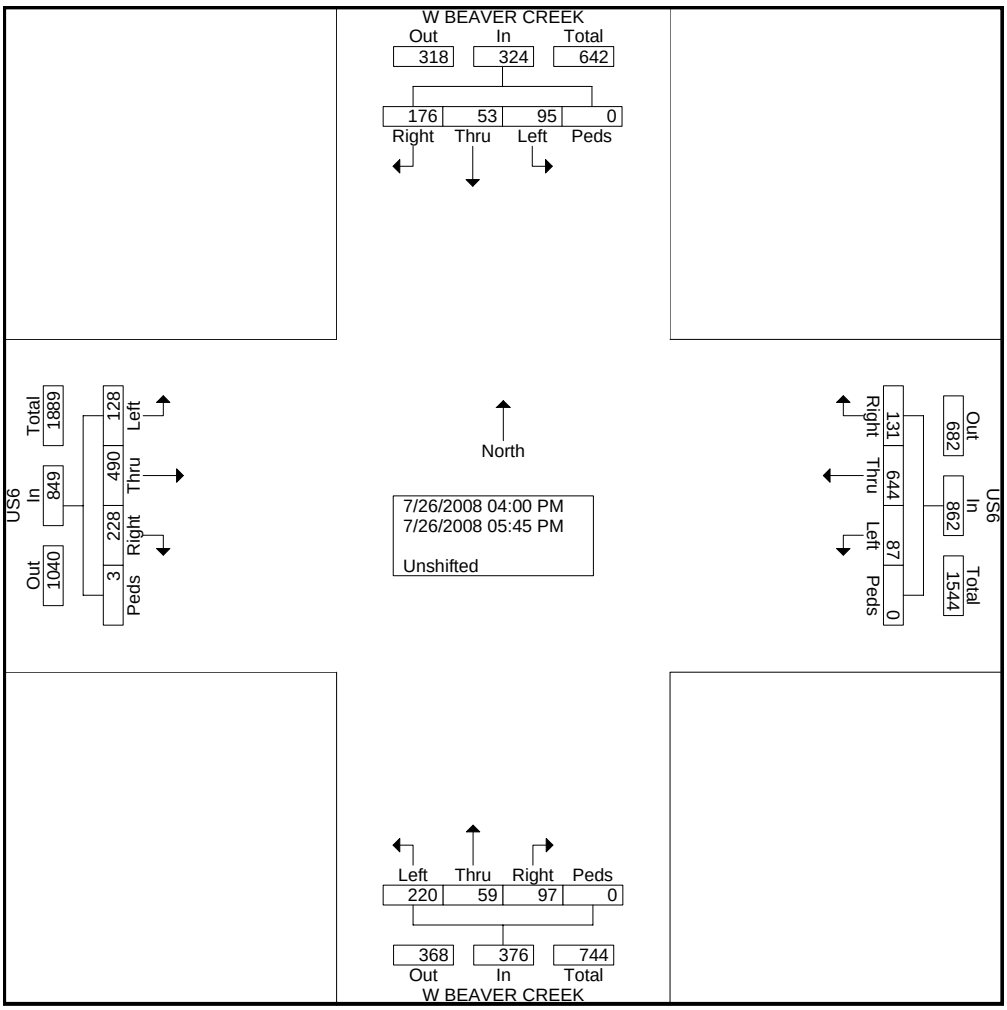
	AVON RD Southbound					US6 Westbound					AVON RD Northbound					US6 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	14	49	85	0	148	21	46	19	0	86	6	88	62	0	156	44	44	12	0	100	490
04:15 PM	17	70	71	0	158	8	53	23	0	84	9	75	45	0	129	57	46	9	0	112	483
04:30 PM	16	52	55	0	123	12	61	32	0	105	7	64	48	0	119	43	50	13	0	106	453
04:45 PM	22	46	74	0	142	15	48	57	0	120	1	59	61	0	121	41	44	11	0	96	479
Total Volume	69	217	285	0	571	56	208	131	0	395	23	286	216	0	525	185	184	45	0	414	1905
% App. Total	12.1	38	49.9	0		14.2	52.7	33.2	0		4.4	54.5	41.1	0		44.7	44.4	10.9	0		
PHF	.784	.775	.838	.000	.903	.667	.852	.575	.000	.823	.639	.813	.871	.000	.841	.811	.920	.865	.000	.924	.972



File Name : #6 WBEAVER&US6PM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

Groups Printed- Unshifted

	W BEAVER CREEK Southbound				US6 Westbound				W BEAVER CREEK Northbound				US6 Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	10	11	28	0	10	83	20	0	18	8	14	0	16	59	33	1	311
04:15 PM	11	3	26	0	12	117	16	0	20	11	15	0	15	74	48	1	369
04:30 PM	12	8	25	0	5	62	18	0	33	14	12	0	18	58	24	1	290
04:45 PM	12	4	21	0	16	81	14	0	23	7	7	0	15	77	16	0	293
Total	45	26	100	0	43	343	68	0	94	40	48	0	64	268	121	3	1263
05:00 PM	14	4	20	0	13	88	16	0	30	6	12	0	14	41	25	0	283
05:15 PM	9	12	20	0	13	79	11	0	42	5	15	0	12	67	24	0	309
05:30 PM	10	3	19	0	12	76	13	0	31	7	11	0	21	59	29	0	291
05:45 PM	17	8	17	0	6	58	23	0	23	1	11	0	17	55	29	0	265
Total	50	27	76	0	44	301	63	0	126	19	49	0	64	222	107	0	1148
Grand Total	95	53	176	0	87	644	131	0	220	59	97	0	128	490	228	3	2411
Apprch %	29.3	16.4	54.3	0	10.1	74.7	15.2	0	58.5	15.7	25.8	0	15.1	57.7	26.9	0.4	
Total %	3.9	2.2	7.3	0	3.6	26.7	5.4	0	9.1	2.4	4	0	5.3	20.3	9.5	0.1	



File Name : #6 WBEAVER&US6PM
Site Code : 00000000
Start Date : 7/26/2008
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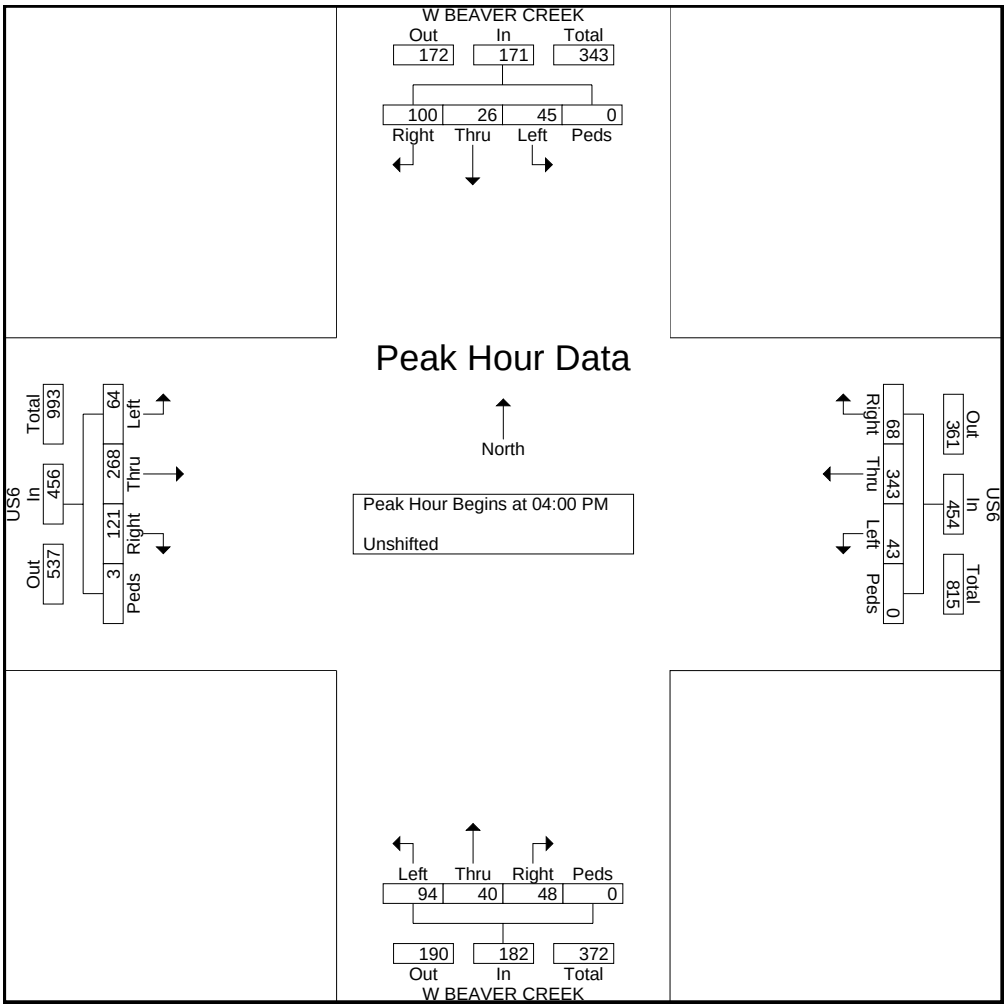
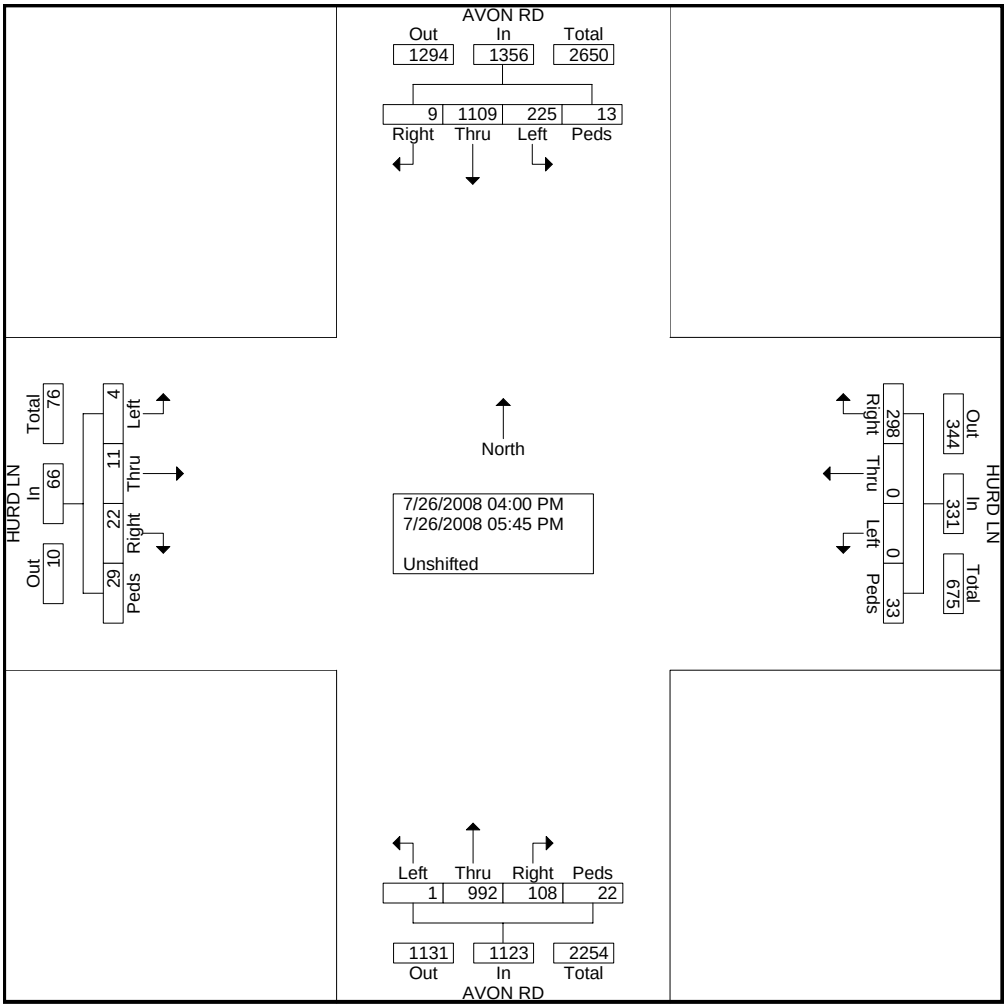
	W BEAVER CREEK Southbound					US6 Westbound					W BEAVER CREEK Northbound					US6 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	10	11	28	0	49	10	83	20	0	113	18	8	14	0	40	16	59	33	1	109	311
04:15 PM	11	3	26	0	40	12	117	16	0	145	20	11	15	0	46	15	74	48	1	138	369
04:30 PM	12	8	25	0	45	5	62	18	0	85	33	14	12	0	59	18	58	24	1	101	290
04:45 PM	12	4	21	0	37	16	81	14	0	111	23	7	7	0	37	15	77	16	0	108	293
Total Volume	45	26	100	0	171	43	343	68	0	454	94	40	48	0	182	64	268	121	3	456	1263
% App. Total	26.3	15.2	58.5	0		9.5	75.6	15	0		51.6	22	26.4	0		14	58.8	26.5	0.7		
PHF	.938	.591	.893	.000	.872	.672	.733	.850	.000	.783	.712	.714	.800	.000	.771	.889	.870	.630	.750	.826	.856



File Name : #7 AVON&HURDPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

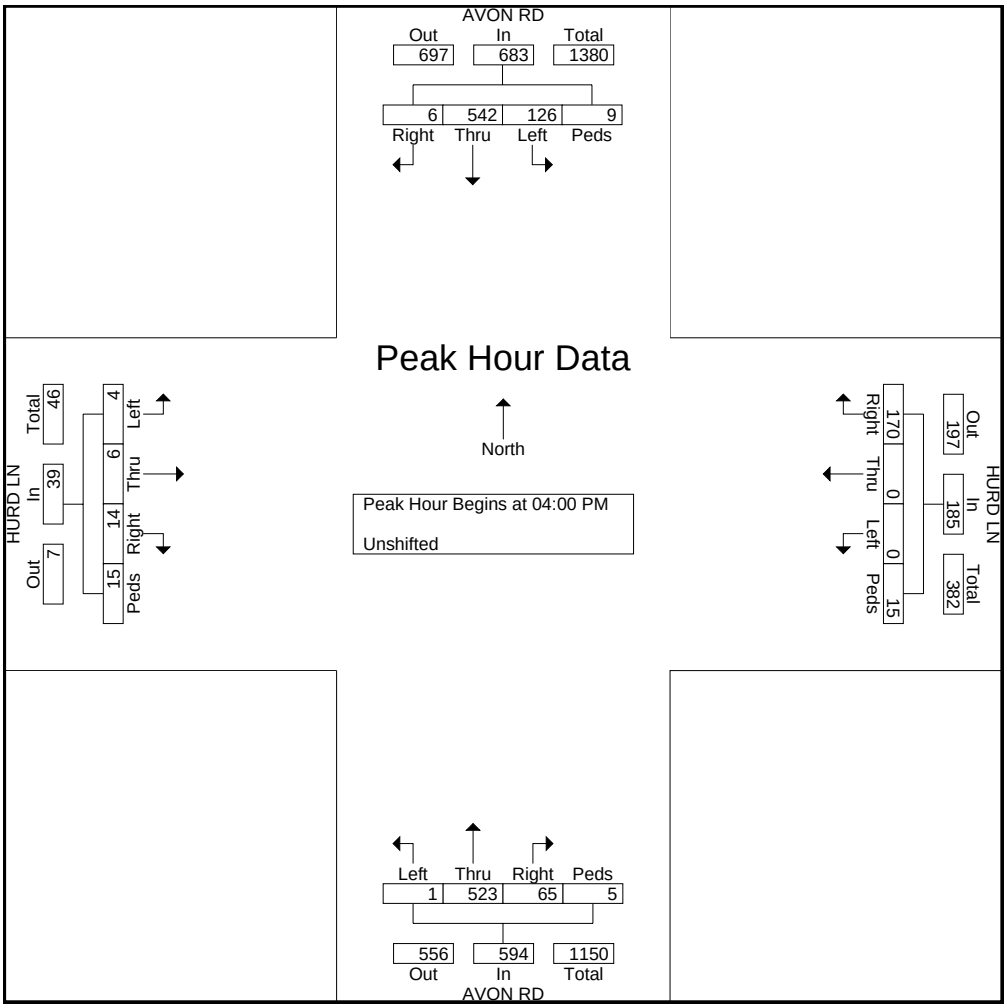
Groups Printed- Unshifted

	AVON RD Southbound				HURD LN Westbound				AVON RD Northbound				HURD LN Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	34	139	2	1	0	0	47	1	1	125	23	5	1	0	2	3	384
04:15 PM	27	148	1	2	0	0	44	3	0	147	11	0	1	0	5	8	397
04:30 PM	28	117	3	3	0	0	39	2	0	117	15	0	1	3	3	0	331
04:45 PM	37	138	0	3	0	0	40	9	0	134	16	0	1	3	4	4	389
Total	126	542	6	9	0	0	170	15	1	523	65	5	4	6	14	15	1501
05:00 PM	36	136	1	0	0	0	40	3	0	110	14	1	0	1	0	2	344
05:15 PM	24	151	2	2	0	0	35	6	0	114	11	4	0	2	0	4	355
05:30 PM	16	139	0	0	0	0	25	5	0	128	5	3	0	2	8	3	334
05:45 PM	23	141	0	2	0	0	28	4	0	117	13	9	0	0	0	5	342
Total	99	567	3	4	0	0	128	18	0	469	43	17	0	5	8	14	1375
Grand Total	225	1109	9	13	0	0	298	33	1	992	108	22	4	11	22	29	2876
Apprch %	16.6	81.8	0.7	1	0	0	90	10	0.1	88.3	9.6	2	6.1	16.7	33.3	43.9	
Total %	7.8	38.6	0.3	0.5	0	0	10.4	1.1	0	34.5	3.8	0.8	0.1	0.4	0.8	1	



File Name : #7 AVON&HURDPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

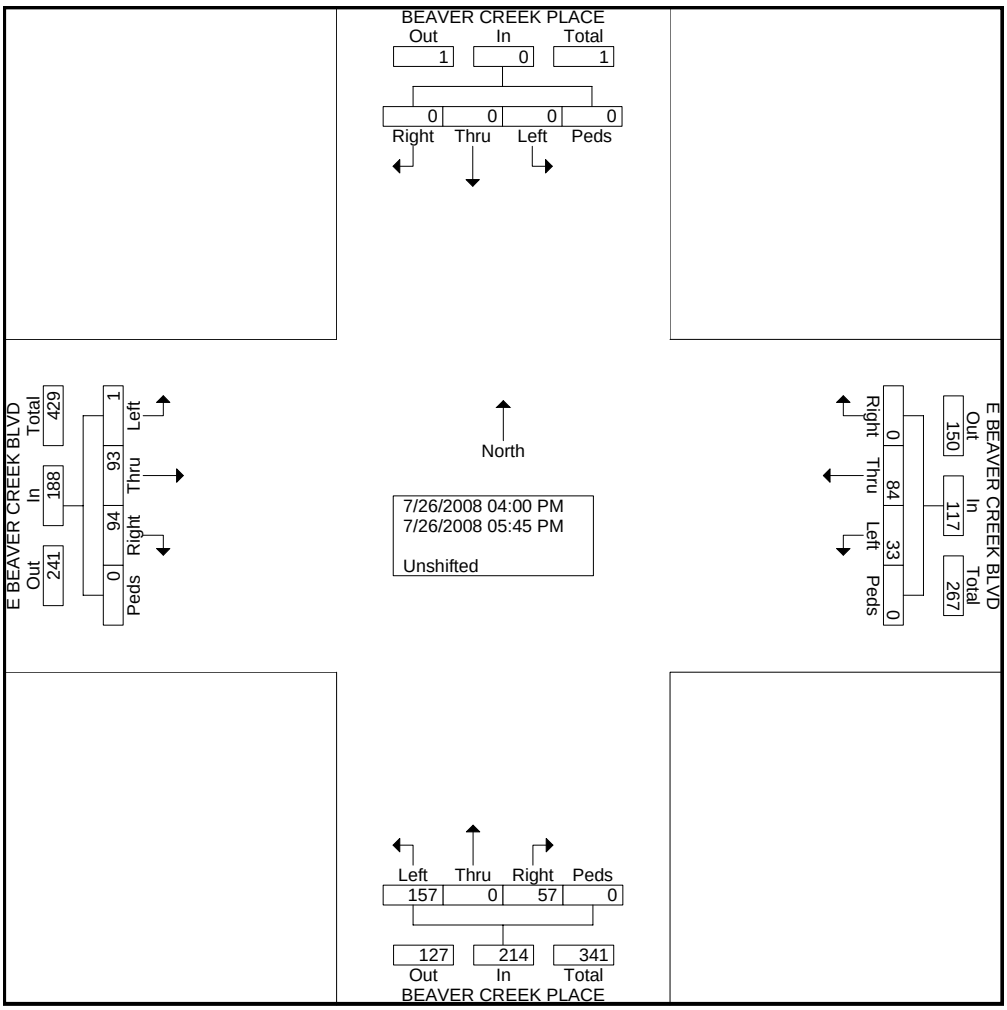
	AVON RD Southbound					HURD LN Westbound					AVON RD Northbound					HURD LN Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	34	139	2	1	176	0	0	47	1	48	1	125	23	5	154	1	0	2	3	6	384
04:15 PM	27	148	1	2	178	0	0	44	3	47	0	147	11	0	158	1	0	5	8	14	397
04:30 PM	28	117	3	3	151	0	0	39	2	41	0	117	15	0	132	1	3	3	0	7	331
04:45 PM	37	138	0	3	178	0	0	40	9	49	0	134	16	0	150	1	3	4	4	12	389
Total Volume	126	542	6	9	683	0	0	170	15	185	1	523	65	5	594	4	6	14	15	39	1501
% App. Total	18.4	79.4	0.9	1.3		0	0	91.9	8.1		0.2	88	10.9	0.8		10.3	15.4	35.9	38.5		
PHF	.851	.916	.500	.750	.959	.000	.000	.904	.417	.944	.250	.889	.707	.250	.940	1.000	.500	.700	.469	.696	.945



File Name : #8 EBEAVER&BEAVERPLPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

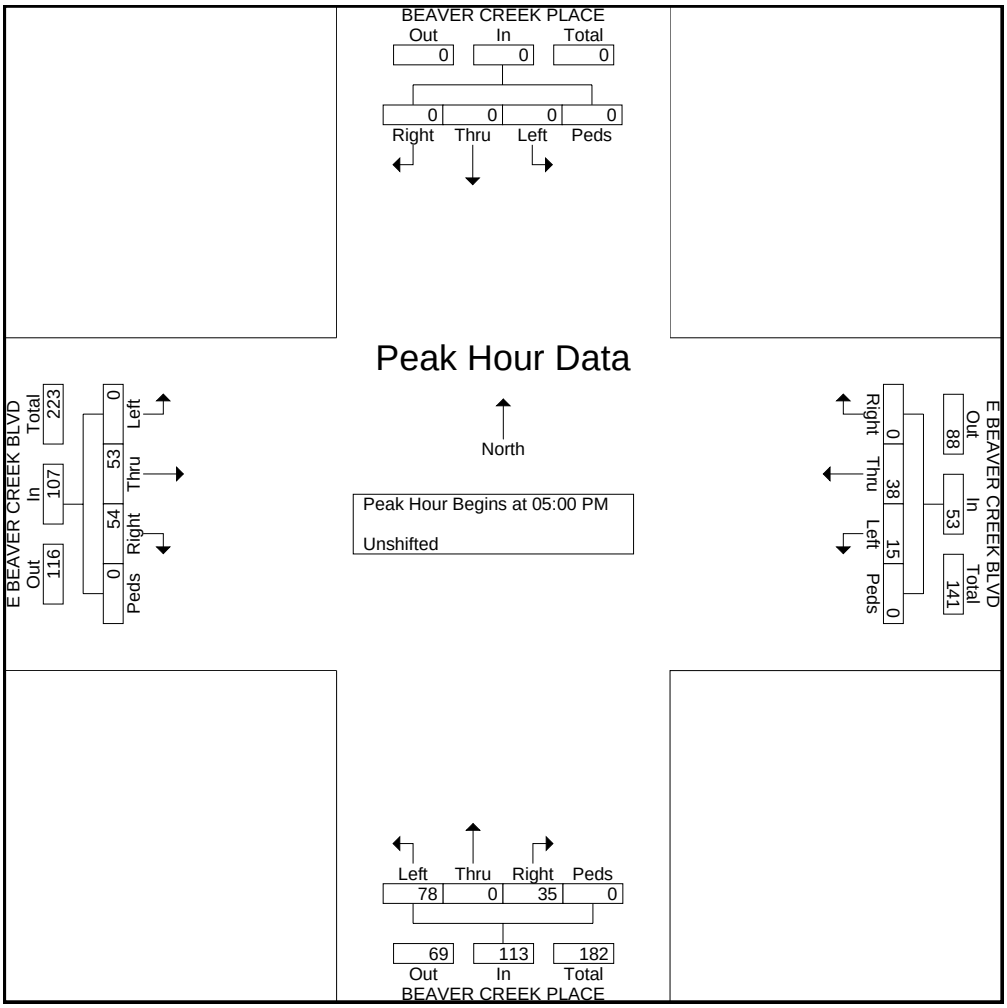
Groups Printed- Unshifted

	BEAVER CREEK PLACE Southbound				E BEAVER CREEK BLVD Westbound				BEAVER CREEK PLACE Northbound				E BEAVER CREEK BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	0	0	0	0	3	12	0	0	19	0	5	0	0	10	8	0	57
04:15 PM	0	0	0	0	10	12	0	0	23	0	7	0	1	10	12	0	75
04:30 PM	0	0	0	0	3	16	0	0	23	0	6	0	0	8	8	0	64
04:45 PM	0	0	0	0	2	6	0	0	14	0	4	0	0	12	12	0	50
Total	0	0	0	0	18	46	0	0	79	0	22	0	1	40	40	0	246
05:00 PM	0	0	0	0	3	10	0	0	27	0	7	0	0	9	17	0	73
05:15 PM	0	0	0	0	5	11	0	0	15	0	14	0	0	21	15	0	81
05:30 PM	0	0	0	0	3	8	0	0	16	0	10	0	0	7	11	0	55
05:45 PM	0	0	0	0	4	9	0	0	20	0	4	0	0	16	11	0	64
Total	0	0	0	0	15	38	0	0	78	0	35	0	0	53	54	0	273
Grand Total	0	0	0	0	33	84	0	0	157	0	57	0	1	93	94	0	519
Apprch %	0	0	0	0	28.2	71.8	0	0	73.4	0	26.6	0	0.5	49.5	50	0	
Total %	0	0	0	0	6.4	16.2	0	0	30.3	0	11	0	0.2	17.9	18.1	0	



File Name : #8 EBEAVER&BEAVERPLPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

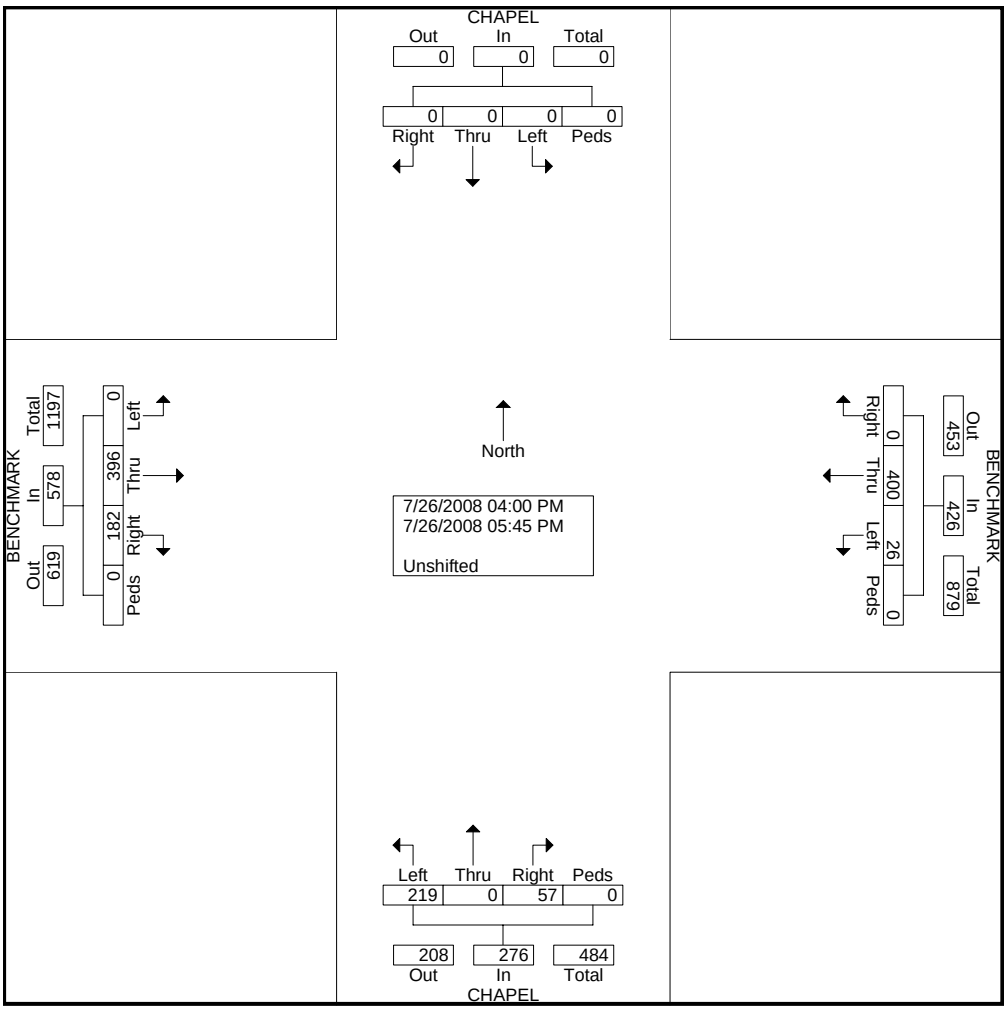
	BEAVER CREEK PLACE Southbound					E BEAVER CREEK BLVD Westbound					BEAVER CREEK PLACE Northbound					E BEAVER CREEK BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	3	10	0	0	13	27	0	7	0	34	0	9	17	0	26	73
05:15 PM	0	0	0	0	0	5	11	0	0	16	15	0	14	0	29	0	21	15	0	36	81
05:30 PM	0	0	0	0	0	3	8	0	0	11	16	0	10	0	26	0	7	11	0	18	55
05:45 PM	0	0	0	0	0	4	9	0	0	13	20	0	4	0	24	0	16	11	0	27	64
Total Volume	0	0	0	0	0	15	38	0	0	53	78	0	35	0	113	0	53	54	0	107	273
% App. Total	0	0	0	0		28.3	71.7	0	0		69	0	31	0		0	49.5	50.5	0		
PHF	.000	.000	.000	.000	.000	.750	.864	.000	.000	.828	.722	.000	.625	.000	.831	.000	.631	.794	.000	.743	.843



File Name : #9 BENCHMARK&CHAPELPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

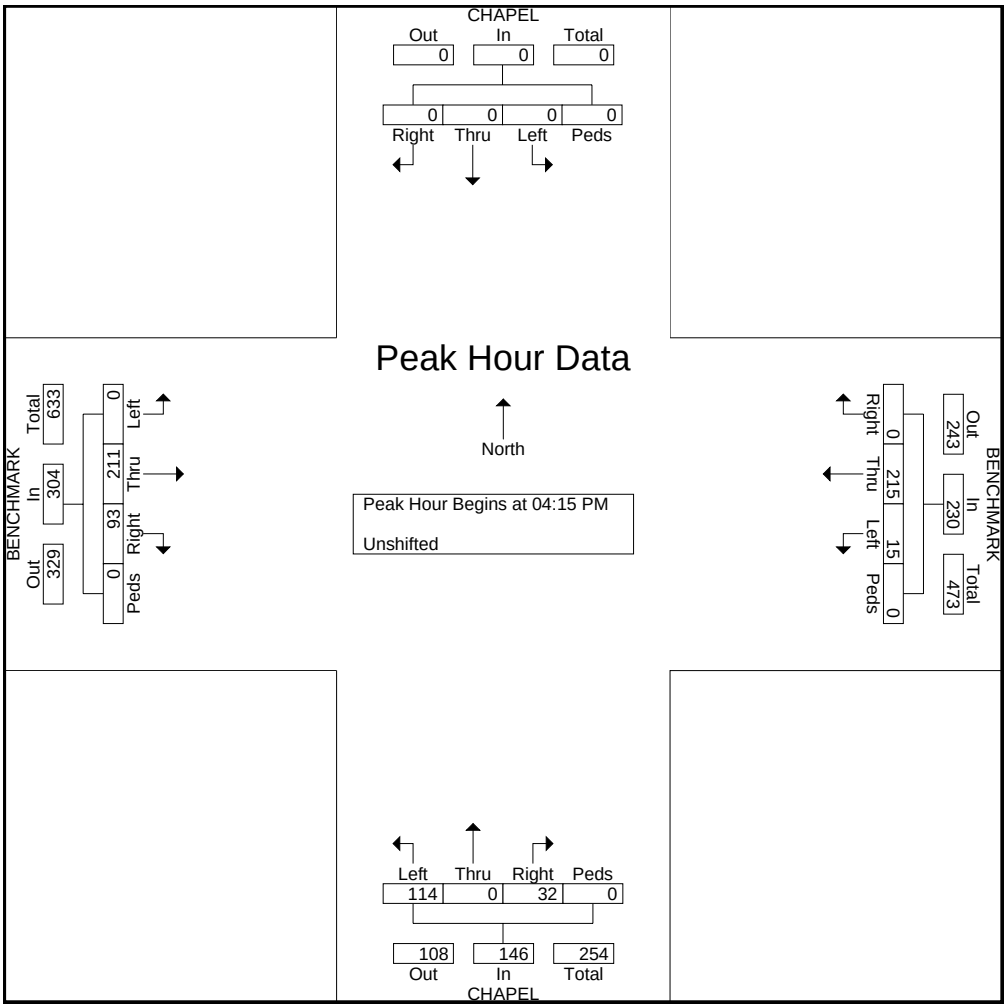
Groups Printed- Unshifted

	CHAPEL Southbound				BENCHMARK Westbound				CHAPEL Northbound				BENCHMARK Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	0	0	0	0	3	43	0	0	36	0	7	0	0	52	21	0	162
04:15 PM	0	0	0	0	4	57	0	0	36	0	14	0	0	65	27	0	203
04:30 PM	0	0	0	0	5	50	0	0	22	0	4	0	0	52	21	0	154
04:45 PM	0	0	0	0	2	54	0	0	26	0	7	0	0	48	19	0	156
Total	0	0	0	0	14	204	0	0	120	0	32	0	0	217	88	0	675
05:00 PM	0	0	0	0	4	54	0	0	30	0	7	0	0	46	26	0	167
05:15 PM	0	0	0	0	1	52	0	0	28	0	5	0	0	46	20	0	152
05:30 PM	0	0	0	0	3	42	0	0	21	0	10	0	0	46	24	0	146
05:45 PM	0	0	0	0	4	48	0	0	20	0	3	0	0	41	24	0	140
Total	0	0	0	0	12	196	0	0	99	0	25	0	0	179	94	0	605
Grand Total	0	0	0	0	26	400	0	0	219	0	57	0	0	396	182	0	1280
Apprch %	0	0	0	0	6.1	93.9	0	0	79.3	0	20.7	0	0	68.5	31.5	0	
Total %	0	0	0	0	2	31.2	0	0	17.1	0	4.5	0	0	30.9	14.2	0	



File Name : #9 BENCHMARK&CHAPELPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

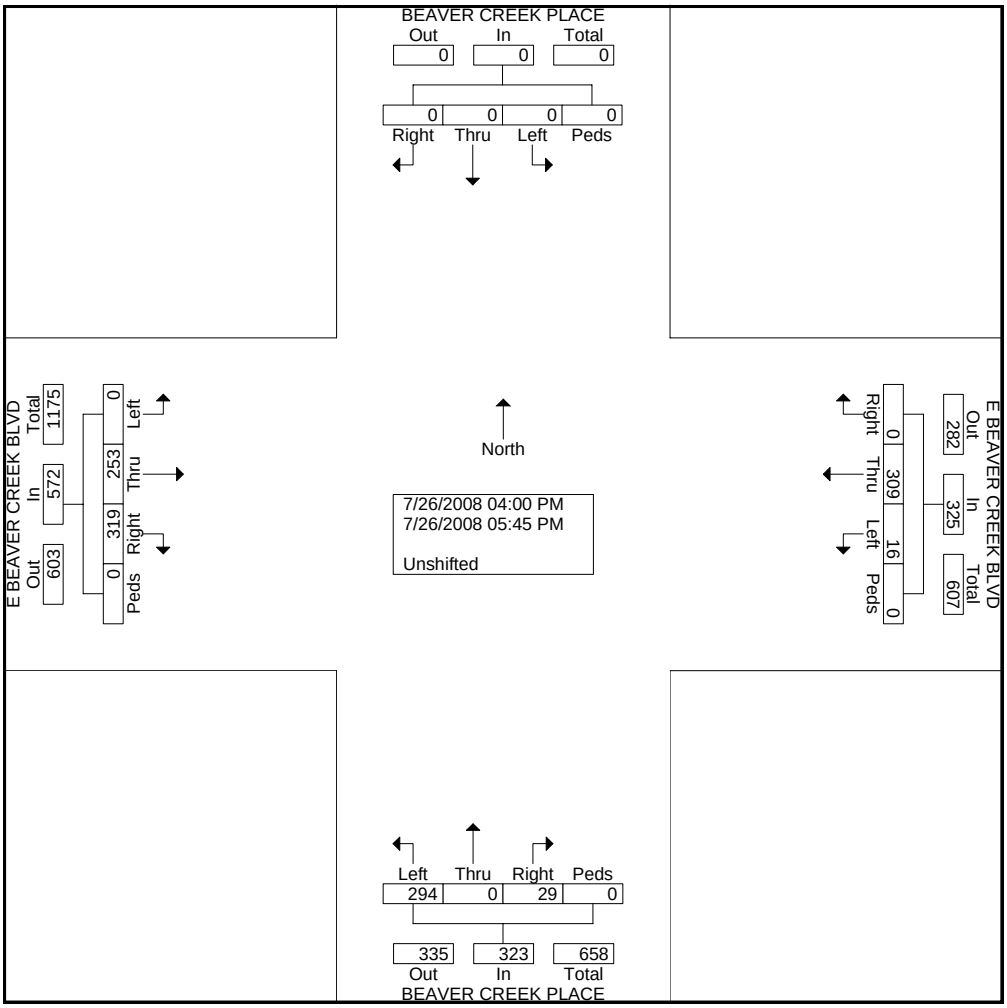
	CHAPEL Southbound					BENCHMARK Westbound					CHAPEL Northbound					BENCHMARK Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	4	57	0	0	61	36	0	14	0	50	0	65	27	0	92	203
04:30 PM	0	0	0	0	0	5	50	0	0	55	22	0	4	0	26	0	52	21	0	73	154
04:45 PM	0	0	0	0	0	2	54	0	0	56	26	0	7	0	33	0	48	19	0	67	156
05:00 PM	0	0	0	0	0	4	54	0	0	58	30	0	7	0	37	0	46	26	0	72	167
Total Volume	0	0	0	0	0	15	215	0	0	230	114	0	32	0	146	0	211	93	0	304	680
% App. Total	0	0	0	0		6.5	93.5	0	0		78.1	0	21.9	0		0	69.4	30.6	0		
PHF	.000	.000	.000	.000	.000	.750	.943	.000	.000	.943	.792	.000	.571	.000	.730	.000	.812	.861	.000	.826	.837



File Name : #10 EBEAVER&EBEAVERPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 1

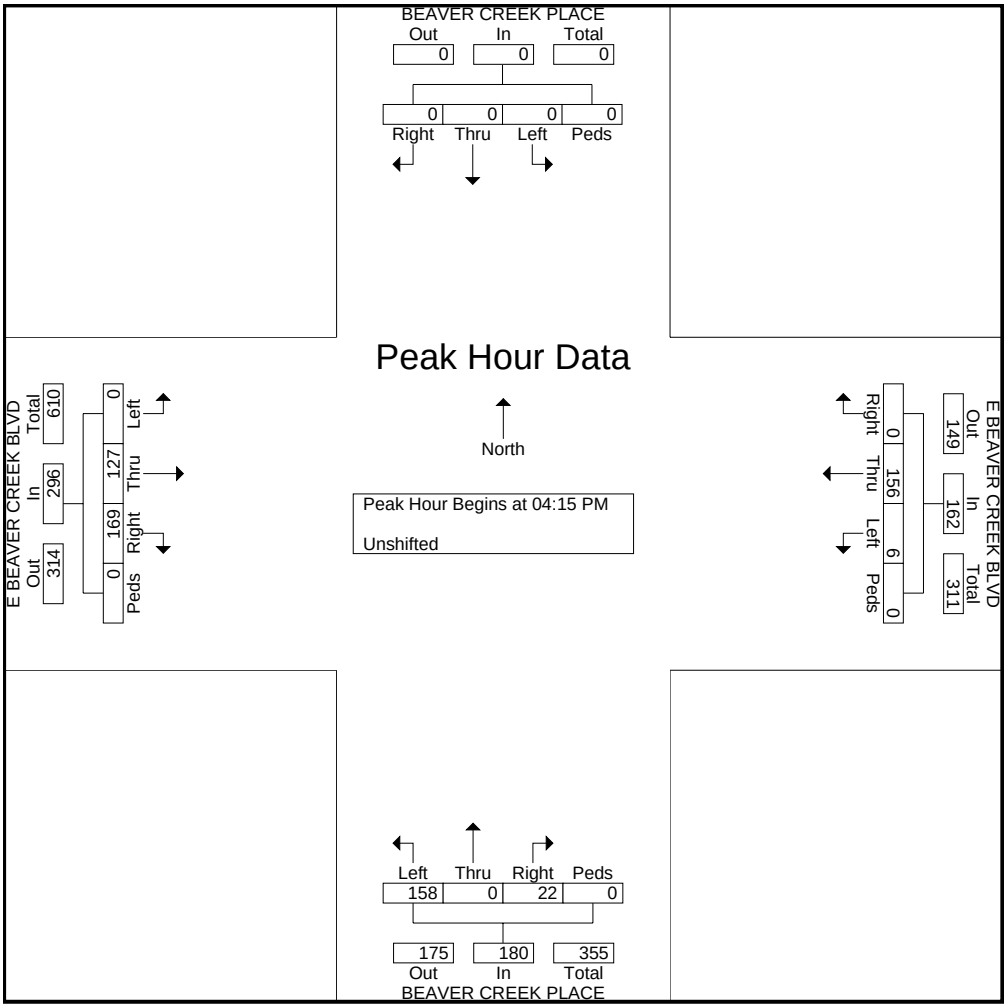
Groups Printed- Unshifted

	BEAVER CREEK PLACE Southbound				E BEAVER CREEK BLVD Westbound				BEAVER CREEK PLACE Northbound				E BEAVER CREEK BLVD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
04:00 PM	0	0	0	0	1	45	0	0	37	0	2	0	0	27	36	0	148
04:15 PM	0	0	0	0	0	45	0	0	34	0	9	0	0	20	52	0	160
04:30 PM	0	0	0	0	3	42	0	0	44	0	7	0	0	33	45	0	174
04:45 PM	0	0	0	0	1	35	0	0	44	0	2	0	0	29	29	0	140
Total	0	0	0	0	5	167	0	0	159	0	20	0	0	109	162	0	622
05:00 PM	0	0	0	0	2	34	0	0	36	0	4	0	0	45	43	0	164
05:15 PM	0	0	0	0	2	34	0	0	33	0	4	0	0	31	47	0	151
05:30 PM	0	0	0	0	2	37	0	0	37	0	1	0	0	35	42	0	154
05:45 PM	0	0	0	0	5	37	0	0	29	0	0	0	0	33	25	0	129
Total	0	0	0	0	11	142	0	0	135	0	9	0	0	144	157	0	598
Grand Total	0	0	0	0	16	309	0	0	294	0	29	0	0	253	319	0	1220
Apprch %	0	0	0	0	4.9	95.1	0	0	91	0	9	0	0	44.2	55.8	0	
Total %	0	0	0	0	1.3	25.3	0	0	24.1	0	2.4	0	0	20.7	26.1	0	



File Name : #10 EBEAVER&EBEAVERPM
Site Code : 00000000
Start Date : 7/26/2008
Page No : 2

	BEAVER CREEK PLACE Southbound					E BEAVER CREEK BLVD Westbound					BEAVER CREEK PLACE Northbound					E BEAVER CREEK BLVD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	0	45	0	0	45	34	0	9	0	43	0	20	52	0	72	160
04:30 PM	0	0	0	0	0	3	42	0	0	45	44	0	7	0	51	0	33	45	0	78	174
04:45 PM	0	0	0	0	0	1	35	0	0	36	44	0	2	0	46	0	29	29	0	58	140
05:00 PM	0	0	0	0	0	2	34	0	0	36	36	0	4	0	40	0	45	43	0	88	164
Total Volume	0	0	0	0	0	6	156	0	0	162	158	0	22	0	180	0	127	169	0	296	638
% App. Total	0	0	0	0		3.7	96.3	0	0		87.8	0	12.2	0		0	42.9	57.1	0		
PHF	.000	.000	.000	.000	.000	.500	.867	.000	.000	.900	.898	.000	.611	.000	.882	.000	.706	.813	.000	.841	.917

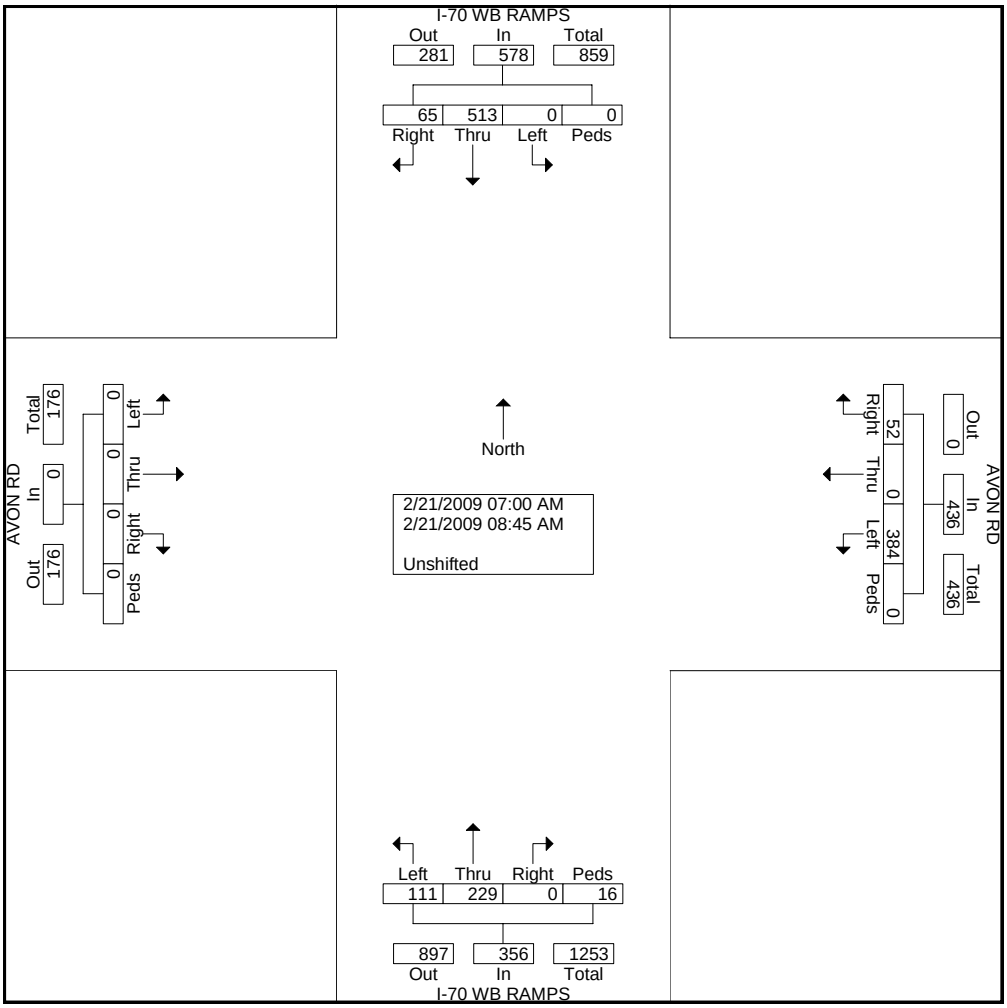


WWW.ALLTRAFFICDATA.NET

File Name : AM_10300 I-70WB&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 1

Groups Printed- Unshifted

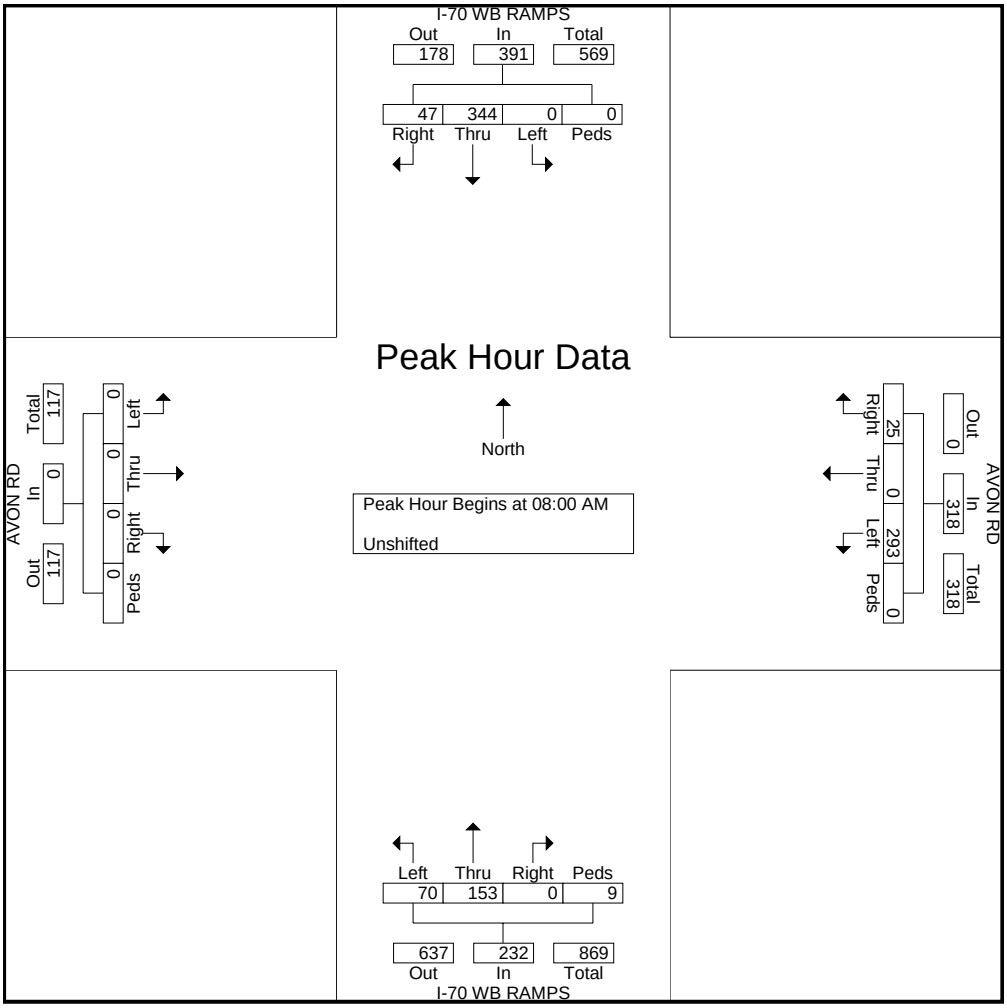
	I-70 WB RAMPS Southbound				AVON RD Westbound				I-70 WB RAMPS Northbound				AVON RD Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	2	17	0	0	5	0	12	0	0	20	7	4	0	0	0	0	67
07:15 AM	6	32	0	0	9	0	16	0	0	16	14	1	0	0	0	0	94
07:30 AM	3	54	0	0	6	0	22	0	0	17	9	1	0	0	0	0	112
07:45 AM	7	66	0	0	7	0	41	0	0	23	11	1	0	0	0	0	156
Total	18	169	0	0	27	0	91	0	0	76	41	7	0	0	0	0	429
08:00 AM	5	72	0	0	11	0	82	0	0	35	10	2	0	0	0	0	217
08:15 AM	23	83	0	0	3	0	57	0	0	47	26	1	0	0	0	0	240
08:30 AM	10	93	0	0	6	0	76	0	0	28	12	2	0	0	0	0	227
08:45 AM	9	96	0	0	5	0	78	0	0	43	22	4	0	0	0	0	257
Total	47	344	0	0	25	0	293	0	0	153	70	9	0	0	0	0	941
Grand Total	65	513	0	0	52	0	384	0	0	229	111	16	0	0	0	0	1370
Apprch %	11.2	88.8	0	0	11.9	0	88.1	0	0	64.3	31.2	4.5	0	0	0	0	
Total %	4.7	37.4	0	0	3.8	0	28	0	0	16.7	8.1	1.2	0	0	0	0	



WWW.ALLTRAFFICDATA.NET

File Name : AM_10300 I-70WB&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 2

	I-70 WB RAMPS Southbound					AVON RD Westbound					I-70 WB RAMPS Northbound					AVON RD Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	5	72	0	0	77	11	0	82	0	93	0	35	10	2	47	0	0	0	0	0	217
08:15 AM	23	83	0	0	106	3	0	57	0	60	0	47	26	1	74	0	0	0	0	0	240
08:30 AM	10	93	0	0	103	6	0	76	0	82	0	28	12	2	42	0	0	0	0	0	227
08:45 AM	9	96	0	0	105	5	0	78	0	83	0	43	22	4	69	0	0	0	0	0	257
Total Volume	47	344	0	0	391	25	0	293	0	318	0	153	70	9	232	0	0	0	0	0	941
% App. Total	12	88	0	0		7.9	0	92.1	0		0	65.9	30.2	3.9		0	0	0	0		
PHF	.511	.896	.000	.000	.922	.568	.000	.893	.000	.855	.000	.814	.673	.563	.784	.000	.000	.000	.000	.000	.915

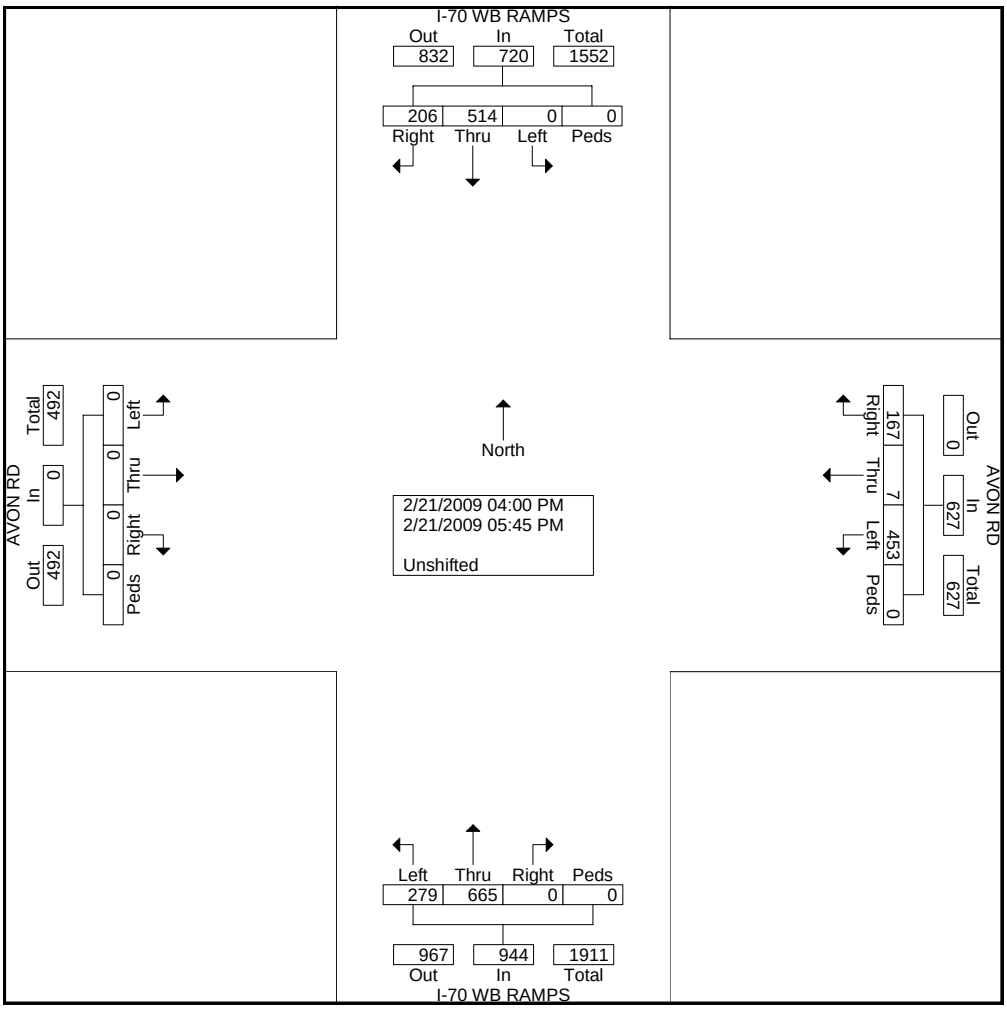


WWW.ALLTRAFFICDATA.NET

File Name : PM_10300 I-70WB&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 1

Groups Printed- Unshifted

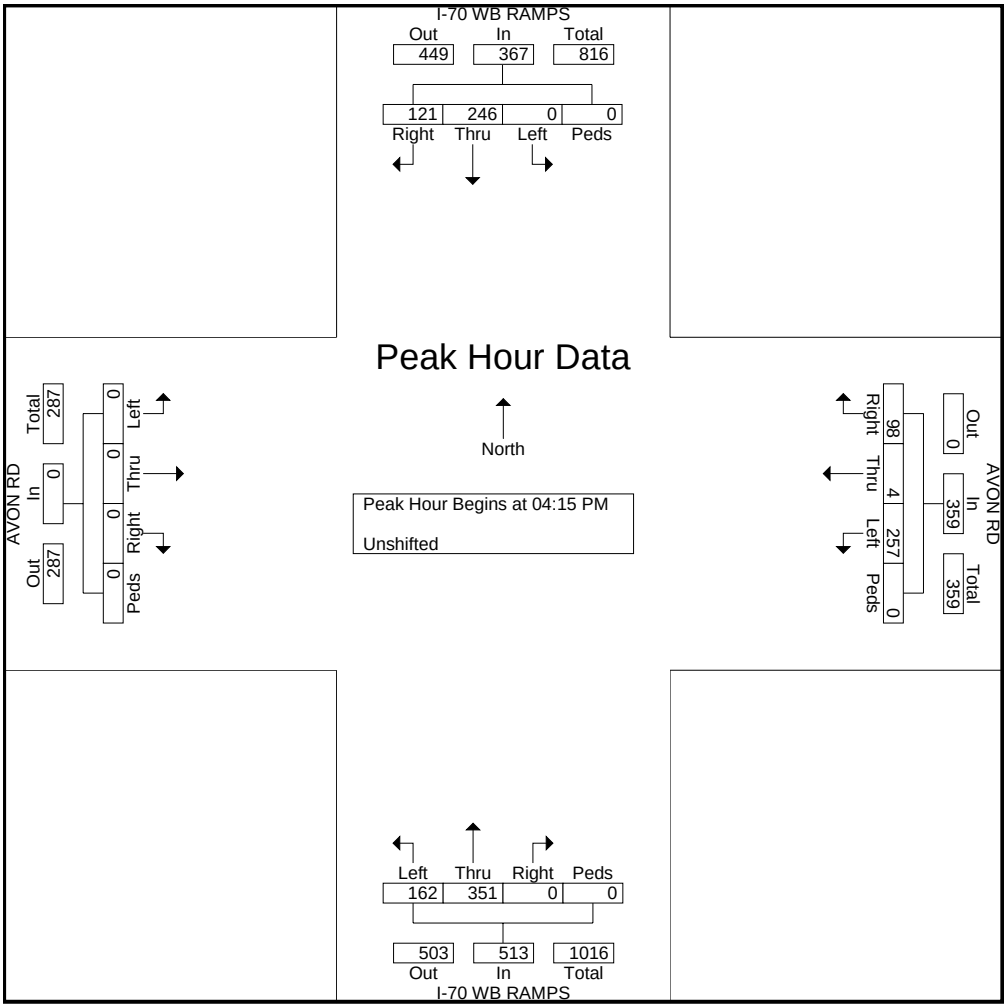
	I-70 WB RAMPS Southbound				AVON RD Westbound				I-70 WB RAMPS Northbound				AVON RD Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	22	57	0	0	18	0	51	0	0	92	32	0	0	0	0	0	272
04:15 PM	27	51	0	0	14	0	69	0	0	72	42	0	0	0	0	0	275
04:30 PM	33	53	0	0	27	2	73	0	0	95	41	0	0	0	0	0	324
04:45 PM	40	71	0	0	29	2	61	0	0	103	39	0	0	0	0	0	345
Total	122	232	0	0	88	4	254	0	0	362	154	0	0	0	0	0	1216
05:00 PM	21	71	0	0	28	0	54	0	0	81	40	0	0	0	0	0	295
05:15 PM	21	59	0	0	13	1	56	0	0	70	45	0	0	0	0	0	265
05:30 PM	18	74	0	0	18	2	41	0	0	74	22	0	0	0	0	0	249
05:45 PM	24	78	0	0	20	0	48	0	0	78	18	0	0	0	0	0	266
Total	84	282	0	0	79	3	199	0	0	303	125	0	0	0	0	0	1075
Grand Total	206	514	0	0	167	7	453	0	0	665	279	0	0	0	0	0	2291
Apprch %	28.6	71.4	0	0	26.6	1.1	72.2	0	0	70.4	29.6	0	0	0	0	0	
Total %	9	22.4	0	0	7.3	0.3	19.8	0	0	29	12.2	0	0	0	0	0	



WWW.ALLTRAFFICDATA.NET

File Name : PM_10300 I-70WB&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 2

	I-70 WB RAMPS Southbound					AVON RD Westbound					I-70 WB RAMPS Northbound					AVON RD Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	27	51	0	0	78	14	0	69	0	83	0	72	42	0	114	0	0	0	0	0	275
04:30 PM	33	53	0	0	86	27	2	73	0	102	0	95	41	0	136	0	0	0	0	0	324
04:45 PM	40	71	0	0	111	29	2	61	0	92	0	103	39	0	142	0	0	0	0	0	345
05:00 PM	21	71	0	0	92	28	0	54	0	82	0	81	40	0	121	0	0	0	0	0	295
Total Volume	121	246	0	0	367	98	4	257	0	359	0	351	162	0	513	0	0	0	0	0	1239
% App. Total	33	67	0	0		27.3	1.1	71.6	0		0	68.4	31.6	0		0	0	0	0		
PHF	.756	.866	.000	.000	.827	.845	.500	.880	.000	.880	.000	.852	.964	.000	.903	.000	.000	.000	.000	.000	.898

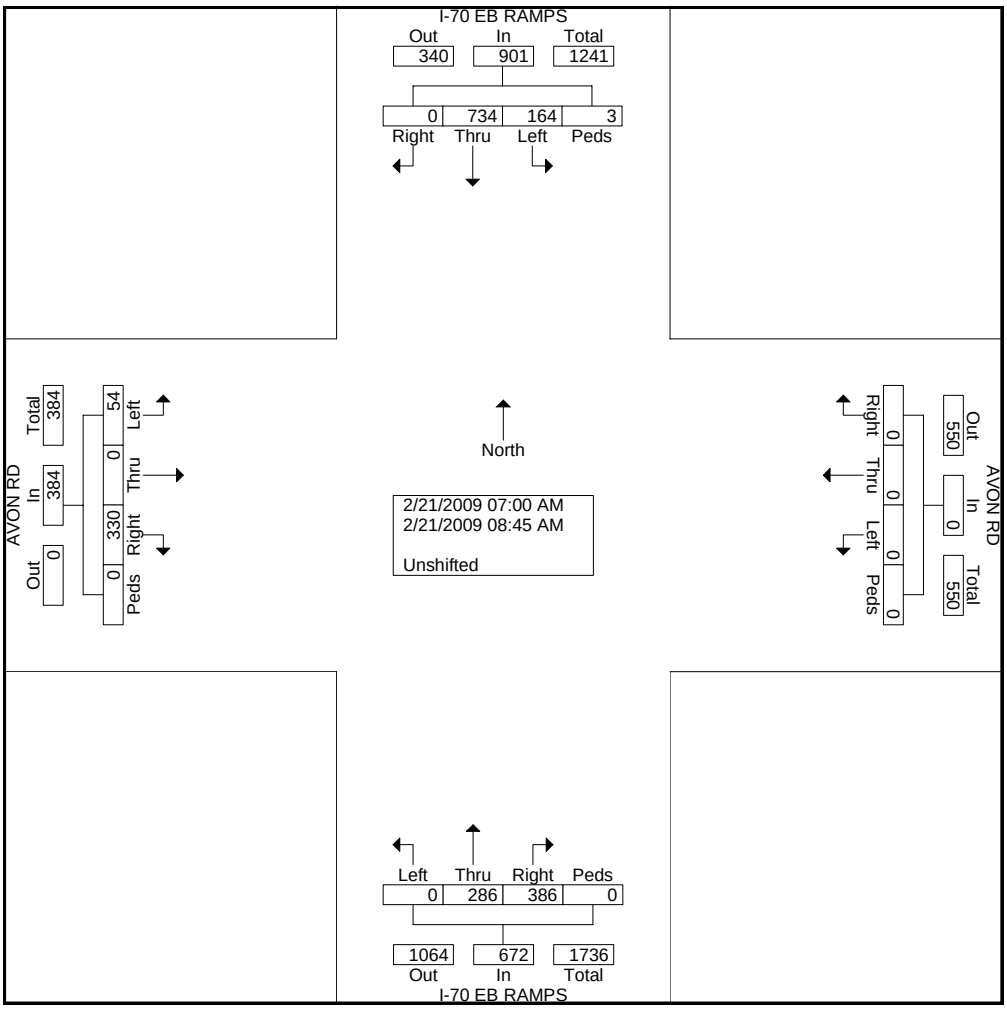


WWW.ALLTRAFFICDATA.NET

File Name : AM_10301 I-70EB&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 1

Groups Printed- Unshifted

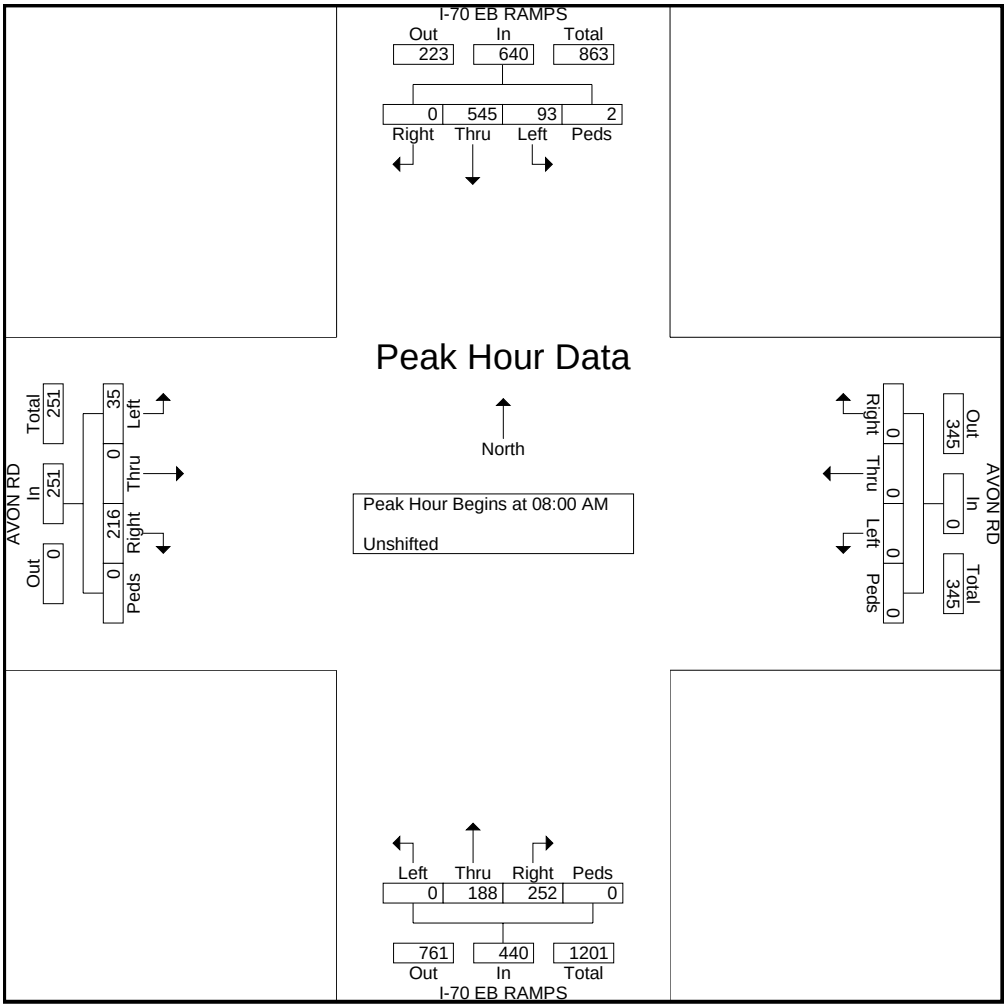
	I-70 EB RAMPS Southbound				AVON RD Westbound				I-70 EB RAMPS Northbound				AVON RD Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	20	9	0	0	0	0	0	26	19	0	0	21	0	8	0	103
07:15 AM	0	35	13	0	0	0	0	0	26	25	0	0	25	0	5	0	129
07:30 AM	0	57	19	0	0	0	0	0	33	23	0	0	32	0	3	0	167
07:45 AM	0	77	30	1	0	0	0	0	49	31	0	0	36	0	3	0	227
Total	0	189	71	1	0	0	0	0	134	98	0	0	114	0	19	0	626
08:00 AM	0	132	22	0	0	0	0	0	55	38	0	0	59	0	7	0	313
08:15 AM	0	111	29	0	0	0	0	0	63	62	0	0	50	0	11	0	326
08:30 AM	0	141	28	1	0	0	0	0	67	35	0	0	50	0	5	0	327
08:45 AM	0	161	14	1	0	0	0	0	67	53	0	0	57	0	12	0	365
Total	0	545	93	2	0	0	0	0	252	188	0	0	216	0	35	0	1331
Grand Total	0	734	164	3	0	0	0	0	386	286	0	0	330	0	54	0	1957
Apprch %	0	81.5	18.2	0.3	0	0	0	0	57.4	42.6	0	0	85.9	0	14.1	0	
Total %	0	37.5	8.4	0.2	0	0	0	0	19.7	14.6	0	0	16.9	0	2.8	0	



WWW.ALLTRAFFICDATA.NET

File Name : AM_10301 I-70EB&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 2

	I-70 EB RAMPS Southbound					AVON RD Westbound					I-70 EB RAMPS Northbound					AVON RD Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	132	22	0	154	0	0	0	0	0	55	38	0	0	93	59	0	7	0	66	313
08:15 AM	0	111	29	0	140	0	0	0	0	0	63	62	0	0	125	50	0	11	0	61	326
08:30 AM	0	141	28	1	170	0	0	0	0	0	67	35	0	0	102	50	0	5	0	55	327
08:45 AM	0	161	14	1	176	0	0	0	0	0	67	53	0	0	120	57	0	12	0	69	365
Total Volume	0	545	93	2	640	0	0	0	0	0	252	188	0	0	440	216	0	35	0	251	1331
% App. Total	0	85.2	14.5	0.3		0	0	0	0		57.3	42.7	0	0		86.1	0	13.9	0		
PHF	.000	.846	.802	.500	.909	.000	.000	.000	.000	.000	.940	.758	.000	.000	.880	.915	.000	.729	.000	.909	.912



WWW.ALLTRAFFICDATA.NET

File Name : PM_10301 I-70EB&AVON
Site Code : 00000000
Start Date : 2/21/2009
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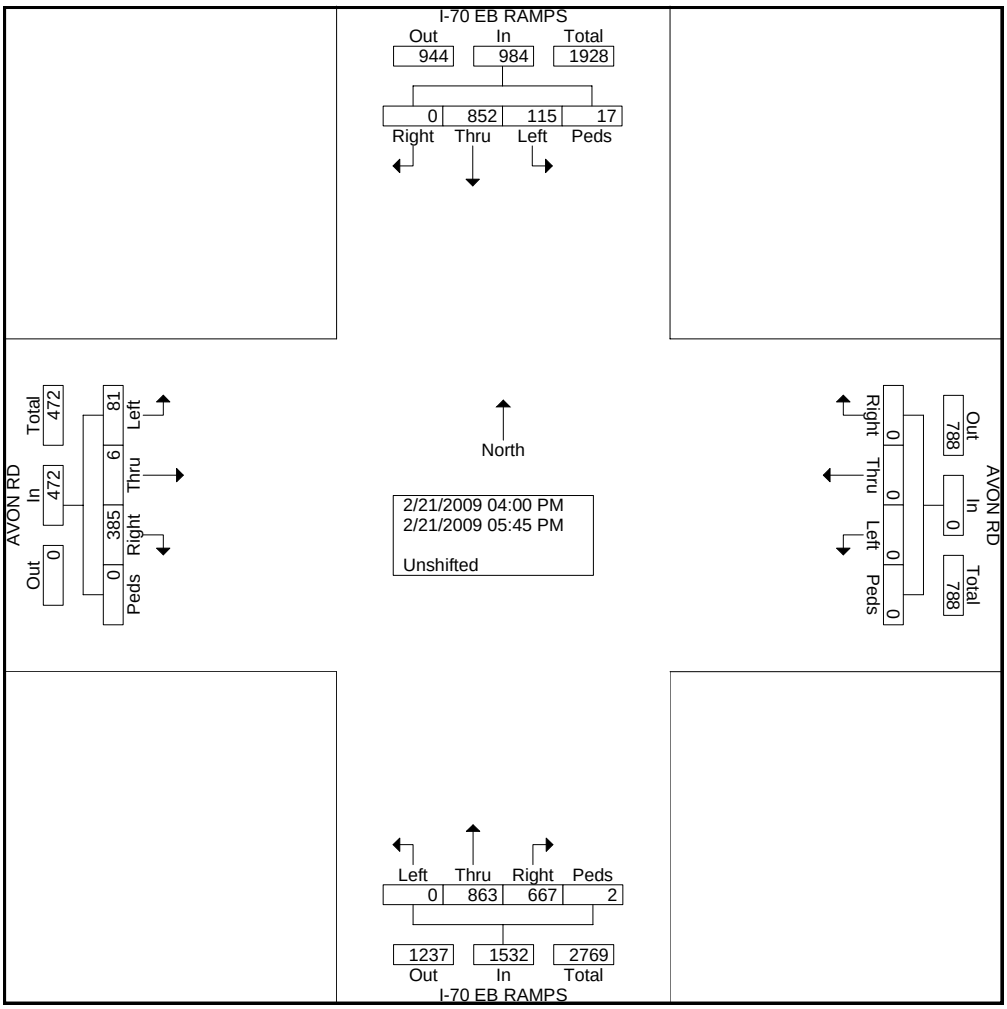
Groups Printed- Unshifted

	I-70 EB RAMPS Southbound				AVON RD Westbound				I-70 EB RAMPS Northbound				AVON RD Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	97	11	2	0	0	0	0	76	119	0	0	40	3	5	0	353
04:15 PM	0	104	16	3	0	0	0	0	97	107	0	0	54	0	7	0	388
04:30 PM	0	115	11	2	0	0	0	0	114	126	0	0	61	1	10	0	440
04:45 PM	0	120	12	4	0	0	0	0	84	131	0	1	48	1	11	0	412
Total	0	436	50	11	0	0	0	0	371	483	0	1	203	5	33	0	1593
05:00 PM	0	104	21	4	0	0	0	0	100	109	0	0	57	1	12	0	408
05:15 PM	0	103	12	1	0	0	0	0	76	101	0	1	42	0	14	0	350
05:30 PM	0	92	23	0	0	0	0	0	66	86	0	0	51	0	10	0	328
05:45 PM	0	117	9	1	0	0	0	0	54	84	0	0	32	0	12	0	309
Total	0	416	65	6	0	0	0	0	296	380	0	1	182	1	48	0	1395
Grand Total	0	852	115	17	0	0	0	0	667	863	0	2	385	6	81	0	2988
Apprch %	0	86.6	11.7	1.7	0	0	0	0	43.5	56.3	0	0.1	81.6	1.3	17.2	0	
Total %	0	28.5	3.8	0.6	0	0	0	0	22.3	28.9	0	0.1	12.9	0.2	2.7	0	



WWW.ALLTRAFFICDATA.NET

File Name : PM_10301 I-70EB&AVON
Site Code : 00000000
Start Date : 2/21/2009
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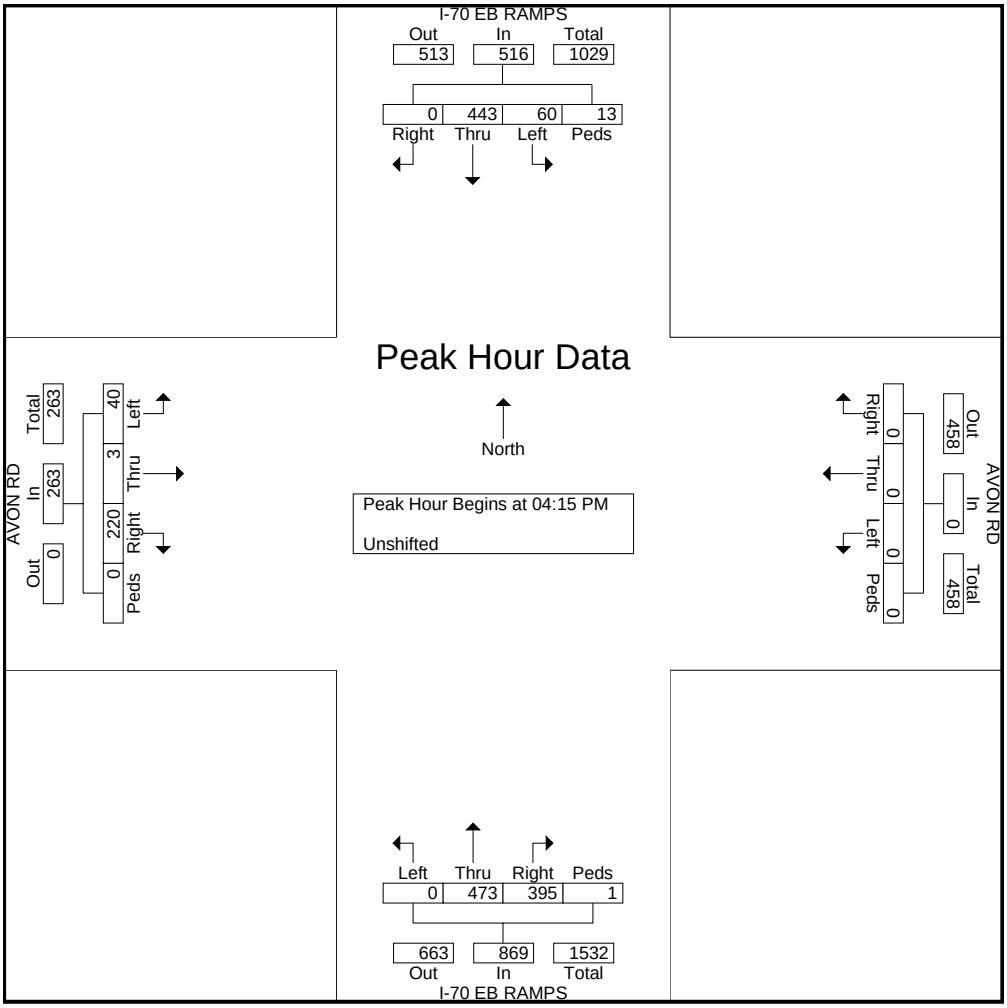
	I-70 EB RAMPS Southbound					AVON RD Westbound					I-70 EB RAMPS Northbound					AVON RD Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	104	16	3	123	0	0	0	0	0	97	107	0	0	204	54	0	7	0	61	388
04:30 PM	0	115	11	2	128	0	0	0	0	0	114	126	0	0	240	61	1	10	0	72	440
04:45 PM	0	120	12	4	136	0	0	0	0	0	84	131	0	1	216	48	1	11	0	60	412
05:00 PM	0	104	21	4	129	0	0	0	0	0	100	109	0	0	209	57	1	12	0	70	408
Total Volume	0	443	60	13	516	0	0	0	0	0	395	473	0	1	869	220	3	40	0	263	1648
% App. Total	0	85.9	11.6	2.5		0	0	0	0		45.5	54.4	0	0.1		83.7	1.1	15.2	0		
PHF	.000	.923	.714	.813	.949	.000	.000	.000	.000	.000	.866	.903	.000	.250	.905	.902	.750	.833	.000	.913	.936



WWW.ALLTRAFFICDATA.NET

File Name : AM_10302 BEAVERCREEK&AVON
Site Code : 00000000
Start Date : 2/21/2009
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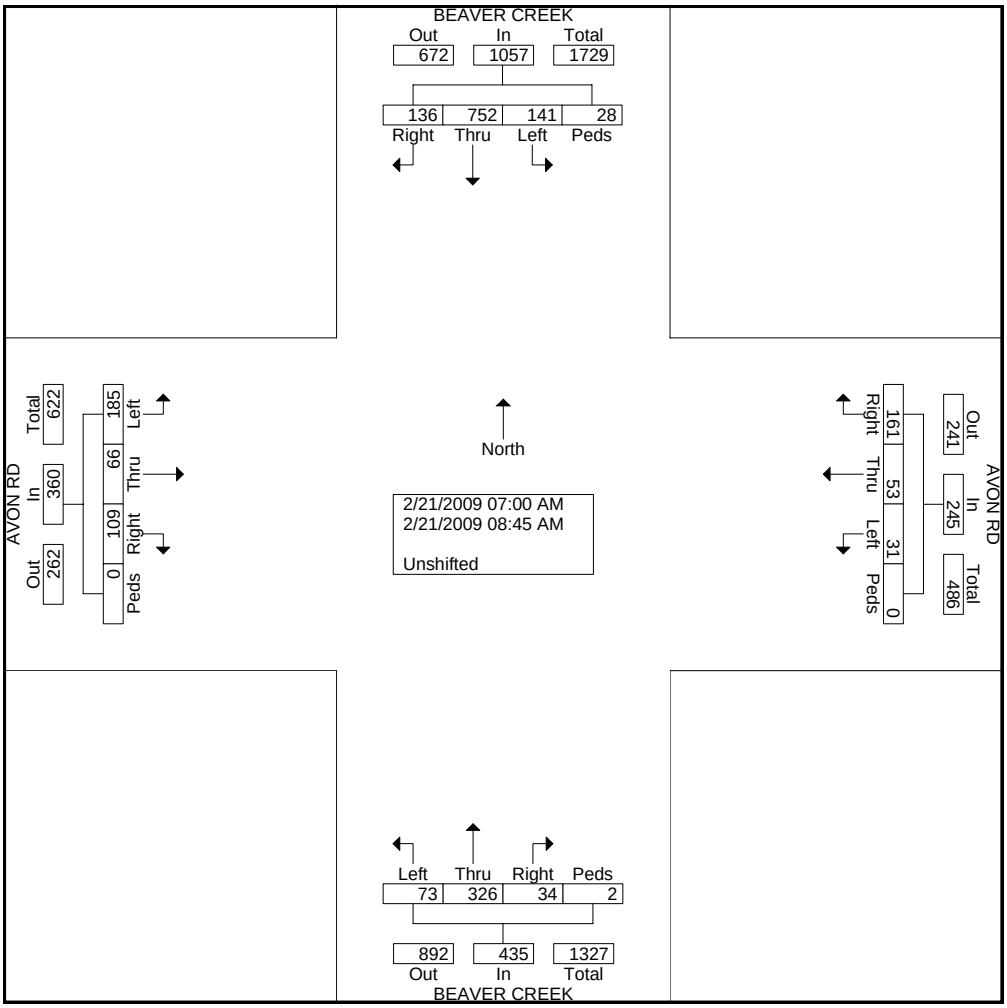
Groups Printed- Unshifted

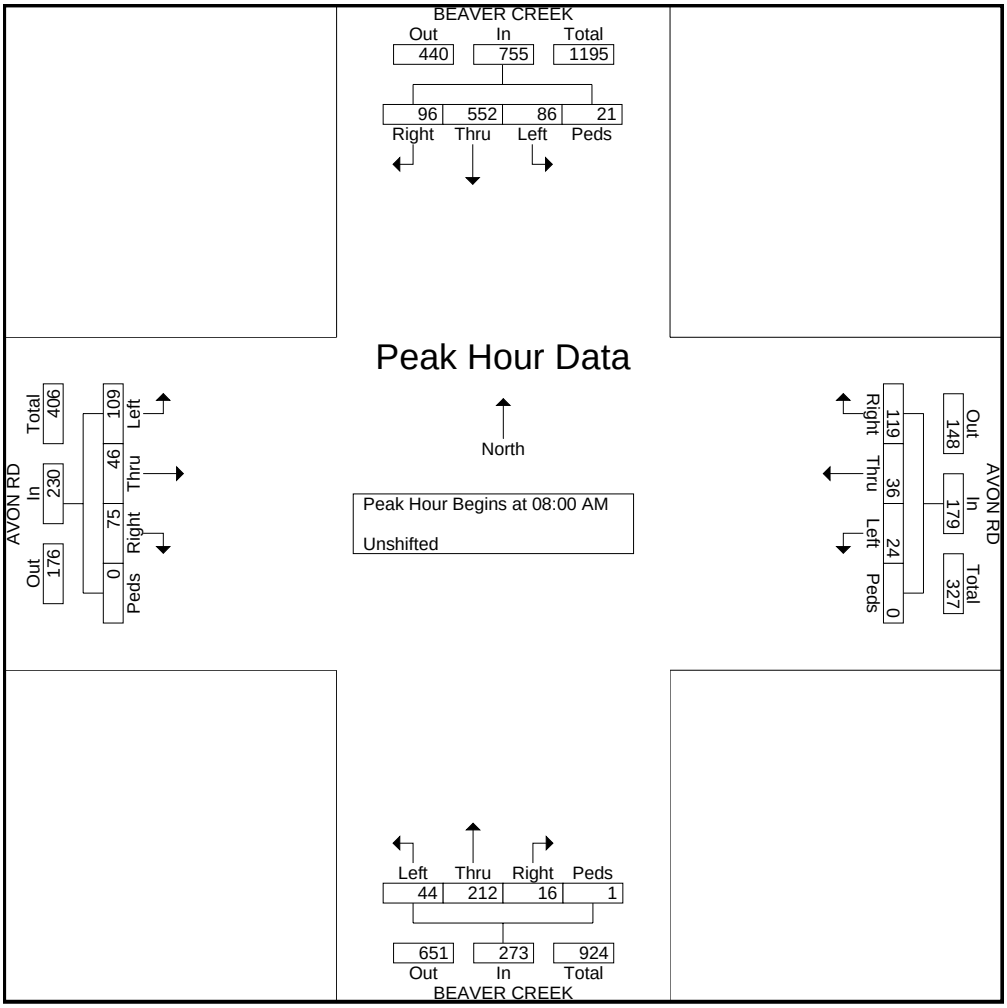
	BEAVER CREEK Southbound				AVON RD Westbound				BEAVER CREEK Northbound				AVON RD Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	8	23	10	2	5	1	1	0	4	22	5	0	6	4	18	0	109
07:15 AM	6	45	10	1	11	4	2	0	4	24	12	0	3	2	16	0	140
07:30 AM	10	55	17	3	9	6	1	0	4	31	5	0	10	7	16	0	174
07:45 AM	16	77	18	1	17	6	3	0	6	37	7	1	15	7	26	0	237
Total	40	200	55	7	42	17	7	0	18	114	29	1	34	20	76	0	660
08:00 AM	25	148	19	5	24	5	8	0	3	41	14	1	15	7	28	0	343
08:15 AM	14	113	22	5	35	7	6	0	4	58	9	0	14	6	32	0	325
08:30 AM	20	142	20	4	24	16	2	0	7	54	10	0	27	17	24	0	367
08:45 AM	37	149	25	7	36	8	8	0	2	59	11	0	19	16	25	0	402
Total	96	552	86	21	119	36	24	0	16	212	44	1	75	46	109	0	1437
Grand Total	136	752	141	28	161	53	31	0	34	326	73	2	109	66	185	0	2097
Apprch %	12.9	71.1	13.3	2.6	65.7	21.6	12.7	0	7.8	74.9	16.8	0.5	30.3	18.3	51.4	0	
Total %	6.5	35.9	6.7	1.3	7.7	2.5	1.5	0	1.6	15.5	3.5	0.1	5.2	3.1	8.8	0	



WWW.ALLTRAFFICDATA.NET

File Name : AM_10302 BEAVERCREEK&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 2

	BEAVER CREEK Southbound					AVON RD Westbound					BEAVER CREEK Northbound					AVON RD Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	25	148	19	5	197	24	5	8	0	37	3	41	14	1	59	15	7	28	0	50	343
08:15 AM	14	113	22	5	154	35	7	6	0	48	4	58	9	0	71	14	6	32	0	52	325
08:30 AM	20	142	20	4	186	24	16	2	0	42	7	54	10	0	71	27	17	24	0	68	367
08:45 AM	37	149	25	7	218	36	8	8	0	52	2	59	11	0	72	19	16	25	0	60	402
Total Volume	96	552	86	21	755	119	36	24	0	179	16	212	44	1	273	75	46	109	0	230	1437
% App. Total	12.7	73.1	11.4	2.8		66.5	20.1	13.4	0		5.9	77.7	16.1	0.4		32.6	20	47.4	0		
PHF	.649	.926	.860	.750	.866	.826	.563	.750	.000	.861	.571	.898	.786	.250	.948	.694	.676	.852	.000	.846	.894



WWW.ALLTRAFFICDATA.NET

File Name : PM_10302 BEAVERCREEK&AVON
Site Code : 00000000
Start Date : 2/21/2009
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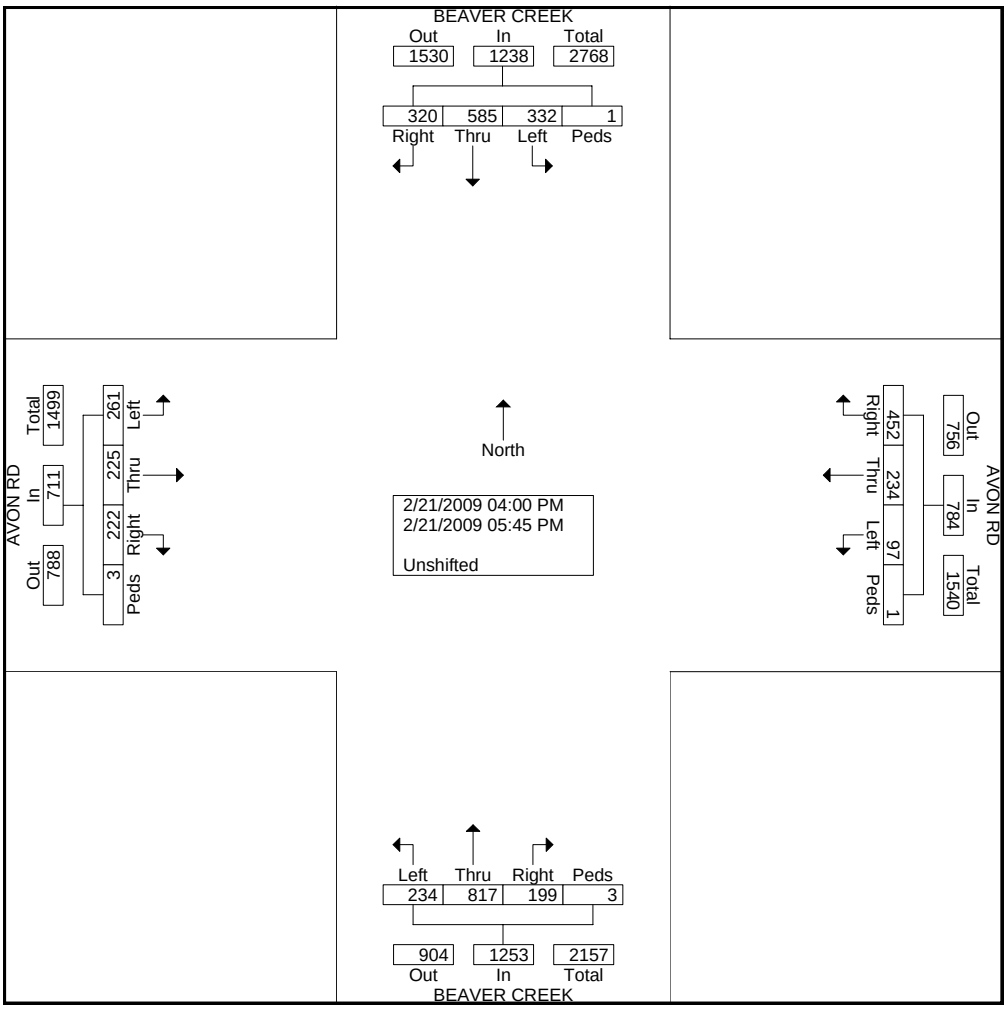
Groups Printed- Unshifted

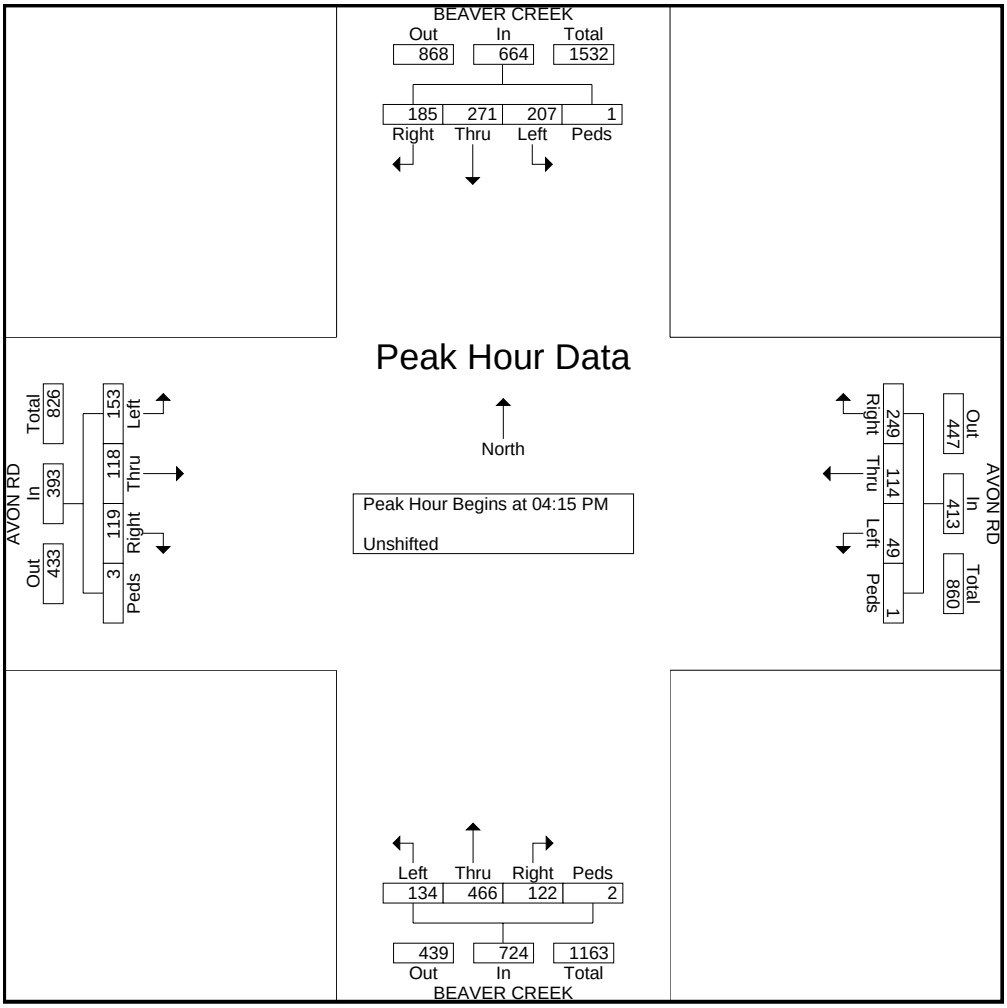
	BEAVER CREEK Southbound				AVON RD Westbound				BEAVER CREEK Northbound				AVON RD Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	35	59	43	0	64	42	7	0	25	113	35	1	24	17	18	0	483
04:15 PM	58	48	52	0	49	30	13	1	20	112	38	0	21	20	43	3	508
04:30 PM	53	58	65	0	66	20	11	0	38	131	47	2	34	26	43	0	594
04:45 PM	42	66	60	1	77	41	15	0	44	105	32	0	35	38	33	0	589
Total	188	231	220	1	256	133	46	1	127	461	152	3	114	101	137	3	2174
05:00 PM	32	99	30	0	57	23	10	0	20	118	17	0	29	34	34	0	503
05:15 PM	39	73	33	0	62	29	19	0	18	89	23	0	32	33	26	0	476
05:30 PM	28	92	23	0	40	22	11	0	19	82	23	0	21	35	30	0	426
05:45 PM	33	90	26	0	37	27	11	0	15	67	19	0	26	22	34	0	407
Total	132	354	112	0	196	101	51	0	72	356	82	0	108	124	124	0	1812
Grand Total	320	585	332	1	452	234	97	1	199	817	234	3	222	225	261	3	3986
Apprch %	25.8	47.3	26.8	0.1	57.7	29.8	12.4	0.1	15.9	65.2	18.7	0.2	31.2	31.6	36.7	0.4	
Total %	8	14.7	8.3	0	11.3	5.9	2.4	0	5	20.5	5.9	0.1	5.6	5.6	6.5	0.1	



WWW.ALLTRAFFICDATA.NET

File Name : PM_10302 BEAVERCREEK&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 2

	BEAVER CREEK Southbound					AVON RD Westbound					BEAVER CREEK Northbound					AVON RD Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	58	48	52	0	158	49	30	13	1	93	20	112	38	0	170	21	20	43	3	87	508
04:30 PM	53	58	65	0	176	66	20	11	0	97	38	131	47	2	218	34	26	43	0	103	594
04:45 PM	42	66	60	1	169	77	41	15	0	133	44	105	32	0	181	35	38	33	0	106	589
05:00 PM	32	99	30	0	161	57	23	10	0	90	20	118	17	0	155	29	34	34	0	97	503
Total Volume	185	271	207	1	664	249	114	49	1	413	122	466	134	2	724	119	118	153	3	393	2194
% App. Total	27.9	40.8	31.2	0.2		60.3	27.6	11.9	0.2		16.9	64.4	18.5	0.3		30.3	30	38.9	0.8		
PHF	.797	.684	.796	.250	.943	.808	.695	.817	.250	.776	.693	.889	.713	.250	.830	.850	.776	.890	.250	.927	.923

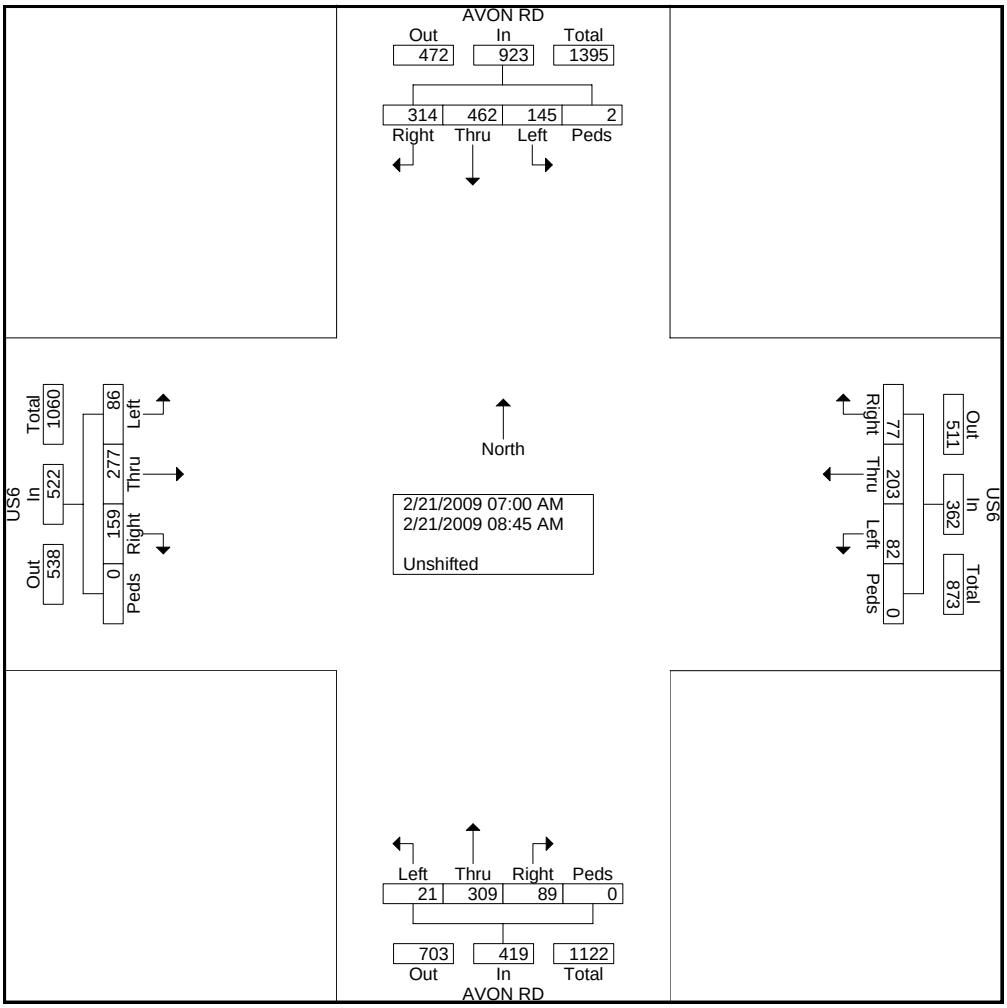


WWW.ALLTRAFFICDATA.NET

File Name : AM_10303 US6&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 1

Groups Printed- Unshifted

	AVON RD Southbound				US6 Westbound				AVON RD Northbound				US6 Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	12	21	4	0	4	13	10	0	4	22	0	0	14	4	7	0	115
07:15 AM	27	15	11	2	9	13	8	0	7	30	3	0	13	20	12	0	170
07:30 AM	30	32	11	0	13	20	7	0	4	27	2	0	15	31	9	0	201
07:45 AM	34	45	20	0	9	27	15	0	10	38	4	0	22	50	14	0	288
Total	103	113	46	2	35	73	40	0	25	117	9	0	64	105	42	0	774
08:00 AM	52	88	28	0	7	27	13	0	20	32	0	0	20	41	11	0	339
08:15 AM	44	60	31	0	12	24	7	0	11	38	5	0	22	52	7	0	313
08:30 AM	52	93	25	0	12	38	9	0	12	56	3	0	25	49	15	0	389
08:45 AM	63	108	15	0	11	41	13	0	21	66	4	0	28	30	11	0	411
Total	211	349	99	0	42	130	42	0	64	192	12	0	95	172	44	0	1452
Grand Total	314	462	145	2	77	203	82	0	89	309	21	0	159	277	86	0	2226
Apprch %	34	50.1	15.7	0.2	21.3	56.1	22.7	0	21.2	73.7	5	0	30.5	53.1	16.5	0	
Total %	14.1	20.8	6.5	0.1	3.5	9.1	3.7	0	4	13.9	0.9	0	7.1	12.4	3.9	0	



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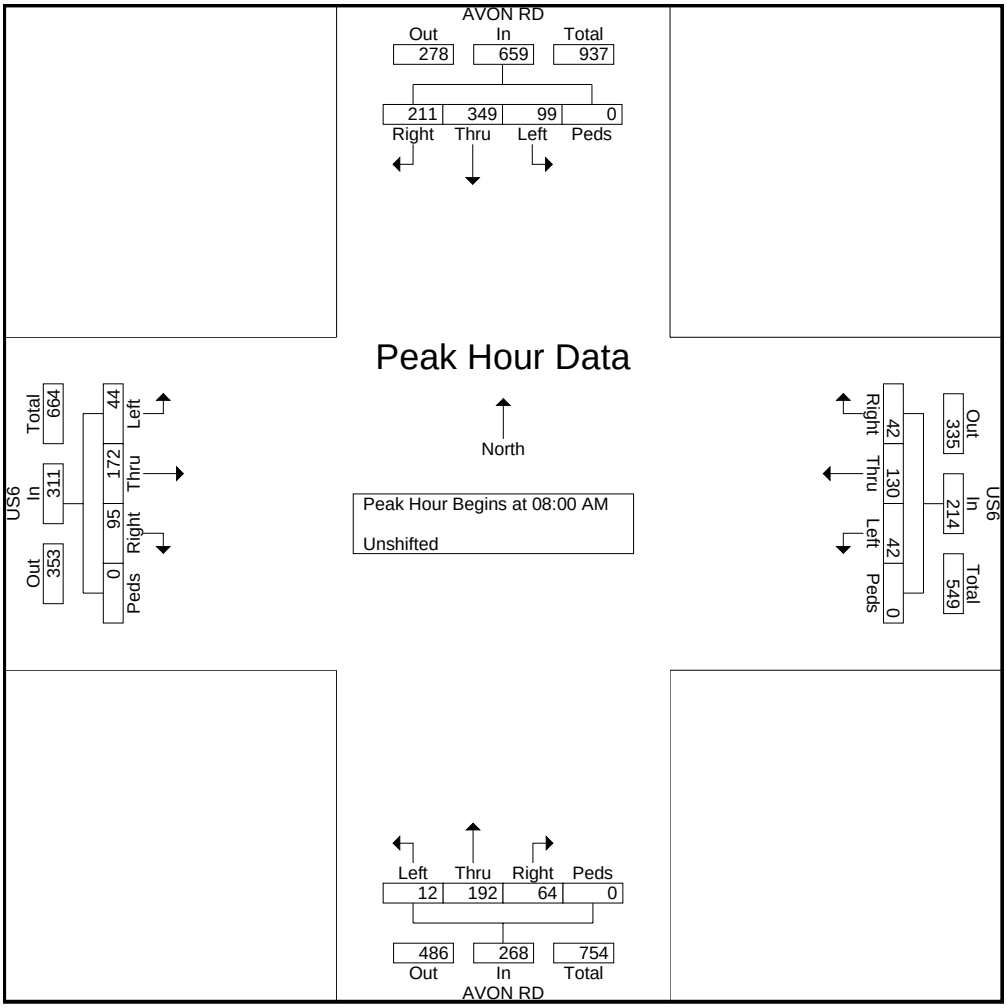
	AVON RD Southbound					US6 Westbound					AVON RD Northbound					US6 Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	52	88	28	0	168	7	27	13	0	47	20	32	0	0	52	20	41	11	0	72	339
08:15 AM	44	60	31	0	135	12	24	7	0	43	11	38	5	0	54	22	52	7	0	81	313
08:30 AM	52	93	25	0	170	12	38	9	0	59	12	56	3	0	71	25	49	15	0	89	389
08:45 AM	63	108	15	0	186	11	41	13	0	65	21	66	4	0	91	28	30	11	0	69	411
Total Volume	211	349	99	0	659	42	130	42	0	214	64	192	12	0	268	95	172	44	0	311	1452
% App. Total	32	53	15	0		19.6	60.7	19.6	0		23.9	71.6	4.5	0		30.5	55.3	14.1	0		
PHF	.837	.808	.798	.000	.886	.875	.793	.808	.000	.823	.762	.727	.600	.000	.736	.848	.827	.733	.000	.874	.883



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File Name : PM_10303 US6&AVON
Site Code : 00000000
Start Date : 2/21/2009
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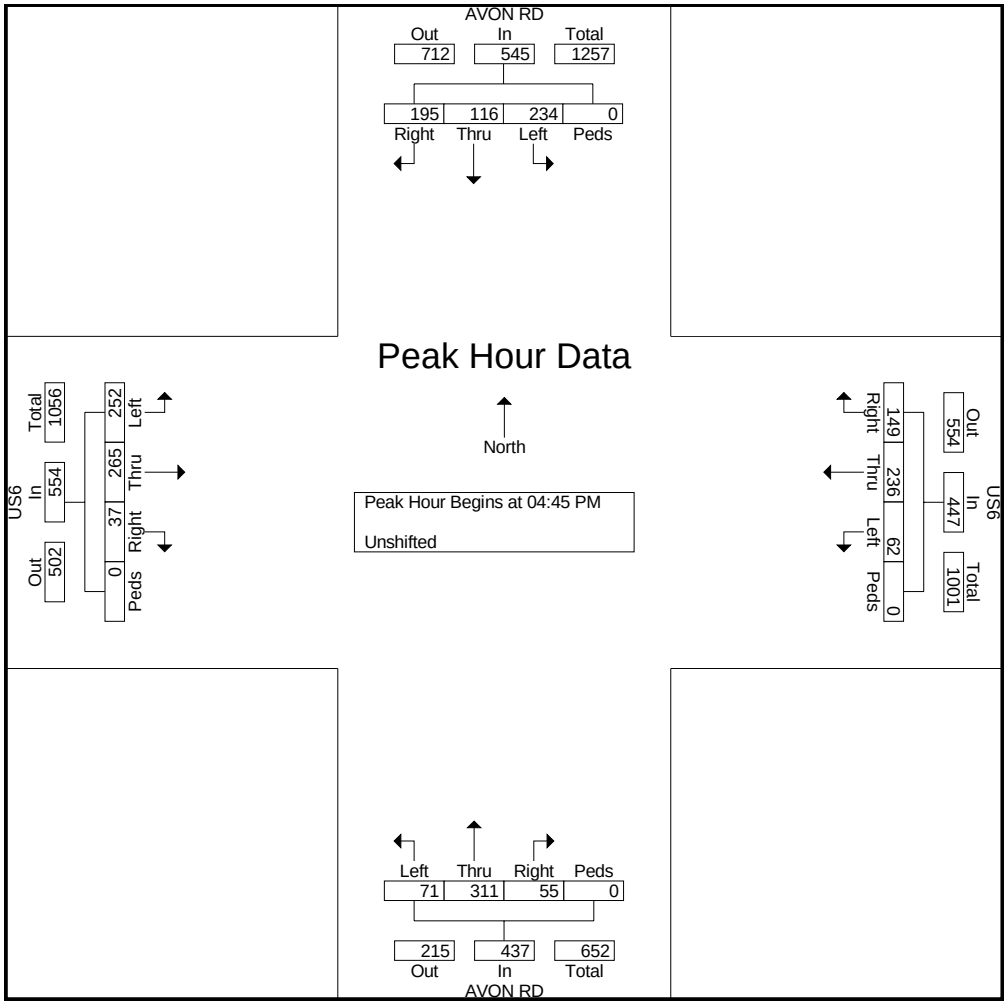
Groups Printed- Unshifted

	AVON RD Southbound				US6 Westbound				AVON RD Northbound				US6 Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	44	28	44	0	32	46	11	0	11	54	16	0	4	38	49	0	377
04:15 PM	54	31	43	0	47	59	10	0	9	59	13	0	7	53	49	0	434
04:30 PM	36	19	49	0	65	58	7	0	22	58	9	0	3	54	60	0	440
04:45 PM	62	29	59	0	51	64	13	0	13	85	17	0	6	74	71	0	544
Total	196	107	195	0	195	227	41	0	55	256	55	0	20	219	229	0	1795
05:00 PM	49	35	46	0	34	59	16	0	13	86	19	0	8	65	59	0	489
05:15 PM	44	22	62	0	35	62	15	0	11	69	21	0	12	59	65	0	477
05:30 PM	40	30	67	0	29	51	18	0	18	71	14	0	11	67	57	0	473
05:45 PM	28	34	58	0	30	42	21	0	7	55	11	0	7	54	40	0	387
Total	161	121	233	0	128	214	70	0	49	281	65	0	38	245	221	0	1826
Grand Total	357	228	428	0	323	441	111	0	104	537	120	0	58	464	450	0	3621
Apprch %	35.2	22.5	42.3	0	36.9	50.4	12.7	0	13.7	70.6	15.8	0	6	47.7	46.3	0	
Total %	9.9	6.3	11.8	0	8.9	12.2	3.1	0	2.9	14.8	3.3	0	1.6	12.8	12.4	0	

WWW.ALLTRAFFICDATA.NET

File Name : PM_10303 US6&AVON
Site Code : 00000000
Start Date : 2/21/2009
Page No : 2

	AVON RD Southbound					US6 Westbound					AVON RD Northbound					US6 Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	62	29	59	0	150	51	64	13	0	128	13	85	17	0	115	6	74	71	0	151	544
05:00 PM	49	35	46	0	130	34	59	16	0	109	13	86	19	0	118	8	65	59	0	132	489
05:15 PM	44	22	62	0	128	35	62	15	0	112	11	69	21	0	101	12	59	65	0	136	477
05:30 PM	40	30	67	0	137	29	51	18	0	98	18	71	14	0	103	11	67	57	0	135	473
Total Volume	195	116	234	0	545	149	236	62	0	447	55	311	71	0	437	37	265	252	0	554	1983
% App. Total	35.8	21.3	42.9	0		33.3	52.8	13.9	0		12.6	71.2	16.2	0		6.7	47.8	45.5	0		
PHF	.786	.829	.873	.000	.908	.730	.922	.861	.000	.873	.764	.904	.845	.000	.926	.771	.895	.887	.000	.917	.911



APPENDIX B EXISTING LOS ANALYSES

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Existing Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / I-70 West Ramps
Existing Summer AM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------------
South: Avon Road
  299   0.096    0.22     0.27     2.7   0.00  0.27     0    4.81    23.7
-----------------------------------------------------------------------------
East: I-70 West Off Ramp
  276   0.077    0.33     0.39     4.3   0.33  0.44     9    5.17    22.7
-----------------------------------------------------------------------------
North: Avon Road
  425   0.200    0.20     0.23     1.7   0.36  0.23    29    7.14    23.6
-----------------------------------------------------------------------------
```

```
ALL VEHICLES:
 1000   0.200    0.75     0.90     2.7   0.24  0.30    29   17.12    23.4
---------------------------------------------------------------------------
INTERSECTION (persons):
 1200   0.200             0.90     2.7   0.24  0.30         17.12    23.4
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Existing Summer AM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
South: Avon Road
  3L L            114   1188   0.096     6.0    A      0.0      0
  8T T            185   1928   0.096     0.7    A      0.0      0
-----------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            103   1341   0.077     6.7    A      0.4      9
  6R R            173   2252   0.077     2.8    A      0.4      9
-----------------------------------------------------------------
North: Avon Road
  4T T            294   1473   0.200*    1.2    A      1.1     29
  4R R            131    656   0.200*    2.6    A      1.1     29
-----------------------------------------------------------------
 ALL VEHICLES:   1000          0.200     2.7    A      1.1     29
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/I-70 West AM
I:\08159\Analysis\Sidra\Int 1 Avon at I-70 west.aap
Processed Nov 20, 2008 08:47:42AM

A0129, Felsburg Holt & Ullevig, Large Office
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SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Existing Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

Avon Road / I-70 East Ramps
Existing Summer AM Peak Hour
Intersection ID: 2
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
West: I-70 East Off Ramp									
234	0.146	0.27	0.33	4.2	0.37	0.43	18	4.42	22.7
South: Avon Road									
402	0.202	1.11	1.33	9.9	0.31	0.61	30	8.48	19.9
North: Avon Road									
386	0.122	0.15	0.18	1.4	0.00	0.14	0	5.71	24.3

```
ALL VEHICLES:
 1022   0.202    1.53     1.84     5.4   0.21  0.39    30   18.60    22.1
----------------------------------------------------------------------
INTERSECTION (persons):
 1226   0.202             1.84     5.4   0.21  0.39         18.60    22.1
----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 East Ramps
Existing Summer AM Peak Hour
Intersection ID: 2
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: I-70 East Off Ramp
  5L L             82   1163   0.071     7.6    A      0.3      8
  2R R  (Slp)     152   1043   0.146     2.4    A      0.7     18
-----------------------------------------------------------------
South: Avon Road
  8T T            217   1076   0.202*   15.8    B      1.2     30
  8R R            185   1067   0.173     3.0    A      1.0     25
-----------------------------------------------------------------
North: Avon Road
  7L L             82    672   0.122     6.0    A      0.0      0
  4T T            304   2493   0.122     0.2    A      0.0      0
-----------------------------------------------------------------
 ALL VEHICLES:   1022          0.202     5.4    A      1.2     30
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/I-70 East AM
I:\08159\Analysis\Sidra\Int 2 Avon at I-70 east.aap
Processed Nov 20, 2008 08:49:54AM

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SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Existing Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Existing Summer AM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-------------------------------------------------------------------------
West: WBCB
  278   0.145    0.31     0.37     4.0   0.40  0.43    19    5.23    22.7
-------------------------------------------------------------------------
South: Avon Road
  276   0.090    0.20     0.24     2.7   0.36  0.31    13    4.83    23.2
-------------------------------------------------------------------------
East: WBCB
  234   0.103    0.20     0.24     3.1   0.37  0.36    14    4.18    23.0
-------------------------------------------------------------------------
```

```
North: Avon Road
  380   0.124    0.20     0.24     1.9   0.25  0.20    18    6.29    23.6
----------------------------------------------------------------------
ALL VEHICLES:
 1168   0.145    0.91     1.09     2.8   0.33  0.31    19   20.54    23.2
----------------------------------------------------------------------
INTERSECTION (persons):
 1402   0.145             1.09     2.8   0.33  0.31         20.54    23.2
----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / W. Beaver Creek Blvd
Existing Summer AM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: WBCB
  5L L            98    677   0.145*    7.0    A      0.8     19
  2T T           103    712   0.145*    1.7    A      0.8     19
  2R R            77    927   0.083     3.4    A      0.4     10
-----------------------------------------------------------------
South: Avon Road
  3L L            38    420   0.090     6.9    A      0.5     13
  8T T           173   1913   0.090     1.4    A      0.5     13
  8R R            65   1024   0.063     3.6    A      0.3      9
-----------------------------------------------------------------
East: WBCB
  1L L            33    405   0.081     6.9    A      0.4     11
  6T T            54    663   0.081     1.2    A      0.4     11
  6R R           147   1428   0.103     2.9    A      0.5     14
-----------------------------------------------------------------
North: Avon Road
  7L L            65    523   0.124     6.4    A      0.7     18
  4T T           266   2140   0.124     0.6    A      0.7     18
  4R R            49    933   0.053     2.6    A      0.3      7
-----------------------------------------------------------------
 ALL VEHICLES:   1168          0.145     2.8    A      0.8     19
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/WBCB AM

I:\08159\Analysis\Sidra\Int 3 Avon at WBCB.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Existing Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Existing Summer AM Peak Hour
Intersection ID: 4
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
   98   0.123    0.09     0.10     3.2   0.44  0.44    16    1.83    23.1
---------------------------------------------------------------------------
South: Avon Road
  458   0.146    0.24     0.29     1.9   0.00  0.21     0    7.00    24.1
---------------------------------------------------------------------------
East: Benchmark
   77   0.061    0.13     0.16     6.1   0.39  0.54     7    1.59    22.2
---------------------------------------------------------------------------
```

```
North: Avon Road
  369   0.164    0.11     0.14     1.1   0.29  0.16    23    5.95    23.9
-----------------------------------------------------------------------
ALL VEHICLES:
 1002   0.164    0.57     0.69     2.1   0.18  0.24    23   16.37    23.7
-----------------------------------------------------------------------
INTERSECTION (persons):
 1202   0.164             0.69     2.1   0.18  0.24         16.37    23.7
-----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Existing Summer AM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
  2R R             98    800   0.123     3.2    A      0.6     16
-----------------------------------------------------------------
South: Avon Road
  3L L             87    595   0.146     6.0    A      0.0      0
  8T T            278   1902   0.146     0.5    A      0.0      0
  8R R             93    636   0.146     2.2    A      0.0      0
-----------------------------------------------------------------
East: Benchmark
  1L L             54    879   0.061     7.2    A      0.3      7
  6T T              6     98   0.061     1.5    A      0.3      7
  6R R             17    585   0.029     4.4    A      0.1      3
-----------------------------------------------------------------
North: Avon Road
  4T T            304   1855   0.164*    0.9    A      0.9     23
  4R R             65    397   0.164*    2.3    A      0.9     23
-----------------------------------------------------------------
 ALL VEHICLES:   1002          0.164     2.1    A      0.9     23
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/Benchmark AM
I:\08159\Analysis\Sidra\Int 4 Avon at Benchmark.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Existing Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Existing Summer AM Peak Hour
Intersection ID: 6
Roundabout

----------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
----------------------------------------------------------------------------
West: US 6
  304   0.195    0.27     0.32     3.2   0.39  0.37    28    5.58    23.0
----------------------------------------------------------------------------
South: Avon Road
  288   0.145    0.19     0.22     2.3   0.38  0.30    21    5.07    23.3
----------------------------------------------------------------------------
East: US 6
  299   0.182    0.23     0.28     2.8   0.40  0.34    26    5.38    23.1
----------------------------------------------------------------------------
```

```
North: Avon Road
  337   0.158    0.22     0.27     2.4   0.35  0.28    24    5.89    23.3
----------------------------------------------------------------------------
ALL VEHICLES:
 1228   0.195    0.91     1.10     2.7   0.38  0.32    28   21.92    23.2
----------------------------------------------------------------------------
INTERSECTION (persons):
 1474   0.195             1.10     2.7   0.38  0.32         21.92    23.2
----------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Existing Summer AM Peak Hour
Intersection ID: 6
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
West: US 6
  5L L            60    308   0.195*    7.1    A      1.1     28
  2T T           141    723   0.195*    1.6    A      1.1     28
  2R R           103    858   0.120     3.0    A      0.6     16
-------------------------------------------------------------------
South: Avon Road
  3L L            12     83   0.145     7.2    A      0.8     21
  8T T           206   1420   0.145     1.7    A      0.8     21
  8R R            70    483   0.145     3.4    A      0.8     21
-------------------------------------------------------------------
East: US 6
  1L L            44    242   0.182     7.0    A      1.0     26
  6T T           141    774   0.182     1.4    A      1.0     26
  6R R           114    906   0.126     3.0    A      0.7     17
-------------------------------------------------------------------
North: Avon Road
  7L L            44    279   0.158     6.9    A      0.9     24
  4T T           168   1065   0.158     1.1    A      0.9     24
  4R R           125    793   0.158     2.5    A      0.9     24
-------------------------------------------------------------------
 ALL VEHICLES:   1228          0.195     2.7    A      1.1     28
-------------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/US6 AM

I:\08159\Analysis\Sidra\Int 6 Avon at US6.aap
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	10	0	0	145	5	275	70	65	300	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	11	0	0	158	5	299	76	71	326	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	791	859	168	663	826	188	337			375		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	791	859	168	663	826	188	337			375		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	81	100			94		
cM capacity (veh/h)	215	274	846	325	286	823	1219			1180		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	11	158	5	199	176	71	217	120
Volume Left	0	0	5	0	0	71	0	0
Volume Right	11	158	0	0	76	0	0	11
cSH	846	823	1219	1700	1700	1180	1700	1700
Volume to Capacity	0.01	0.19	0.00	0.12	0.10	0.06	0.13	0.07
Queue Length 95th (ft)	1	18	0	0	0	5	0	0
Control Delay (s)	9.3	10.4	8.0	0.0	0.0	8.2	0.0	0.0
Lane LOS	A	B	A			A		
Approach Delay (s)	9.3	10.4	0.1			1.4		
Approach LOS	A	B						

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	210	95	35	195	30	35	5	30	30	15	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1620		1770	1642	
Flt Permitted	0.47	1.00	1.00	0.50	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	871	1863	1583	939	1863	1583	1770	1620		1770	1642	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	228	103	38	212	33	38	5	33	33	16	60
RTOR Reduction (vph)	0	0	80	0	0	26	0	25	0	0	45	0
Lane Group Flow (vph)	43	228	23	38	212	7	38	13	0	33	31	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	16.3	14.1	14.1	14.7	13.3	13.3	16.2	16.2		16.2	16.2	
Effective Green, g (s)	16.3	14.1	14.1	14.7	13.3	13.3	16.2	16.2		16.2	16.2	
Actuated g/C Ratio	0.26	0.22	0.22	0.23	0.21	0.21	0.25	0.25		0.25	0.25	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	253	411	349	234	388	329	449	411		449	416	
v/s Ratio Prot	c0.01	c0.12		0.00	0.11		c0.02	0.01		0.02	c0.02	
v/s Ratio Perm	0.04		0.01	0.03		0.00						
v/c Ratio	0.17	0.55	0.07	0.16	0.55	0.02	0.08	0.03		0.07	0.08	
Uniform Delay, d1	18.3	22.1	19.7	19.4	22.6	20.1	18.2	18.0		18.1	18.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	1.6	0.1	0.3	1.6	0.0	0.4	0.1		0.3	0.4	
Delay (s)	18.6	23.7	19.8	19.7	24.2	20.1	18.6	18.1		18.5	18.5	
Level of Service	B	C	B	B	C	C	B	B		B	B	
Approach Delay (s)		22.1			23.1			18.3			18.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	63.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	30	30	5	20	35	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	33	5	22	38	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	65	5	22	43
Volume Left (vph)	0	5	0	38
Volume Right (vph)	33	0	0	5
Hadj (s)	-0.27	0.53	0.03	0.13
Departure Headway (s)	3.9	5.2	4.7	4.2
Degree Utilization, x	0.07	0.01	0.03	0.05
Capacity (veh/h)	915	676	751	824
Control Delay (s)	7.2	7.0	6.6	7.5
Approach Delay (s)	7.2	6.7		7.5
Approach LOS	A	A		A

Intersection Summary			
Delay	7.2		
HCM Level of Service	A		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	105	40	5	70	30	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	43	5	76	33	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			158		223	136
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			158		223	136
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	99
cM capacity (veh/h)			1422		762	913

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	158	82	33	5
Volume Left	0	5	33	0
Volume Right	43	0	0	5
cSH	1700	1422	762	913
Volume to Capacity	0.09	0.00	0.04	0.01
Queue Length 95th (ft)	0	0	3	0
Control Delay (s)	0.0	0.5	9.9	9.0
Lane LOS		A	A	A
Approach Delay (s)	0.0	0.5	9.8	
Approach LOS			A	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	75	60	5	65	30	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	65	5	71	33	5

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	147	76	38
Volume Left (vph)	0	5	33
Volume Right (vph)	65	0	5
Hadj (s)	-0.23	0.05	0.12
Departure Headway (s)	3.8	4.2	4.5
Degree Utilization, x	0.16	0.09	0.05
Capacity (veh/h)	922	846	759
Control Delay (s)	7.5	7.6	7.7
Approach Delay (s)	7.5	7.6	7.7
Approach LOS	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Existing Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / I-70 West Ramps
Existing Summer PM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
South: Avon Road
  494   0.159    0.32     0.39     2.4   0.00  0.24     0    7.79    23.9
-----------------------------------------------------------------------
East: I-70 West Off Ramp
  327   0.105    0.56     0.67     6.1   0.41  0.59    13    6.75    22.1
-----------------------------------------------------------------------
North: Avon Road
  413   0.217    0.26     0.31     2.3   0.47  0.32    31    7.28    23.3
-----------------------------------------------------------------------
```

```
ALL VEHICLES:
 1234   0.217    1.14     1.37     3.3   0.26  0.36    31   21.82    23.2
----------------------------------------------------------------------------
INTERSECTION (persons):
 1481   0.217             1.37     3.3   0.26  0.36         21.82    23.2
----------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Existing Summer PM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
South: Avon Road
  3L L            157    990   0.159     6.0    A      0.0      0
  8T T            337   2126   0.159     0.7    A      0.0      0
-----------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            234   2227   0.105     7.2    A      0.5     13
  6R R             93   1014   0.092     3.4    A      0.4     11
-----------------------------------------------------------------
North: Avon Road
  4T T            304   1400   0.217*    1.9    A      1.2     31
  4R R            109    502   0.217*    3.3    A      1.2     31
-----------------------------------------------------------------
 ALL VEHICLES:   1234          0.217     3.3    A      1.2     31
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/I-70 West PM
I:\08159\Analysis\Sidra\Int 1 Avon at I-70 west.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Existing Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / I-70 East Ramps
Existing Summer PM Peak Hour
Intersection ID: 2
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: I-70 East Off Ramp
  408   0.358    0.46     0.55     4.0   0.49  0.48    51    7.83    22.7
-----------------------------------------------------------------------
South: Avon Road
  684   0.358    0.35     0.43     1.9   0.31  0.25    63   11.72    23.5
-----------------------------------------------------------------------
North: Avon Road
  527   0.167    0.12     0.15     0.8   0.00  0.09     0    7.49    24.6
-----------------------------------------------------------------------
```

```
ALL VEHICLES:
 1619   0.358    0.94     1.12     2.1   0.26  0.26    63   27.04    23.6
----------------------------------------------------------------------------
INTERSECTION (persons):
 1943   0.358             1.12     2.1   0.26  0.26         27.04    23.6
----------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 East Ramps
Existing Summer PM Peak Hour
Intersection ID: 2
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: I-70 East Off Ramp
  5L L             65   1084   0.060     8.1    A      0.3      7
  2R R  (Slp)     343    958   0.358*    3.3    A      2.0     51
-----------------------------------------------------------------
South: Avon Road
  8T T            423   1182   0.358*    1.2    A      2.5     63
  8R R            261   1034   0.252     3.0    A      1.5     39
-----------------------------------------------------------------
North: Avon Road
  7L L             60    360   0.167     6.0    A      0.0      0
  4T T            467   2805   0.166     0.2    A      0.0      0
-----------------------------------------------------------------
 ALL VEHICLES:   1619          0.358     2.1    A      2.5     63
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/I-70 East PM
I:\08159\Analysis\Sidra\Int 2 Avon at I-70 east.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Existing Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Existing Summer PM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: WBCB
  315   0.200    0.38     0.46     4.3   0.52  0.50    29    6.17    22.5
-----------------------------------------------------------------------
South: Avon Road
  511   0.196    0.52     0.63     3.7   0.47  0.41    31    9.61    22.8
-----------------------------------------------------------------------
East: WBCB
  526   0.233    0.51     0.62     3.5   0.51  0.43    35    9.84    22.7
-----------------------------------------------------------------------
```

```
North: Avon Road
  663   0.235    0.61     0.73     3.3   0.47  0.37    38   12.23    22.8
----------------------------------------------------------------------------
ALL VEHICLES:
 2015   0.235    2.02     2.43     3.6   0.49  0.42    38   37.85    22.7
----------------------------------------------------------------------------
INTERSECTION (persons):
 2418   0.235             2.43     3.6   0.49  0.42         37.85    22.7
----------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / W. Beaver Creek Blvd
Existing Summer PM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: WBCB
  5L L            93    465   0.200     7.6    A      1.2     29
  2T T           152    760   0.200     2.3    A      1.2     29
  2R R            70    723   0.097     4.4    A      0.5     12
-----------------------------------------------------------------
South: Avon Road
  3L L           114    583   0.196     7.5    A      1.2     30
  8T T           304   1555   0.195     2.0    A      1.2     31
  8R R            93    842   0.110     4.5    A      0.6     15
-----------------------------------------------------------------
East: WBCB
  1L L            70    301   0.233     7.6    A      1.3     34
  6T T           185    796   0.232     2.1    A      1.3     34
  6R R           271   1167   0.232     3.5    A      1.4     35
-----------------------------------------------------------------
North: Avon Road
  7L L           152    648   0.235*    7.4    A      1.5     37
  4T T           375   1598   0.235*    1.5    A      1.5     38
  4R R           136    934   0.146     3.6    A      0.8     21
-----------------------------------------------------------------
 ALL VEHICLES:   2015          0.235     3.6    A      1.5     38
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/WBCB PM

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SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Existing Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Existing Summer PM Peak Hour
Intersection ID: 4
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
  136   0.217    0.19     0.23     5.1   0.61  0.67    30    2.90    22.6
---------------------------------------------------------------------------
South: Avon Road
  458   0.146    0.24     0.29     1.9   0.00  0.21     0    7.00    24.1
---------------------------------------------------------------------------
East: Benchmark
  294   0.250    0.56     0.68     6.9   0.44  0.63    33    6.38    21.9
---------------------------------------------------------------------------
```

```
North: Avon Road
  527   0.272    0.31     0.37     2.1   0.49  0.30    45    9.35    23.3
-----------------------------------------------------------------------
ALL VEHICLES:
 1415   0.272    1.31     1.57     3.3   0.33  0.38    45   25.63    23.1
-----------------------------------------------------------------------
INTERSECTION (persons):
 1698   0.272             1.57     3.3   0.33  0.38         25.63    23.1
-----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Existing Summer PM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
  2R R            136    626   0.217     5.1    A      1.2     30
-----------------------------------------------------------------
South: Avon Road
  3L L             87    595   0.146     6.0    A      0.0      0
  8T T            278   1902   0.146     0.5    A      0.0      0
  8R R             93    636   0.146     2.2    A      0.0      0
-----------------------------------------------------------------
East: Benchmark
  1L L            239    964   0.248     7.4    A      1.3     33
  6T T              6     24   0.250     1.8    A      1.3     33
  6R R             49    545   0.090     4.9    A      0.4     10
-----------------------------------------------------------------
North: Avon Road
  4T T            467   1717   0.272*    1.9    A      1.8     45
  4R R             60    221   0.271     3.4    A      1.8     45
-----------------------------------------------------------------
 ALL VEHICLES:   1415          0.272     3.3    A      1.8     45
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/Benchmark PM
I:\08159\Analysis\Sidra\Int 4 Avon at Benchmark.aap
Processed Nov 20, 2008 08:53:07AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
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www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Existing Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Existing Summer PM Peak Hour
Intersection ID: 6
Roundabout

-----------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------------
West: US 6
  451   0.428    0.69     0.82     5.5   0.58  0.56    81    9.56    22.2
-----------------------------------------------------------------------------
South: Avon Road
  572   0.348    0.68     0.82     4.3   0.62  0.56    61   11.68    22.6
-----------------------------------------------------------------------------
East: US 6
  430   0.343    0.52     0.63     4.4   0.60  0.54    58    8.75    22.6
-----------------------------------------------------------------------------
```

```
North: Avon Road
  621   0.323    0.58     0.70     3.4   0.52  0.42    58   11.86    22.8
----------------------------------------------------------------------------
ALL VEHICLES:
 2074   0.428    2.47     2.97     4.3   0.58  0.51    81   41.85    22.6
----------------------------------------------------------------------------
INTERSECTION (persons):
 2489   0.428             2.97     4.3   0.58  0.51         41.85    22.6
----------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Existing Summer PM Peak Hour
Intersection ID: 6
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: US 6
  5L L            201    470   0.428*    8.2    A      3.2     81
  2T T            201    470   0.428*    2.8    A      3.2     81
  2R R             49    488   0.100     5.2    A      0.5     13
-----------------------------------------------------------------
South: Avon Road
  3L L             28     81   0.346     8.8    A      2.4     61
  8T T            310    891   0.348     3.3    A      2.4     61
  8R R            234    673   0.348     5.0    A      2.4     61
-----------------------------------------------------------------
East: US 6
  1L L             60    175   0.343     8.6    A      2.3     58
  6T T            229    669   0.342     3.0    A      2.3     58
  6R R            141    668   0.211     4.9    A      1.2     31
-----------------------------------------------------------------
North: Avon Road
  7L L             77    239   0.322     7.7    A      2.3     58
  4T T            234    726   0.322     1.9    A      2.3     58
  4R R            310    961   0.323     3.4    A      2.3     58
-----------------------------------------------------------------
 ALL VEHICLES:   2074          0.428     4.3    A      3.2     81
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Summer Avon/US6 PM

I:\08159\Analysis\Sidra\Int 6 Avon at US6.aap
Processed Nov 20, 2008 08:54:16AM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	25	0	0	170	5	525	65	125	540	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	27	0	0	185	5	571	71	136	587	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1342	1514	296	1209	1481	321	592			641		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1342	1514	296	1209	1481	321	592			641		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	96	100	100	73	99			86		
cM capacity (veh/h)	71	101	700	118	106	675	979			939		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	185	5	380	261	136	391	201
Volume Left	0	0	5	0	0	136	0	0
Volume Right	27	185	0	0	71	0	0	5
cSH	700	675	979	1700	1700	939	1700	1700
Volume to Capacity	0.04	0.27	0.01	0.22	0.15	0.14	0.23	0.12
Queue Length 95th (ft)	3	28	0	0	0	13	0	0
Control Delay (s)	10.3	12.3	8.7	0.0	0.0	9.5	0.0	0.0
Lane LOS	B	B	A			A		
Approach Delay (s)	10.3	12.3	0.1			1.8		
Approach LOS	B	B						

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	270	120	45	345	70	95	40	50	45	25	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1707		1770	1639	
Flt Permitted	0.27	1.00	1.00	0.44	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	499	1863	1583	813	1863	1583	1770	1707		1770	1639	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	293	130	49	375	76	103	43	54	49	27	109
RTOR Reduction (vph)	0	0	92	0	0	55	0	42	0	0	84	0
Lane Group Flow (vph)	71	293	38	49	375	21	103	55	0	49	52	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	23.9	20.8	20.8	22.1	19.9	19.9	16.2	16.2		16.2	16.2	
Effective Green, g (s)	23.9	20.8	20.8	22.1	19.9	19.9	16.2	16.2		16.2	16.2	
Actuated g/C Ratio	0.33	0.29	0.29	0.31	0.28	0.28	0.23	0.23		0.23	0.23	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	222	543	461	281	519	441	402	387		402	372	
v/s Ratio Prot	c0.01	0.16		0.01	c0.20		c0.06	0.03		0.03	c0.03	
v/s Ratio Perm	0.09		0.02	0.05		0.01						
v/c Ratio	0.32	0.54	0.08	0.17	0.72	0.05	0.26	0.14		0.12	0.14	
Uniform Delay, d1	17.3	21.3	18.4	17.7	23.3	18.8	22.7	22.1		21.9	22.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	1.0	0.1	0.3	4.9	0.0	1.5	0.8		0.6	0.8	
Delay (s)	18.1	22.3	18.4	18.0	28.2	18.9	24.2	22.8		22.6	22.8	
Level of Service	B	C	B	B	C	B	C	C		C	C	
Approach Delay (s)		20.7			25.8			23.5			22.7	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	71.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	55	55	15	40	80	35
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	60	16	43	87	38

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	120	16	43	125
Volume Left (vph)	0	16	0	87
Volume Right (vph)	60	0	0	38
Hadj (s)	-0.27	0.53	0.03	-0.01
Departure Headway (s)	4.1	5.4	4.9	4.3
Degree Utilization, x	0.14	0.02	0.06	0.15
Capacity (veh/h)	850	638	704	803
Control Delay (s)	7.7	7.3	7.0	8.0
Approach Delay (s)	7.7	7.1		8.0
Approach LOS	A	A		A

Intersection Summary			
Delay	7.7		
HCM Level of Service	A		
Intersection Capacity Utilization	20.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	210	95	15	245	115	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	228	103	16	266	125	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			332		579	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			332		579	280
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		73	96
cM capacity (veh/h)			1228		471	759

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	332	283	125	33
Volume Left	0	16	125	0
Volume Right	103	0	0	33
cSH	1700	1228	471	759
Volume to Capacity	0.20	0.01	0.27	0.04
Queue Length 95th (ft)	0	1	26	3
Control Delay (s)	0.0	0.6	15.4	10.0
Lane LOS		A	C	A
Approach Delay (s)	0.0	0.6	14.3	
Approach LOS			B	

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	125	170	5	155	160	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	185	5	168	174	22

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	321	174	196
Volume Left (vph)	0	5	174
Volume Right (vph)	185	0	22
Hadj (s)	-0.31	0.04	0.15
Departure Headway (s)	4.4	4.9	5.2
Degree Utilization, x	0.39	0.23	0.28
Capacity (veh/h)	786	700	647
Control Delay (s)	10.1	9.3	10.2
Approach Delay (s)	10.1	9.3	10.2
Approach LOS	B	A	B

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Existing Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / I-70 West Ramps
Existing Winter AM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
South: Avon Road
  348   0.112    0.30     0.36     3.1   0.00  0.30     0    5.73    23.6
-----------------------------------------------------------------------
East: I-70 West Off Ramp
  317   0.090    0.41     0.49     4.6   0.35  0.48    11    6.07    22.5
-----------------------------------------------------------------------
North: Avon Road
  380   0.188    0.21     0.26     2.0   0.41  0.28    27    6.55    23.4
-----------------------------------------------------------------------
```

```
ALL VEHICLES:
 1045   0.188    0.92     1.11     3.2   0.25  0.35    27   18.36    23.2
---------------------------------------------------------------------------
INTERSECTION (persons):
 1254   0.188             1.11     3.2   0.25  0.35         18.36    23.2
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Existing Winter AM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
South: Avon Road
  3L L            158   1415   0.112     6.0    A      0.0      0
  8T T            190   1701   0.112     0.7    A      0.0      0
-----------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            139   1537   0.090     6.9    A      0.4     11
  6R R            178   1968   0.090     2.9    A      0.4     11
-----------------------------------------------------------------
North: Avon Road
  4T T            253   1345   0.188*    1.5    A      1.1     27
  4R R            127    675   0.188*    3.0    A      1.1     27
-----------------------------------------------------------------
 ALL VEHICLES:   1045          0.188     3.2    A      1.1     27
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/I-70 West AM
I:\08159\Analysis\Sidra\Int 1 Avon at I-70 west.aap
Processed Nov 20, 2008 08:47:42AM

A0129, Felsburg Holt & Ullevig, Large Office
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SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Existing Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

Avon Road / I-70 East Ramps
Existing Winter AM Peak Hour
Intersection ID: 2
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
West: I-70 East Off Ramp									
208	0.132	0.23	0.28	4.1	0.37	0.42	16	3.90	22.8
South: Avon Road									
569	0.281	0.36	0.44	2.3	0.33	0.31	44	9.94	23.4
North: Avon Road									
393	0.124	0.17	0.21	1.6	0.00	0.15	0	5.88	24.2

```
ALL VEHICLES:
 1170   0.281    0.77     0.93     2.4   0.23  0.27    44   19.71    23.5
----------------------------------------------------------------------------
INTERSECTION (persons):
 1404   0.281             0.93     2.4   0.23  0.27         19.71    23.5
----------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 East Ramps
Existing Winter AM Peak Hour
Intersection ID: 2
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: I-70 East Off Ramp
  5L L             69   1159   0.060     7.6    A      0.3      7
  2R R  (Slp)     139   1050   0.132     2.3    A      0.6     16
-----------------------------------------------------------------
South: Avon Road
  8T T            259   1084   0.239     1.3    A      1.4     36
  8R R            310   1103   0.281*    3.1    A      1.7     44
-----------------------------------------------------------------
North: Avon Road
  7L L             95    765   0.124     6.0    A      0.0      0
  4T T            298   2400   0.124     0.2    A      0.0      0
-----------------------------------------------------------------
 ALL VEHICLES:   1170          0.281     2.4    A      1.7     44
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/I-70 East AM
I:\08159\Analysis\Sidra\Int 2 Avon at I-70 east.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Existing Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Existing Winter AM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-------------------------------------------------------------------------
West: WBCB
  316   0.157    0.34     0.41     3.9   0.44  0.44    21    5.95    22.7
-------------------------------------------------------------------------
South: Avon Road
  494   0.172    0.35     0.42     2.5   0.38  0.30    26    8.66    23.2
-------------------------------------------------------------------------
East: WBCB
  253   0.109    0.26     0.31     3.7   0.45  0.43    15    4.72    22.7
-------------------------------------------------------------------------
```

```
North: Avon Road
  437   0.153    0.21     0.26     1.8   0.30  0.20    23    7.25    23.5
----------------------------------------------------------------------
ALL VEHICLES:
 1500   0.172    1.17     1.40     2.8   0.38  0.32    26   26.59    23.1
----------------------------------------------------------------------
INTERSECTION (persons):
 1800   0.172             1.40     2.8   0.38  0.32         26.59    23.1
----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / W. Beaver Creek Blvd
Existing Winter AM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: WBCB
  5L L            89    568   0.157     7.2    A      0.8     21
  2T T           120    766   0.157     1.9    A      0.8     21
  2R R           107    956   0.112     3.5    A      0.6     14
-----------------------------------------------------------------
South: Avon Road
  3L L            57    332   0.172*    7.0    A      1.0     26
  8T T           342   1994   0.172*    1.4    A      1.0     26
  8R R            95    946   0.100     3.8    A      0.5     14
-----------------------------------------------------------------
East: WBCB
  1L L            51    466   0.109     7.3    A      0.6     15
  6T T            63    576   0.109     1.7    A      0.6     15
  6R R           139   1271   0.109     3.3    A      0.6     15
-----------------------------------------------------------------
North: Avon Road
  7L L            57    372   0.153     6.6    A      0.9     23
  4T T           336   2191   0.153     0.8    A      0.9     23
  4R R            44    845   0.052     3.0    A      0.3      7
-----------------------------------------------------------------
 ALL VEHICLES:   1500          0.172     2.8    A      1.0     26
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/WBCB AM

I:\08159\Analysis\Sidra\Int 3 Avon at WBCB.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Existing Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Existing Winter AM Peak Hour
Intersection ID: 4
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
  114   0.155    0.12     0.14     3.8   0.50  0.52    20    2.22    22.9
---------------------------------------------------------------------------
South: Avon Road
  682   0.218    0.30     0.36     1.6   0.00  0.18     0   10.21    24.2
---------------------------------------------------------------------------
East: Benchmark
   90   0.079    0.17     0.21     6.9   0.46  0.61     9    1.93    22.0
---------------------------------------------------------------------------
```

```
North: Avon Road
  493   0.222    0.17     0.20     1.2   0.33  0.18    34    8.07    23.7
----------------------------------------------------------------------
ALL VEHICLES:
 1379   0.222    0.76     0.92     2.0   0.19  0.23    34   22.44    23.8
----------------------------------------------------------------------
INTERSECTION (persons):
 1655   0.222             0.92     2.0   0.19  0.23         22.44    23.8
----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Existing Winter AM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
  2R R            114    734   0.155     3.8    A      0.8     20
-----------------------------------------------------------------
South: Avon Road
  3L L            101    464   0.218     6.0    A      0.0      0
  8T T            474   2178   0.218     0.5    A      0.0      0
  8R R            107    492   0.217     2.2    A      0.0      0
-----------------------------------------------------------------
East: Benchmark
  1L L             63    799   0.079     7.8    A      0.4      9
  6T T              7     89   0.079     2.2    A      0.4      9
  6R R             20    517   0.039     5.6    A      0.2      4
-----------------------------------------------------------------
North: Avon Road
  4T T            417   1884   0.221     1.0    A      1.3     34
  4R R             76    343   0.222*    2.5    A      1.3     34
-----------------------------------------------------------------
 ALL VEHICLES:   1379          0.222     2.0    A      1.3     34
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/Benchmark AM
I:\08159\Analysis\Sidra\Int 4 Avon at Benchmark.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Existing Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Existing Winter AM Peak Hour
Intersection ID: 6
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: US 6
  380   0.256    0.44     0.53     4.2   0.49  0.48    40    7.45    22.6
-----------------------------------------------------------------------
South: Avon Road
  539   0.282    0.41     0.49     2.8   0.47  0.37    47    9.91    23.1
-----------------------------------------------------------------------
East: US 6
  355   0.266    0.44     0.52     4.4   0.54  0.52    40    7.10    22.6
-----------------------------------------------------------------------
```

```
North: Avon Road
  512   0.253    0.37     0.44     2.6   0.44  0.33    42    9.24    23.1
----------------------------------------------------------------------
ALL VEHICLES:
 1786   0.282    1.66     1.99     3.3   0.48  0.41    47   33.71    22.9
----------------------------------------------------------------------
INTERSECTION (persons):
 2143   0.282             1.99     3.3   0.48  0.41         33.71    22.9
----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Existing Winter AM Peak Hour
Intersection ID: 6
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: US 6
  5L L            95    371   0.256     7.8    A      1.6     40
  2T T           146    570   0.256     2.3    A      1.6     40
  2R R           139    810   0.172     3.7    A      1.0     24
-----------------------------------------------------------------
South: Avon Road
  3L L            20     71   0.282*    7.6    A      1.9     47
  8T T           380   1350   0.281     2.1    A      1.9     47
  8R R           139    494   0.281     3.8    A      1.9     47
-----------------------------------------------------------------
East: US 6
  1L L            89    334   0.266     8.0    A      1.6     40
  6T T           146    548   0.266     2.3    A      1.6     40
  6R R           120    714   0.168     4.3    A      0.9     23
-----------------------------------------------------------------
North: Avon Road
  7L L            44    174   0.253     7.3    A      1.7     42
  4T T           253   1003   0.252     1.5    A      1.7     42
  4R R           215    853   0.252     2.9    A      1.7     42
-----------------------------------------------------------------
 ALL VEHICLES:   1786          0.282     3.3    A      1.9     47
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/US6 AM

I:\08159\Analysis\Sidra\Int 6 Avon at US6.aap
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	10	0	0	145	5	395	70	65	395	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	11	0	0	158	5	429	76	71	429	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	959	1092	220	845	1060	253	440			505		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	959	1092	220	845	1060	253	440			505		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	79	100			93		
cM capacity (veh/h)	158	198	784	239	207	747	1116			1055		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	11	158	5	286	219	71	286	154
Volume Left	0	0	5	0	0	71	0	0
Volume Right	11	158	0	0	76	0	0	11
cSH	784	747	1116	1700	1700	1055	1700	1700
Volume to Capacity	0.01	0.21	0.00	0.17	0.13	0.07	0.17	0.09
Queue Length 95th (ft)	1	20	0	0	0	5	0	0
Control Delay (s)	9.7	11.1	8.2	0.0	0.0	8.7	0.0	0.0
Lane LOS	A	B	A			A		
Approach Delay (s)	9.7	11.1	0.1			1.2		
Approach LOS	A	B						

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	28.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	200	120	135	160	25	75	15	30	30	30	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1675		1770	1689	
Flt Permitted	0.65	1.00	1.00	0.42	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1206	1863	1583	789	1863	1583	1770	1675		1770	1689	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	217	130	147	174	27	82	16	33	33	33	54
RTOR Reduction (vph)	0	0	101	0	0	20	0	25	0	0	41	0
Lane Group Flow (vph)	38	217	29	147	174	7	82	24	0	33	46	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	16.6	15.1	15.1	21.6	17.6	17.6	16.0	16.0		16.0	16.0	
Effective Green, g (s)	16.6	15.1	15.1	21.6	17.6	17.6	16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.25	0.23	0.23	0.32	0.26	0.26	0.24	0.24		0.24	0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	311	419	356	312	489	415	422	399		422	403	
v/s Ratio Prot	0.00	0.12		c0.03	0.09		c0.05	0.01		0.02	c0.03	
v/s Ratio Perm	0.03		0.02	c0.12		0.00						
v/c Ratio	0.12	0.52	0.08	0.47	0.36	0.02	0.19	0.06		0.08	0.11	
Uniform Delay, d1	19.4	22.8	20.5	17.2	20.1	18.3	20.4	19.7		19.8	20.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	1.1	0.1	1.1	0.4	0.0	1.0	0.3		0.4	0.6	
Delay (s)	19.6	23.9	20.6	18.4	20.6	18.4	21.4	20.0		20.2	20.6	
Level of Service	B	C	C	B	C	B	C	C		C	C	
Approach Delay (s)		22.4			19.5			20.9			20.5	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	67.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	25	25	5	20	30	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	27	5	22	33	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	54	5	22	38
Volume Left (vph)	0	5	0	33
Volume Right (vph)	27	0	0	5
Hadj (s)	-0.27	0.53	0.03	0.12
Departure Headway (s)	3.9	5.2	4.7	4.2
Degree Utilization, x	0.06	0.01	0.03	0.04
Capacity (veh/h)	919	679	755	832
Control Delay (s)	7.1	7.0	6.6	7.4
Approach Delay (s)	7.1	6.7		7.4
Approach LOS	A	A		A

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	95	35	5	65	25	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	103	38	5	71	27	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			141		204	122
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			141		204	122
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		97	99
cM capacity (veh/h)			1442		782	929

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	141	76	27	5
Volume Left	0	5	27	0
Volume Right	38	0	0	5
cSH	1700	1442	782	929
Volume to Capacity	0.08	0.00	0.03	0.01
Queue Length 95th (ft)	0	0	3	0
Control Delay (s)	0.0	0.6	9.8	8.9
Lane LOS		A	A	A
Approach Delay (s)	0.0	0.6	9.6	
Approach LOS			A	

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	70	50	5	60	25	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	54	5	65	27	5

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	130	71	33
Volume Left (vph)	0	5	27
Volume Right (vph)	54	0	5
Hadj (s)	-0.22	0.05	0.10
Departure Headway (s)	3.8	4.1	4.4
Degree Utilization, x	0.14	0.08	0.04
Capacity (veh/h)	924	853	772
Control Delay (s)	7.4	7.5	7.6
Approach Delay (s)	7.4	7.5	7.6
Approach LOS	A	A	A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	17.3%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Existing Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / I-70 West Ramps
Existing Winter PM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
South: Avon Road
  556   0.178    0.40     0.48     2.6   0.00  0.26     0    8.90    23.8
-----------------------------------------------------------------------
East: I-70 West Off Ramp
  374   0.128    0.67     0.80     6.4   0.43  0.62    16    7.85    22.0
-----------------------------------------------------------------------
North: Avon Road
  297   0.165    0.21     0.25     2.5   0.49  0.36    23    5.33    23.2
-----------------------------------------------------------------------
```

```
ALL VEHICLES:
 1227   0.178    1.28     1.53     3.8   0.25  0.39    23   22.08    23.0
----------------------------------------------------------------------------
INTERSECTION (persons):
 1472   0.178             1.53     3.8   0.25  0.39         22.08    23.0
----------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Existing Winter PM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
South: Avon Road
  3L L            202   1132   0.178*    6.0    A      0.0      0
  8T T            354   1984   0.178*    0.7    A      0.0      0
-----------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            279   2172   0.128     7.4    A      0.6     16
  6R R             95    954   0.100     3.7    A      0.5     12
-----------------------------------------------------------------
North: Avon Road
  4T T            221   1341   0.165     2.1    A      0.9     23
  4R R             76    461   0.165     3.6    A      0.9     23
-----------------------------------------------------------------
 ALL VEHICLES:   1227          0.178     3.8    A      0.9     23
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/I-70 West PM
I:\08159\Analysis\Sidra\Int 1 Avon at I-70 west.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Existing Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / I-70 East Ramps
Existing Winter PM Peak Hour
Intersection ID: 2
Roundabout

-----------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------------
West: I-70 East Off Ramp
  355   0.305    0.38     0.45     3.8   0.46  0.45    42    6.71    22.8
-----------------------------------------------------------------------------
South: Avon Road
  861   0.404    0.48     0.57     2.0   0.33  0.27    74   14.90    23.4
-----------------------------------------------------------------------------
North: Avon Road
  500   0.158    0.14     0.16     1.0   0.00  0.10     0    7.17    24.5
-----------------------------------------------------------------------------
```

```
ALL VEHICLES:
 1716   0.404    0.99     1.19     2.1   0.26  0.26    74   28.78    23.6
---------------------------------------------------------------------------
INTERSECTION (persons):
 2059   0.404             1.19     2.1   0.26  0.26         28.78    23.6
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 East Ramps
Existing Winter PM Peak Hour
Intersection ID: 2
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: I-70 East Off Ramp
  5L L             57   1097   0.052     7.9    A      0.2      6
  2R R  (Slp)     298    977   0.305     3.0    A      1.6     42
-----------------------------------------------------------------
South: Avon Road
  8T T            481   1192   0.404*    1.2    A      2.9     74
  8R R            380   1132   0.336     3.0    A      2.2     57
-----------------------------------------------------------------
North: Avon Road
  7L L             69    437   0.158     6.0    A      0.0      0
  4T T            431   2729   0.158     0.2    A      0.0      0
-----------------------------------------------------------------
 ALL VEHICLES:   1716          0.404     2.1    A      2.9     74
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/I-70 East PM
I:\08159\Analysis\Sidra\Int 2 Avon at I-70 east.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Existing Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Existing Winter PM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-------------------------------------------------------------------------
West: WBCB
  356   0.230    0.44     0.52     4.4   0.57  0.52    35    7.05    22.5
-------------------------------------------------------------------------
South: Avon Road
  791   0.313    0.84     1.01     3.8   0.53  0.44    54   15.20    22.7
-------------------------------------------------------------------------
East: WBCB
  583   0.304    0.69     0.83     4.3   0.61  0.53    46   11.54    22.5
-------------------------------------------------------------------------
```

```
North: Avon Road
  728   0.286    0.73     0.87     3.6   0.54  0.42    49   13.84    22.7
----------------------------------------------------------------------
ALL VEHICLES:
 2458   0.313    2.69     3.23     3.9   0.56  0.47    54   47.63    22.6
----------------------------------------------------------------------
INTERSECTION (persons):
 2950   0.313             3.23     3.9   0.56  0.47         47.63    22.6
----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / W. Beaver Creek Blvd
Existing Winter PM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: WBCB
  5L L            89    387   0.230     7.8    A      1.4     35
  2T T           178    774   0.230     2.6    A      1.4     35
  2R R            89    721   0.123     4.6    A      0.6     16
-----------------------------------------------------------------
South: Avon Road
  3L L           164    524   0.313*    7.8    A      2.1     53
  8T T           494   1578   0.313*    2.2    A      2.1     54
  8R R           133    799   0.166     4.8    A      0.9     24
-----------------------------------------------------------------
East: WBCB
  1L L            89    293   0.304     8.4    A      1.8     46
  6T T           215    707   0.304     2.9    A      1.8     46
  6R R           279    995   0.280     4.0    A      1.7     44
-----------------------------------------------------------------
North: Avon Road
  7L L           152    532   0.286     7.9    A      1.9     48
  4T T           449   1571   0.286     2.0    A      1.9     49
  4R R           127    820   0.155     4.2    A      0.9     23
-----------------------------------------------------------------
 ALL VEHICLES:   2458          0.313     3.9    A      2.1     54
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

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Site: Existing Winter Avon/WBCB PM

I:\08159\Analysis\Sidra\Int 3 Avon at WBCB.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Existing Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Existing Winter PM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: Benchmark
  158   0.281    0.27     0.32     6.1   0.68  0.74    41    3.53    22.2
-----------------------------------------------------------------------
South: Avon Road
 1101   0.352    0.44     0.52     1.4   0.00  0.17     0   16.31    24.3
-----------------------------------------------------------------------
East: Benchmark
  343   0.355    0.87     1.04     9.1   0.61  0.80    50    8.18    21.3
-----------------------------------------------------------------------
```

```
North: Avon Road
  638   0.347    0.46     0.55     2.6   0.57  0.37    62   11.85    23.1
----------------------------------------------------------------------
ALL VEHICLES:
 2240   0.355    2.02     2.43     3.3   0.30  0.36    62   39.87    23.3
----------------------------------------------------------------------
INTERSECTION (persons):
 2688   0.355             2.43     3.3   0.30  0.36         39.87    23.3
----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Existing Winter PM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
  2R R            158    562   0.281     6.1    A      1.6     41
-----------------------------------------------------------------
South: Avon Road
  3L L            101    287   0.352     6.0    A      0.0      0
  8T T            734   2089   0.351     0.5    A      0.0      0
  8R R            266    757   0.351     2.2    A      0.0      0
-----------------------------------------------------------------
East: Benchmark
  1L L            279    787   0.355*    9.4    A      2.0     50
  6T T              7     20   0.350     3.8    A      2.0     50
  6R R             57    414   0.138     8.2    A      0.6     15
-----------------------------------------------------------------
North: Avon Road
  4T T            569   1640   0.347     2.4    A      2.5     62
  4R R             69    199   0.347     3.9    A      2.5     62
-----------------------------------------------------------------
 ALL VEHICLES:   2240          0.355     3.3    A      2.5     62
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/Benchmark PM
I:\08159\Analysis\Sidra\Int 4 Avon at Benchmark.aap
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SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Existing Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Existing Winter PM Peak Hour
Intersection ID: 6
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: US 6
  557   0.634    1.46     1.75     9.4   0.79  0.96   157   14.58    21.1
-----------------------------------------------------------------------
South: Avon Road
 1082   0.743    3.28     3.93    10.9   0.93  1.15   253   31.42    20.4
-----------------------------------------------------------------------
East: US 6
  494   0.571    1.33     1.59     9.7   0.84  0.97   136   13.17    20.9
-----------------------------------------------------------------------
```

```
North: Avon Road
  873   0.498    1.03     1.23     4.2   0.69  0.57   111   18.36    22.4
-----------------------------------------------------------------------
ALL VEHICLES:
 3006   0.743    7.09     8.51     8.5   0.82  0.91   253   77.53    21.2
-----------------------------------------------------------------------
INTERSECTION (persons):
 3607   0.743             8.51     8.5   0.82  0.91         77.53    21.2
-----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Existing Winter PM Peak Hour
Intersection ID: 6
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: US 6
  5L L            272    429   0.634    12.1    B      6.2    157
  2T T            209    330   0.633     6.6    A      6.2    157
  2R R             76    399   0.190     7.8    A      1.0     25
-----------------------------------------------------------------
South: Avon Road
  3L L             57     77   0.740    15.3    B      9.9    253
  8T T            557    750   0.743*    9.9    A      9.9    252
  8R R            468    630   0.743*   11.6    B      9.9    252
-----------------------------------------------------------------
East: US 6
  1L L            120    210   0.571    13.8    B      5.4    136
  6T T            228    400   0.570     8.2    A      5.4    136
  6R R            146    439   0.333     8.5    A      2.2     55
-----------------------------------------------------------------
North: Avon Road
  7L L             83    167   0.497     8.9    A      4.4    111
  4T T            474    953   0.497     3.2    A      4.4    111
  4R R            316    635   0.498     4.6    A      4.4    111
-----------------------------------------------------------------
 ALL VEHICLES:   3006          0.743     8.5    A      9.9    253
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Existing Winter Avon/US6 PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	25	0	0	170	5	700	65	125	665	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	27	0	0	185	5	761	71	136	723	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1573	1840	364	1467	1807	416	728			832		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1573	1840	364	1467	1807	416	728			832		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	96	100	100	68	99			83		
cM capacity (veh/h)	44	62	633	74	64	586	871			797		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	185	5	507	324	136	482	246
Volume Left	0	0	5	0	0	136	0	0
Volume Right	27	185	0	0	71	0	0	5
cSH	633	586	871	1700	1700	797	1700	1700
Volume to Capacity	0.04	0.32	0.01	0.30	0.19	0.17	0.28	0.14
Queue Length 95th (ft)	3	34	0	0	0	15	0	0
Control Delay (s)	10.9	14.0	9.2	0.0	0.0	10.4	0.0	0.0
Lane LOS	B	B	A			B		
Approach Delay (s)	10.9	14.0	0.1			1.6		
Approach LOS	B	B						

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	250	100	60	310	75	220	40	135	50	30	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.88		1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1647		1770	1654	
Flt Permitted	0.31	1.00	1.00	0.42	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	572	1863	1583	777	1863	1583	1770	1647		1770	1654	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	272	109	65	337	82	239	43	147	54	33	98
RTOR Reduction (vph)	0	0	81	0	0	61	0	112	0	0	75	0
Lane Group Flow (vph)	65	272	28	65	337	21	239	78	0	54	56	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	20.6	17.5	17.5	20.6	17.5	17.5	16.2	16.2		16.2	16.2	
Effective Green, g (s)	20.6	17.5	17.5	20.6	17.5	17.5	16.2	16.2		16.2	16.2	
Actuated g/C Ratio	0.30	0.25	0.25	0.30	0.25	0.25	0.23	0.23		0.23	0.23	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	225	473	401	277	473	401	416	387		416	388	
v/s Ratio Prot	c0.01	0.15		0.01	c0.18		c0.14	0.05		0.03	c0.03	
v/s Ratio Perm	0.07		0.02	0.06		0.01						
v/c Ratio	0.29	0.58	0.07	0.23	0.71	0.05	0.57	0.20		0.13	0.14	
Uniform Delay, d1	18.1	22.5	19.6	17.8	23.5	19.5	23.4	21.2		20.8	20.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	1.7	0.1	0.4	5.0	0.1	5.7	1.2		0.6	0.8	
Delay (s)	18.8	24.2	19.6	18.3	28.5	19.5	29.0	22.4		21.5	21.7	
Level of Service	B	C	B	B	C	B	C	C		C	C	
Approach Delay (s)		22.3			25.6			26.1			21.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	24.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	50	50	15	35	70	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	54	16	38	76	33

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	109	16	38	109
Volume Left (vph)	0	16	0	76
Volume Right (vph)	54	0	0	33
Hadj (s)	-0.27	0.53	0.03	-0.01
Departure Headway (s)	4.0	5.4	4.9	4.2
Degree Utilization, x	0.12	0.02	0.05	0.13
Capacity (veh/h)	862	645	714	811
Control Delay (s)	7.6	7.3	6.9	7.9
Approach Delay (s)	7.6	7.0		7.9
Approach LOS	A	A		A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	180	85	15	220	105	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	196	92	16	239	114	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			288		514	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			288		514	242
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		78	97
cM capacity (veh/h)			1274		514	797

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	288	255	114	27
Volume Left	0	16	114	0
Volume Right	92	0	0	27
cSH	1700	1274	514	797
Volume to Capacity	0.17	0.01	0.22	0.03
Queue Length 95th (ft)	0	1	21	3
Control Delay (s)	0.0	0.6	14.0	9.7
Lane LOS		A	B	A
Approach Delay (s)	0.0	0.6	13.2	
Approach LOS			B	

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	115	155	5	140	145	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	125	168	5	152	158	22

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	293	158	179
Volume Left (vph)	0	5	158
Volume Right (vph)	168	0	22
Hadj (s)	-0.31	0.04	0.14
Departure Headway (s)	4.3	4.8	5.1
Degree Utilization, x	0.35	0.21	0.25
Capacity (veh/h)	801	715	663
Control Delay (s)	9.5	9.0	9.7
Approach Delay (s)	9.5	9.0	9.7
Approach LOS	A	A	A

Intersection Summary			
Delay	9.5		
HCM Level of Service	A		
Intersection Capacity Utilization	31.5%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX C FUTURE LOS ANALYSES

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Future Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 West Ramps
Future Summer AM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left    325     7    1.00     0.92
           North        8T   Thru    245     5    1.00     0.92
-------------------------------------------------------------------
 East: I-70 West Off Ramp
           South        1L   Left    218     4    1.00     0.92
           North        6R   Right   224     5    1.00     0.92
-------------------------------------------------------------------
 North: Avon Road
           West         4R   Right   272     6    1.00     0.92
```

```
            South        4T   Thru    575    12    1.00     0.92
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 West Ramps
Future Summer AM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         A
   Average intersection delay (s/pers)       =       5.1
   Largest average movement delay (s)        =       8.2
   Largest back of queue, 95% (ft)           =       117
   Performance Index                         =     38.92
   Degree of saturation (highest)            =     0.520
   Practical Spare Capacity (lowest)         =        64 %
   Effective intersection capacity, (veh/h)  =      3653
   Total vehicle flow (veh/h)                =      1898
   Total person flow (pers/h)                =      2278
   Total vehicle delay (veh-h/h)             =      2.67
   Total person delay (pers-h/h)             =      3.21
   Total effective vehicle stops (veh/h)     =      1150
   Total effective person stops (pers/h)     =      1380
   Total vehicle travel (veh-mi/h)           =     651.6
   Total cost ($/h)                          =    396.59
   Total fuel (gal/h)                        =      26.5
   Total CO2 (kg/h)                          =    251.01
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.55     0.67     6.0   0.00  0.55    0.0     0    6.42   22.4
   8T T     0.05     0.06     0.7   0.00  0.09    0.0     0    3.52   24.7
---------------------------------------------------------------------------
East: I-70 West Off Ramp
   1L L     0.50     0.60     8.2   0.50  0.73    1.3    32    5.07   21.6
   6R R     0.25     0.30     3.9   0.51  0.53    1.3    33    4.39   22.8
---------------------------------------------------------------------------
North: Avon Road
   4T T     0.82     0.98     5.0   0.72  0.74    4.6   117   13.10   22.6
   4R R     0.50     0.60     6.5   0.72  0.80    4.6   117    6.41   22.0
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Avon Road / I-70 West Ramps
Future Summer AM Peak Hour
Intersection ID: 1
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
South: Avon Road									
582	0.203	0.60	0.72	3.7	0.00	0.36	0	9.95	23.3
East: I-70 West Off Ramp									
451	0.255	0.75	0.90	6.0	0.50	0.63	33	9.47	22.2
North: Avon Road									
865	0.520	1.32	1.58	5.5	0.72	0.76	117	19.51	22.4
ALL VEHICLES:									
1898	0.520	2.67	3.21	5.1	0.45	0.61	117	38.92	22.6
INTERSECTION (persons):									
2278	0.520		3.21	5.1	0.45	0.61		38.92	22.6

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Avon Road / I-70 West Ramps
Future Summer AM Peak Hour
Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
South: Avon Road								
1 L	332	1636	0.203	6.0	0.55	0.0	0.0	1600.0
2 T	250	1446	0.173	0.7	0.09	0.0	0.0	1600.0
East: I-70 West Off Ramp								
1 L	222	895	0.248	8.2	0.73	1.3	31.9	1600.0
2 R	229	897	0.255	3.9	0.53	1.3	33.1	1600.0
North: Avon Road								
1 T	433	833	0.519	5.0	0.74	4.6	116.7	1600.0
2 TR	432	833	0.519	5.9	0.78	4.6	116.8	1600.0

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / I-70 West Ramps
Future Summer AM Peak Hour
Intersection ID: 1
Roundabout

--------------------------------------------------
                                Min  Tot
 Lane     Dem Flow (veh/h)      Cap  Cap  Deg.  Lane
 No.    -------------------   (veh (veh  Satn  Util
         Lef Thru  Rig  Tot     /h)  /h)   x     %
--------------------------------------------------
 South: Avon Road
 1 L     332    0    0  332   150 1636  0.203  100
 2 T       0  250    0  250   150 1446  0.173   85P
--------------------------------------------------
 East: I-70 West Off Ramp
 1 L     222    0    0  222   150  895  0.248   97P
 2 R       0    0  229  229   150  897  0.255  100
--------------------------------------------------
 North: Avon Road
 1 T       0  433    0  433   150  833  0.519  100
 2 TR      0  154  278  432   150  833  0.519  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Future Summer AM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
South: Avon Road
  3L L            332   1636   0.203     6.0    A      0.0      0
  8T T            250   1446   0.173     0.7    A      0.0      0
-------------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            222    895   0.248     8.2    A      1.3     32
  6R R            229    897   0.255     3.9    A      1.3     33
-------------------------------------------------------------------
North: Avon Road
  4T T            587   1131   0.519     5.0    A      4.6    117
  4R R            278    535   0.520*    6.5    A      4.6    117
-------------------------------------------------------------------
 ALL VEHICLES:   1898          0.520     5.1    A      4.6    117
-------------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
```

```
*   Maximum v/c ratio, or critical green periods
"   Movement Level of service has been determined using adjacent lane
    v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Summer Avon/I-70 West AM
I:\08159\Analysis\Sidra\Future\Int 1 Avon at I-70 west_min lanes.aap
Processed May 15, 2009 09:56:41AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
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SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Future Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 East Ramps
Future Summer AM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 West: I-70 East Off Ramp
           South        2R   Right   229     5    1.00     0.92
           North        5L   Left    112     2    1.00     0.92
-------------------------------------------------------------------
 South: Avon Road
           East         8R   Right   479    10    1.00     0.92
           North        8T   Thru    453     9    1.00     0.92
-------------------------------------------------------------------
 North: Avon Road
           South        4T   Thru    490    10    1.00     0.92
```

```
            East         7L   Left    309     6    1.00     0.92
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 East Ramps
Future Summer AM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         B
   Average intersection delay (s/pers)       =       7.5
   Largest average movement delay (s)        =      18.8
   Largest back of queue, 95% (ft)           =       127
   Performance Index                         =     43.60
   Degree of saturation (highest)            =     0.554
   Practical Spare Capacity (lowest)         =        53 %
   Effective intersection capacity, (veh/h)  =      3813
   Total vehicle flow (veh/h)                =      2114
   Total person flow (pers/h)                =      2537
   Total vehicle delay (veh-h/h)             =      4.39
   Total person delay (pers-h/h)             =      5.27
   Total effective vehicle stops (veh/h)     =      1220
   Total effective person stops (pers/h)     =      1464
   Total vehicle travel (veh-mi/h)           =     717.7
   Total cost ($/h)                          =    449.61
   Total fuel (gal/h)                        =      28.4
   Total CO2 (kg/h)                          =    268.57
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
West: I-70 East Off Ramp
   5L L     0.28     0.34     8.9   0.54  0.79    1.0    26    2.67   21.4
   2R R     0.29     0.35     4.5   0.54  0.60    1.0    26    4.64   22.7
---------------------------------------------------------------------------
South: Avon Road
   8T T     2.41     2.89    18.8   0.66  0.93    4.5   113   12.35   17.0
   8R R     0.86     1.04     6.4   0.67  0.76    5.0   127   11.08   22.1
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.52     0.63     6.0   0.00  0.55    0.0     0    6.10   22.5
   4T T     0.03     0.03     0.2   0.00  0.03    0.0     0    6.77   24.9
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Avon Road / I-70 East Ramps
Future Summer AM Peak Hour
Intersection ID: 2
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
West: I-70 East Off Ramp									
348	0.214	0.57	0.69	5.9	0.54	0.66	26	7.31	22.3
South: Avon Road									
951	0.554	3.27	3.93	12.4	0.67	0.84	127	23.43	19.3
North: Avon Road									
815	0.257	0.55	0.66	2.4	0.00	0.23	0	12.87	23.8
ALL VEHICLES:									
2114	0.554	4.39	5.27	7.5	0.39	0.58	127	43.60	21.4
INTERSECTION (persons):									
2537	0.554		5.27	7.5	0.39	0.58		43.60	21.4

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Avon Road / I-70 East Ramps
Future Summer AM Peak Hour
Intersection ID: 2
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
West: I-70 East Off Ramp								
1 LR	172	804	0.214	7.4	0.73	1.0	26.1	1600.0
2 R	176	824	0.214	4.5	0.60	1.0	26.2	1600.0
South: Avon Road								
1 T	462	881	0.525	18.8	0.93	4.5	113.1	1600.0
2 R	489	882	0.555	6.4	0.76	5.0	126.9	1600.0
North: Avon Road								
1 LT	385	1494	0.257	4.9	0.46	0.0	0.0	1600.0
2 T	430	1671	0.257	0.2	0.03	0.0	0.0	1600.0

Table S.8 - Lane Flow and Capacity Information

Avon Road / I-70 East Ramps
Future Summer AM Peak Hour
Intersection ID: 2
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap (veh /h)	Tot Cap (veh /h)	Deg. Satn x	Lane Util %
West: I-70 East Off Ramp								
1 LR	114	0	58	172	150	804	0.214	100
2 R	0	0	176	176	150	824	0.214	100
South: Avon Road								
1 T	0	462	0	462	150	881	0.525	95P
2 R	0	0	489	489	150	882	0.555	100
North: Avon Road								
1 LT	315	70	0	385	150	1494	0.257	100
2 T	0	430	0	430	150	1671	0.257	100

P Lane under-utilisation found by the "Program". This includes cases where the value of lane under-utilisation due to downstream effects has been modified by the program during lane flow calculations (e.g. a de facto exclusive lane has been found).

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

Table S.15 - Capacity and Level of Service

Avon Road / I-70 East Ramps
Future Summer AM Peak Hour
Intersection ID: 2
Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: I-70 East Off Ramp								
5L	L	114	533	0.214	8.9	A	1.0	26
2R	R	234	1095	0.214	4.5	A	1.0	26
South: Avon Road								
8T	T	462	881	0.524	18.8	B	4.5	113
8R	R	489	882	0.554*	6.4	A	5.0	127
North: Avon Road								
7L	L	315	1224	0.257	6.0	A	0.0	0
4T	T	500	1942	0.257	0.2	A	0.0	0
ALL VEHICLES:		2114		0.554	7.5	A	5.0	127

Level of Service calculations are based on average control delay including geometric delay (HCM criteria), independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the SIDRA Output Guide or the Output section of the on-line help.

```
*   Maximum v/c ratio, or critical green periods
"   Movement Level of service has been determined using adjacent lane
    v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Summer Avon/I-70 East AM
I:\08159\Analysis\Sidra\Future\Int 2 Avon at I-70 east_min lanes.aap
Processed May 15, 2009 10:03:33AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
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SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Future Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / W. Beaver Creek Blvd
Future Summer AM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-----------------------------------------------------------------
 West: WBCB
           South        2R   Right    80     2    1.00     0.92
           East         2T   Thru    107     2    1.00     0.92
           North        5L   Left    346     7    1.00     0.92
-----------------------------------------------------------------
 South: Avon Road
           West         3L   Left     37     1    1.00     0.92
           East         8R   Right    69     1    1.00     0.92
           North        8T   Thru    314     6    1.00     0.92
-----------------------------------------------------------------
```

```
 East: WBCB
           West         6T   Thru     53     1    1.00     0.92
           South        1L   Left     43     1    1.00     0.92
           North        6R   Right   288     6    1.00     0.92
----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   101     2    1.00     0.92
           South        4T   Thru    415     8    1.00     0.92
           East         7L   Left    149     3    1.00     0.92
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / W. Beaver Creek Blvd
Future Summer AM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         A
   Average intersection delay (s/pers)       =       4.2
   Largest average movement delay (s)        =       9.1
   Largest back of queue, 95% (ft)           =        49
   Performance Index                         =     39.50
   Degree of saturation (highest)            =     0.324
   Practical Spare Capacity (lowest)         =       162 %
   Effective intersection capacity, (veh/h)  =      6305
   Total vehicle flow (veh/h)                =      2042
   Total person flow (pers/h)                =      2450
   Total vehicle delay (veh-h/h)             =      2.37
   Total person delay (pers-h/h)             =      2.84
   Total effective vehicle stops (veh/h)     =       940
   Total effective person stops (pers/h)     =      1128
   Total vehicle travel (veh-mi/h)           =     700.8
   Total cost ($/h)                          =    425.59
   Total fuel (gal/h)                        =      28.4
   Total CO2 (kg/h)                          =    268.56
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
West: WBCB
   5L L     0.76     0.92     7.8   0.55  0.72    1.9    49    7.95   21.5
   2T T     0.10     0.12     3.2   0.53  0.47    0.8    19    2.07   23.1
   2R R     0.11     0.14     5.0   0.53  0.62    0.6    15    1.68   22.7
-------------------------------------------------------------------------
South: Avon Road
   3L L     0.09     0.11     8.3   0.57  0.73    1.2    29    0.88   21.5
   8T T     0.24     0.29     2.7   0.57  0.39    1.2    30    5.86   23.0
   8R R     0.11     0.13     5.5   0.56  0.63    0.5    14    1.46   22.4
```

```
-----------------------------------------------------------------------
East: WBCB
   1L L     0.11     0.13     9.1   0.59  0.76    0.8    19    1.05   21.4
   6T T     0.05     0.06     3.4   0.59  0.50    0.8    19    1.05   23.0
   6R R     0.37     0.44     4.5   0.60  0.57    1.6    42    5.86   22.5
-----------------------------------------------------------------------
North: Avon Road
   7L L     0.27     0.33     6.5   0.29  0.55    1.4    35    3.20   21.9
   4T T     0.08     0.10     0.7   0.29  0.10    1.4    36    6.59   24.0
   4R R     0.08     0.09     2.7   0.29  0.34    0.6    15    1.83   23.3
-----------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Future Summer AM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: WBCB
  544   0.324    0.97     1.17     6.4   0.54  0.65    49   11.70    21.9
-----------------------------------------------------------------------
South: Avon Road
  428   0.192    0.43     0.52     3.6   0.57  0.46    30    8.20    22.8
-----------------------------------------------------------------------
East: WBCB
  392   0.255    0.53     0.63     4.8   0.60  0.58    42    7.96    22.4
-----------------------------------------------------------------------
North: Avon Road
  678   0.216    0.43     0.52     2.3   0.29  0.24    36   11.63    23.3
-----------------------------------------------------------------------
ALL VEHICLES:
 2042   0.324    2.37     2.84     4.2   0.47  0.46    49   39.50    22.6
-----------------------------------------------------------------------
INTERSECTION (persons):
 2450   0.324             2.84     4.2   0.47  0.46         39.50    22.6
-----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / W. Beaver Creek Blvd
Future Summer AM Peak Hour
Intersection ID: 3
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.    95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: WBCB
 1 L       353  1090 0.324    7.8  0.72    1.9   48.6   1600.0
```

```
 2 T       109   718 0.152    3.2  0.47    0.8   19.1   1600.0
 3 R        82   656 0.125    5.0  0.62    0.6   15.4   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      169   878 0.192    4.1  0.48    1.2   29.5   1600.0
 2 T       189   984 0.192    2.6  0.37    1.2   30.3   1600.0
 3 R        70   692 0.101    5.5  0.63    0.5   13.9   1600.0
-------------------------------------------------------------
 East: WBCB
 1 LT       98   716 0.137    5.9  0.61    0.8   19.3   1600.0
 2 R        38   610 0.063    5.6  0.61    0.3    8.2   1600.0
 3 R       256  1004 0.255    4.3  0.57    1.6   41.8   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 LT      275  1277 0.216    3.9  0.35    1.4   35.0   1600.0
 2 T       300  1390 0.216    0.7  0.10    1.4   35.5   1600.0
 3 R       103   986 0.104    2.7  0.34    0.6   14.8   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / W. Beaver Creek Blvd
Future Summer AM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
-------------------------------------------------
 West: WBCB
 1 L     353    0    0  353   150 1090  0.324  100
 2 T       0  109    0  109   109  718  0.152   47P
 3 R       0    0   82   82    82  656  0.125   39P
-------------------------------------------------
 South: Avon Road
 1 LT     38  131    0  169   150  878  0.192  100
 2 T       0  189    0  189   150  984  0.192  100
 3 R       0    0   70   70    70  692  0.101  100
-------------------------------------------------
 East: WBCB
 1 LT     44   54    0   98    98  716  0.137   54P
 2 R       0    0   38   38    38  610  0.063   25D
 3 R       0    0  256  256   150 1004  0.255  100
-------------------------------------------------
 North: Avon Road
 1 LT    152  123    0  275   150 1277  0.216  100
 2 T       0  300    0  300   150 1390  0.216  100
 3 R       0    0  103  103   103  986  0.104  100
-------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).
  D  Lane under-utilisation due to downstream effects

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

Avon Road / W. Beaver Creek Blvd
Future Summer AM Peak Hour
Intersection ID: 3
Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: WBCB								
5L	L	353	1090	0.324*	7.8	A	1.9	49
2T	T	109	718	0.152	3.2	A	0.8	19
2R	R	82	656	0.125	5.0	A	0.6	15
South: Avon Road								
3L	L	38	198	0.192	8.3	A	1.2	29
8T	T	320	1664	0.192	2.7	A	1.2	30
8R	R	70	692	0.101	5.5	A	0.5	14
East: WBCB								
1L	L	44	321	0.137	9.1	A	0.8	19
6T	T	54	395	0.137	3.4	A	0.8	19
6R	R	294	1154	0.255	4.5	A	1.6	42
North: Avon Road								
7L	L	152	705	0.216	6.5	A	1.4	35
4T	T	423	1962	0.216	0.7	A	1.4	36
4R	R	103	986	0.104	2.7	A	0.6	15
ALL VEHICLES:		2042		0.324	4.2	A	1.9	49

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Summer Avon/WBCB AM
I:\08159\Analysis\Sidra\Future\Int 3 Avon at WBCB.aap
Processed Apr 13, 2009 11:48:41AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Future Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / Benchmark Road
Future Summer AM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 West: Benchmark
           South        2R   Right   107     2    1.00     0.92
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left     96     2    1.00     0.92
           East         8R   Right   101     2    1.00     0.92
           North        8T   Thru    320     7    1.00     0.92
-------------------------------------------------------------------
 East: Benchmark
           West         6T   Thru     11     0    1.00     0.92
```

```
            South        1L   Left     75     2    1.00     0.92
            North        6R   Right   112     2    1.00     0.92
-----------------------------------------------------------------
 North: Avon Road
            West         4R   Right   107     2    1.00     0.92
            South        4T   Thru    437     9    1.00     0.92
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / Benchmark Road
Future Summer AM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         A
   Average intersection delay (s/pers)       =       2.3
   Largest average movement delay (s)        =       7.5
   Largest back of queue, 95% (ft)           =        39
   Performance Index                         =     23.39
   Degree of saturation (highest)            =     0.251
   Practical Spare Capacity (lowest)         =       238 %
   Effective intersection capacity, (veh/h)  =      5552
   Total vehicle flow (veh/h)                =      1395
   Total person flow (pers/h)                =      1674
   Total vehicle delay (veh-h/h)             =      0.88
   Total person delay (pers-h/h)             =      1.05
   Total effective vehicle stops (veh/h)     =       378
   Total effective person stops (pers/h)     =       454
   Total vehicle travel (veh-mi/h)           =     471.6
   Total cost ($/h)                          =    272.98
   Total fuel (gal/h)                        =      17.9
   Total CO2 (kg/h)                          =    169.77
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
West: Benchmark
   2R R     0.12     0.15     4.0   0.52  0.55    0.8    20    2.16   22.9
-------------------------------------------------------------------------
South: Avon Road
   3L L     0.16     0.19     6.0   0.00  0.55    0.0     0    1.90   22.5
   8T T     0.05     0.06     0.5   0.00  0.07    0.0     0    4.55   24.7
   8R R     0.06     0.08     2.2   0.00  0.29    0.0     0    1.61   23.9
-------------------------------------------------------------------------
East: Benchmark
   1L L     0.16     0.19     7.5   0.41  0.64    0.5    12    1.69   21.8
   6T T     0.01     0.01     1.9   0.41  0.27    0.5    12    0.20   23.6
   6R R     0.10     0.12     3.2   0.41  0.43    0.6    14    2.07   23.1
```

```
-----------------------------------------------------------------------
North: Avon Road
   4T T     0.14     0.17     1.1   0.35  0.16    1.5    39    7.28   23.8
   4R R     0.08     0.09     2.6   0.35  0.34    1.5    39    1.93   23.2
-----------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Future Summer AM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: Benchmark
  109   0.153    0.12     0.15     4.0   0.52  0.55    20    2.16    22.9
-----------------------------------------------------------------------
South: Avon Road
  528   0.169    0.27     0.33     1.9   0.00  0.20     0    8.05    24.1
-----------------------------------------------------------------------
East: Benchmark
  203   0.119    0.27     0.32     4.8   0.41  0.50    14    3.97    22.6
-----------------------------------------------------------------------
North: Avon Road
  555   0.251    0.22     0.26     1.4   0.35  0.20    39    9.22    23.7
-----------------------------------------------------------------------
ALL VEHICLES:
 1395   0.251    0.88     1.05     2.3   0.24  0.27    39   23.39    23.6
-----------------------------------------------------------------------
INTERSECTION (persons):
 1674   0.251             1.05     2.3   0.24  0.27         23.39    23.6
-----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / Benchmark Road
Future Summer AM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
-------------------------------------------------------------
 West: Benchmark
 1 R       109   713 0.153    4.0  0.55    0.8   20.0   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      250  1485 0.169    2.6  0.26    0.0    0.0   1600.0
 2 TR      278  1648 0.169    1.1  0.15    0.0    0.0   1600.0
-------------------------------------------------------------
 East: Benchmark
```

```
 1 LT       89   910 0.098    6.8  0.59    0.5   11.7   1600.0
 2 R       114   962 0.118    3.2  0.43    0.6   14.3   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 T       277  1105 0.251    1.1  0.16    1.5   39.3   1600.0
 2 TR      278  1105 0.251    1.7  0.23    1.5   39.3   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / Benchmark Road
Future Summer AM Peak Hour
Intersection ID: 4
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: Benchmark
 1 R       0    0  109  109   109  713  0.153  100
--------------------------------------------------
 South: Avon Road
 1 LT     98  152    0  250   150 1485  0.169  100
 2 TR      0  175  103  278   150 1648  0.169  100
--------------------------------------------------
 East: Benchmark
 1 LT     77   12    0   89    89  910  0.098   83P
 2 R       0    0  114  114   114  962  0.118  100
--------------------------------------------------
 North: Avon Road
 1 T       0  277    0  277   150 1105  0.251  100
 2 TR      0  169  109  278   150 1105  0.251  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Future Summer AM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
```

2R R	109	713	0.153	4.0	A	0.8	20
South: Avon Road							
3L L	98	582	0.168	6.0	A	0.0	0
8T T	327	1940	0.169	0.5	A	0.0	0
8R R	103	611	0.169	2.2	A	0.0	0
East: Benchmark							
1L L	77	787	0.098	7.5	A	0.5	12
6T T	12	123	0.098	1.9	A	0.5	12
6R R	114	962	0.119	3.2	A	0.6	14
North: Avon Road							
4T T	446	1775	0.251*	1.1	A	1.5	39
4R R	109	434	0.251*	2.6	A	1.5	39
ALL VEHICLES:	1395		0.251	2.3	A	1.5	39

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

* Maximum v/c ratio, or critical green periods

" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Summer Avon/Benchmark AM
I:\08159\Analysis\Sidra\Future\Int 4 Avon at Benchmark.aap
Processed Apr 13, 2009 11:50:34AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	20	0	0	145	15	335	70	65	465	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	22	0	0	158	16	364	76	71	505	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1043	1144	277	851	1130	220	554			440		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1043	1144	277	851	1130	220	554			440		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	97	100	100	80	98			94		
cM capacity (veh/h)	138	183	720	231	186	784	1012			1116		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	22	158	16	243	197	71	337	217
Volume Left	0	0	16	0	0	71	0	0
Volume Right	22	158	0	0	76	0	0	49
cSH	720	784	1012	1700	1700	1116	1700	1700
Volume to Capacity	0.03	0.20	0.02	0.14	0.12	0.06	0.20	0.13
Queue Length 95th (ft)	2	19	1	0	0	5	0	0
Control Delay (s)	10.2	10.7	8.6	0.0	0.0	8.4	0.0	0.0
Lane LOS	B	B	A			A		
Approach Delay (s)	10.2	10.7	0.3			1.0		
Approach LOS	B	B						

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Future Summer AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

Avon Road / US 6
Future Summer AM Peak Hour
Intersection ID: 6
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale	Peak Flow Factor
West: US 6							
	South	2R	Right	101	2	1.00	0.92
	East	2T	Thru	586	12	1.00	0.92
	North	5L	Left	75	2	1.00	0.92
South: Avon Road							
	West	3L	Left	11	0	1.00	0.92
	East	8R	Right	69	1	1.00	0.92
	North	8T	Thru	202	4	1.00	0.92

```
 East: US 6
           West         6T   Thru    634    13    1.00     0.92
           South        1L   Left     43     1    1.00     0.92
           North        6R   Right   170     3    1.00     0.92
----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   170     3    1.00     0.92
           South        4T   Thru    250     5    1.00     0.92
           East         7L   Left    101     2    1.00     0.92
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / US 6
Future Summer AM Peak Hour
Intersection ID: 6
Roundabout

-------------------------------------------------------
   Intersection Level of Service            =         A
   Worst movement Level of Service          =         B
   Average intersection delay (s/pers)      =       5.4
   Largest average movement delay (s)       =      11.0
   Largest back of queue, 95% (ft)          =       229
   Performance Index                        =     56.74
   Degree of saturation (highest)           =     0.733
   Practical Spare Capacity (lowest)        =        16 %
   Effective intersection capacity, (veh/h) =      3356
   Total vehicle flow (veh/h)               =      2461
   Total person flow (pers/h)               =      2953
   Total vehicle delay (veh-h/h)            =      3.72
   Total person delay (pers-h/h)            =      4.47
   Total effective vehicle stops (veh/h)    =      1803
   Total effective person stops (pers/h)    =      2164
   Total vehicle travel (veh-mi/h)          =     829.4
   Total cost ($/h)                         =    518.05
   Total fuel (gal/h)                       =      35.2
   Total CO2 (kg/h)                         =    333.43
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
---------------------------------------------------------------------------
West: US 6
   5L L     0.23     0.28    11.0   0.82  0.97    9.0   229    2.12   20.7
   2T T     0.92     1.10     5.5   0.82  0.88    9.0   229   14.53   22.3
   2R R     0.16     0.19     5.6   0.58  0.64    1.1    29    2.26   22.4
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.04     0.04    11.0   0.79  0.87    1.9    49    0.32   20.7
   8T T     0.32     0.38     5.6   0.79  0.76    1.9    49    4.82   22.4
   8R R     0.14     0.17     7.3   0.79  0.81    1.9    49    1.69   21.7
```

```
---------------------------------------------------------------------------
East: US 6
   1L L     0.11     0.13     8.9   0.70  0.79    7.4   188    1.11   21.3
   6T T     0.58     0.69     3.2   0.70  0.52    7.4   188   13.39   22.7
   6R R     0.24     0.29     5.0   0.55  0.60    1.9    47    3.72   22.6
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.31     0.37    10.9   0.80  0.90    3.4    85    2.76   20.7
   4T T     0.36     0.43     5.1   0.80  0.77    3.4    85    5.89   22.4
   4R R     0.31     0.38     6.5   0.80  0.83    3.4    85    4.13   22.0
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Future Summer AM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: US 6
  778   0.733    1.31     1.58     6.1   0.79  0.86   229   18.92    22.1
---------------------------------------------------------------------------
South: Avon Road
  288   0.255    0.50     0.60     6.2   0.79  0.78    49    6.83    22.1
---------------------------------------------------------------------------
East: US 6
  864   0.669    0.93     1.11     3.9   0.67  0.55   188   18.21    22.6
---------------------------------------------------------------------------
North: Avon Road
  531   0.406    0.99     1.18     6.7   0.80  0.82    85   12.77    21.9
---------------------------------------------------------------------------
ALL VEHICLES:
 2461   0.733    3.72     4.47     5.4   0.75  0.73   229   56.74    22.3
---------------------------------------------------------------------------
INTERSECTION (persons):
 2953   0.733             4.47     5.4   0.75  0.73         56.74    22.3
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / US 6
Future Summer AM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: US 6
 1 LT      675   923 0.732    6.2  0.89    9.0  229.3   1600.0
```

```
 2 R       103   493 0.209    5.6  0.64    1.1   29.0   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      144   566 0.254    6.0  0.77    1.9   49.2   1600.0
 2 TR      144   568 0.254    6.4  0.79    1.9   49.0   1600.0
-------------------------------------------------------------
 East: US 6
 1 LT      691  1033 0.669    3.6  0.54    7.4  188.1   1600.0
 2 R       173   554 0.312    5.0  0.60    1.9   47.1   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 LT      264   652 0.405    7.4  0.82    3.4   85.2   1600.0
 2 TR      267   657 0.405    6.0  0.81    3.4   85.3   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / US 6
Future Summer AM Peak Hour
Intersection ID: 6
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: US 6
 1 LT     77  598    0  675   150  923  0.732  100
 2 R       0    0  103  103   103  493  0.209   29P
--------------------------------------------------
 South: Avon Road
 1 LT     12  132    0  144   144  566  0.254  100
 2 TR      0   74   70  144   144  568  0.254  100
--------------------------------------------------
 East: US 6
 1 LT     44  647    0  691   150 1033  0.669  100
 2 R       0    0  173  173   150  554  0.312   47P
--------------------------------------------------
 North: Avon Road
 1 LT    103  161    0  264   150  652  0.405  100
 2 TR      0   94  173  267   150  657  0.405  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Future Summer AM Peak Hour
Intersection ID: 6
Roundabout
```

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: US 6								
5L	L	77	105	0.733*	11.0	B	9.0	229
2T	T	598	817	0.732	5.5	A	9.0	229
2R	R	103	493	0.209	5.6	A	1.1	29
South: Avon Road								
3L	L	12	47	0.255	11.0	B	1.9	49
8T	T	206	811	0.254	5.6	A	1.9	49
8R	R	70	276	0.254	7.3	A	1.9	49
East: US 6								
1L	L	44	66	0.667	8.9	A	7.4	188
6T	T	647	967	0.669	3.2	A	7.4	188
6R	R	173	554	0.312	5.0	A	1.9	47
North: Avon Road								
7L	L	103	254	0.406	10.9	B	3.4	85
4T	T	255	629	0.405	5.1	A	3.4	85
4R	R	173	427	0.405	6.5	A	3.4	85
ALL VEHICLES:		2461		0.733	5.4	A	9.0	229

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

* Maximum v/c ratio, or critical green periods

" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Summer Avon/US6 AM
I:\08159\Analysis\Sidra\Future\Int 6 Avon at US6.aap
Processed May 14, 2009 01:49:18PM

A0129, Felsburg Holt & Ullevig, Large Office

Produced by SIDRA Intersection 3.2.0.1455
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	735	95	35	630	30	35	5	30	30	15	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1620		1770	1642	
Flt Permitted	0.23	1.00	1.00	0.17	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	438	3539	1583	313	3539	1583	1770	1620		1770	1642	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	799	103	38	685	33	38	5	33	33	16	60
RTOR Reduction (vph)	0	0	71	0	0	23	0	25	0	0	47	0
Lane Group Flow (vph)	43	799	32	38	685	10	38	13	0	33	29	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	29.3	26.6	26.6	29.3	26.6	26.6	21.4	21.4		18.3	18.3	
Effective Green, g (s)	29.3	26.6	26.6	29.3	26.6	26.6	21.4	21.4		18.3	18.3	
Actuated g/C Ratio	0.34	0.31	0.31	0.34	0.31	0.31	0.25	0.25		0.22	0.22	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	193	1107	495	154	1107	495	446	408		381	354	
v/s Ratio Prot	0.01	c0.23		c0.01	0.19		c0.02	0.01		c0.02	0.02	
v/s Ratio Perm	0.07		0.02	0.08		0.01						
v/c Ratio	0.22	0.72	0.07	0.25	0.62	0.02	0.09	0.03		0.09	0.08	
Uniform Delay, d1	19.4	25.9	20.5	19.8	24.9	20.2	24.3	24.0		26.7	26.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	2.4	0.1	0.8	1.0	0.0	0.4	0.1		0.4	0.5	
Delay (s)	20.0	28.3	20.5	20.7	25.9	20.2	24.7	24.1		27.1	27.1	
Level of Service	B	C	C	C	C	C	C	C		C	C	
Approach Delay (s)		27.0			25.4			24.4			27.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	26.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	60	30	5	30	35	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	33	5	33	38	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	98	5	33	43
Volume Left (vph)	0	5	0	38
Volume Right (vph)	33	0	0	5
Hadj (s)	-0.17	0.53	0.03	0.13
Departure Headway (s)	4.0	5.2	4.7	4.3
Degree Utilization, x	0.11	0.01	0.04	0.05
Capacity (veh/h)	889	673	747	800
Control Delay (s)	7.5	7.0	6.7	7.6
Approach Delay (s)	7.5	6.8		7.6
Approach LOS	A	A		A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	15.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	105	40	5	70	35	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	43	5	76	38	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			158		223	136
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			158		223	136
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		95	99
cM capacity (veh/h)			1422		762	913

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	158	82	38	5
Volume Left	0	5	38	0
Volume Right	43	0	0	5
cSH	1700	1422	762	913
Volume to Capacity	0.09	0.00	0.05	0.01
Queue Length 95th (ft)	0	0	4	0
Control Delay (s)	0.0	0.5	10.0	9.0
Lane LOS		A	A	A
Approach Delay (s)	0.0	0.5	9.8	
Approach LOS			A	

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	105	70	5	70	30	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	76	5	76	33	5

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	190	82	38
Volume Left (vph)	0	5	33
Volume Right (vph)	76	0	5
Hadj (s)	-0.21	0.05	0.12
Departure Headway (s)	3.9	4.2	4.6
Degree Utilization, x	0.20	0.10	0.05
Capacity (veh/h)	914	837	736
Control Delay (s)	7.9	7.7	7.8
Approach Delay (s)	7.9	7.7	7.8
Approach LOS	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Future Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 West Ramps
Future Summer PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left    325     7    1.00     0.92
           North        8T   Thru    479    10    1.00     0.92
-------------------------------------------------------------------
 East: I-70 West Off Ramp
           South        1L   Left    570    12    1.00     0.92
           North        6R   Right   309     6    1.00     0.92
-------------------------------------------------------------------
 North: Avon Road
           West         4R   Right   181     4    1.00     0.92
```

```
            South        4T   Thru    463     9    1.00     0.92
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 West Ramps
Future Summer PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         B
   Average intersection delay (s/pers)       =       6.6
   Largest average movement delay (s)        =      10.9
   Largest back of queue, 95% (ft)           =       111
   Performance Index                         =     51.88
   Degree of saturation (highest)            =     0.552
   Practical Spare Capacity (lowest)         =        54 %
   Effective intersection capacity, (veh/h)  =      4301
   Total vehicle flow (veh/h)                =      2375
   Total person flow (pers/h)                =      2850
   Total vehicle delay (veh-h/h)             =      4.38
   Total person delay (pers-h/h)             =      5.26
   Total effective vehicle stops (veh/h)     =      1655
   Total effective person stops (pers/h)     =      1986
   Total vehicle travel (veh-mi/h)           =     823.4
   Total cost ($/h)                          =    512.75
   Total fuel (gal/h)                        =      34.0
   Total CO2 (kg/h)                          =    322.26
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.55     0.67     6.0   0.00  0.55    0.0     0    6.42   22.4
   8T T     0.09     0.11     0.7   0.00  0.09    0.0     0    6.89   24.7
---------------------------------------------------------------------------
East: I-70 West Off Ramp
   1L L     1.76     2.12    10.9   0.68  0.95    4.0   101   15.07   20.7
   6R R     0.58     0.69     6.6   0.67  0.84    4.0   101    7.14   22.0
---------------------------------------------------------------------------
North: Avon Road
   4T T     0.96     1.15     7.3   0.81  0.92    4.4   111   11.69   21.7
   4R R     0.44     0.53     8.6   0.81  0.95    4.4   111    4.67   21.2
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Avon Road / I-70 West Ramps
Future Summer PM Peak Hour
Intersection ID: 1
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
South: Avon Road									
821	0.263	0.65	0.77	2.8	0.00	0.28	0	13.31	23.7
East: I-70 West Off Ramp									
897	0.552	2.34	2.81	9.4	0.67	0.91	101	22.21	21.1
North: Avon Road									
657	0.517	1.40	1.68	7.7	0.81	0.93	111	16.36	21.6
ALL VEHICLES:									
2375	0.552	4.38	5.26	6.6	0.48	0.70	111	51.88	22.1
INTERSECTION (persons):									
2850	0.552		5.26	6.6	0.48	0.70		51.88	22.1

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Avon Road / I-70 West Ramps
Future Summer PM Peak Hour
Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
South: Avon Road								
1 LT	390	1480	0.263	5.2	0.49	0.0	0.0	1600.0
2 T	431	1636	0.263	0.7	0.09	0.0	0.0	1600.0
East: I-70 West Off Ramp								
1 L	443	802	0.552	11.0	0.95	4.0	100.5	1600.0
2 LR	454	823	0.552	7.9	0.87	4.0	100.8	1600.0
North: Avon Road								
1 T	323	624	0.517	7.4	0.92	4.3	109.6	1600.0
2 TR	334	647	0.517	7.9	0.94	4.4	111.1	1600.0

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / I-70 West Ramps
Future Summer PM Peak Hour
Intersection ID: 1
Roundabout

--------------------------------------------------
                                Min  Tot
 Lane     Dem Flow (veh/h)      Cap  Cap  Deg.  Lane
 No.    -------------------   (veh (veh  Satn  Util
         Lef Thru  Rig  Tot     /h)  /h)   x     %
--------------------------------------------------
 South: Avon Road
 1 LT    332   58    0  390   150 1480  0.263  100
 2 T       0  431    0  431   150 1636  0.263  100
--------------------------------------------------
 East: I-70 West Off Ramp
 1 L     443    0    0  443   150  802  0.552  100
 2 LR    139    0  315  454   150  823  0.552  100
--------------------------------------------------
 North: Avon Road
 1 T       0  323    0  323   150  624  0.517  100
 2 TR      0  149  185  334   150  647  0.517  100
--------------------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Future Summer PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
South: Avon Road
  3L L            332   1260   0.263     6.0    A      0.0      0
  8T T            489   1856   0.263     0.7    A      0.0      0
-------------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            582   1054   0.552*   10.9    B      4.0    101
  6R R            315    571   0.552*    6.6    A      4.0    101
-------------------------------------------------------------------
North: Avon Road
  4T T            472    913   0.517     7.3    A      4.4    111
  4R R            185    358   0.517     8.6    A      4.4    111
-------------------------------------------------------------------
 ALL VEHICLES:   2375          0.552     6.6    A      4.4    111
-------------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
```

SIDRA SOLUTIONS

Site: Future Summer Avon/I-70 West PM
I:\08159\Analysis\Sidra\Future\Int 1 Avon at I-70 west_min lanes.aap
Processed May 15, 2009 10:00:07AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Future Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 East Ramps
Future Summer PM Peak Hour
Intersection ID: 2
Roundabout

-----------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-----------------------------------------------------------------
 West: I-70 East Off Ramp
           South        2R   Right   570    12    1.00     0.92
           North        5L   Left    202     4    1.00     0.92
-----------------------------------------------------------------
 South: Avon Road
           East         8R   Right   506    10    1.00     0.92
           North        8T   Thru    602    12    1.00     0.92
-----------------------------------------------------------------
 North: Avon Road
           South        4T   Thru    852    17    1.00     0.92
```

```
            East         7L   Left    181     4    1.00     0.92
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 East Ramps
Future Summer PM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         B
   Average intersection delay (s/pers)       =       5.0
   Largest average movement delay (s)        =      12.1
   Largest back of queue, 95% (ft)           =       203
   Performance Index                         =     60.78
   Degree of saturation (highest)            =     0.679
   Practical Spare Capacity (lowest)         =        25 %
   Effective intersection capacity, (veh/h)  =      4376
   Total vehicle flow (veh/h)                =      2972
   Total person flow (pers/h)                =      3566
   Total vehicle delay (veh-h/h)             =      4.13
   Total person delay (pers-h/h)             =      4.96
   Total effective vehicle stops (veh/h)     =      1725
   Total effective person stops (pers/h)     =      2070
   Total vehicle travel (veh-mi/h)           =    1005.0
   Total cost ($/h)                          =    608.85
   Total fuel (gal/h)                        =      40.4
   Total CO2 (kg/h)                          =    382.56
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
West: I-70 East Off Ramp
   5L L     0.69     0.83    12.1   0.70  0.97    3.6    92    5.45   20.3
   2R R     1.21     1.45     7.5   0.70  0.87    3.7    93   13.51   21.6
---------------------------------------------------------------------------
South: Avon Road
   8T T     0.98     1.18     5.8   0.77  0.81    8.0   203   14.63   22.3
   8R R     0.90     1.08     6.3   0.70  0.76    5.7   144   11.85   22.1
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.31     0.37     6.0   0.00  0.55    0.0     0    3.58   22.5
   4T T     0.05     0.06     0.2   0.00  0.03    0.0     0   11.77   24.9
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Avon Road / I-70 East Ramps
Future Summer PM Peak Hour
Intersection ID: 2
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
West: I-70 East Off Ramp									
788	0.532	1.90	2.28	8.7	0.70	0.90	93	18.95	21.3
South: Avon Road									
1130	0.679	1.88	2.26	6.0	0.74	0.79	203	26.47	22.2
North: Avon Road									
1054	0.333	0.35	0.42	1.2	0.00	0.12	0	15.35	24.4
ALL VEHICLES:									
2972	0.679	4.13	4.96	5.0	0.47	0.58	203	60.78	22.7
INTERSECTION (persons):									
3566	0.679		4.96	5.0	0.47	0.58		60.78	22.7

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Avon Road / I-70 East Ramps
Future Summer PM Peak Hour
Intersection ID: 2
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
West: I-70 East Off Ramp								
1 LR	382	718	0.532	10.1	0.93	3.6	91.8	1600.0
2 R	406	763	0.532	7.3	0.87	3.7	93.0	1600.0
South: Avon Road								
1 T	614	904	0.679	5.8	0.81	8.0	203.3	1600.0
2 R	516	882	0.585	6.3	0.76	5.7	144.2	1600.0
North: Avon Road								
1 LT	498	1494	0.333	2.3	0.22	0.0	0.0	1600.0
2 T	556	1671	0.333	0.2	0.03	0.0	0.0	1600.0

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / I-70 East Ramps
Future Summer PM Peak Hour
Intersection ID: 2
Roundabout

--------------------------------------------------
                                Min  Tot
 Lane     Dem Flow (veh/h)      Cap  Cap  Deg.  Lane
 No.    -------------------   (veh (veh  Satn  Util
         Lef Thru  Rig  Tot     /h)  /h)   x     %
--------------------------------------------------
 West: I-70 East Off Ramp
 1 LR    206    0  176  382   150  718  0.532  100
 2 R       0    0  406  406   150  763  0.532  100
--------------------------------------------------
 South: Avon Road
 1 T       0  614    0  614   150  904  0.679  100
 2 R       0    0  516  516   150  882  0.585  100
--------------------------------------------------
 North: Avon Road
 1 LT    185  313    0  498   150 1494  0.333  100
 2 T       0  556    0  556   150 1671  0.333  100
--------------------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 East Ramps
Future Summer PM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
West: I-70 East Off Ramp
  5L L            206    387   0.532    12.1    B      3.6     92
  2R R            582   1094   0.532     7.5    A      3.7     93
-------------------------------------------------------------------
South: Avon Road
  8T T            614    904   0.679*    5.8    A      8.0    203
  8R R            516    882   0.585     6.3    A      5.7    144
-------------------------------------------------------------------
North: Avon Road
  7L L            185    556   0.333     6.0    A      0.0      0
  4T T            869   2610   0.333     0.2    A      0.0      0
-------------------------------------------------------------------
 ALL VEHICLES:   2972          0.679     5.0    A      8.0    203
-------------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Summer Avon/I-70 East PM
I:\08159\Analysis\Sidra\Future\Int 2 Avon at I-70 east_min lanes.aap
Processed May 15, 2009 10:04:00AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Future Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / W. Beaver Creek Blvd
Future Summer PM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-----------------------------------------------------------------
 West: WBCB
           South        2R   Right    75     2    1.00     0.92
           East         2T   Thru    154     3    1.00     0.92
           North        5L   Left    336     7    1.00     0.92
-----------------------------------------------------------------
 South: Avon Road
           West         3L   Left    128     3    1.00     0.92
           East         8R   Right   107     2    1.00     0.92
           North        8T   Thru    394     8    1.00     0.92
-----------------------------------------------------------------
```

```
 East: WBCB
           West         6T   Thru    181     4    1.00     0.92
           South        1L   Left     80     2    1.00     0.92
           North        6R   Right   362     7    1.00     0.92
----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   245     5    1.00     0.92
           South        4T   Thru    719    15    1.00     0.92
           East         7L   Left    405     8    1.00     0.92
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / W. Beaver Creek Blvd
Future Summer PM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         B
   Average intersection delay (s/pers)       =       5.7
   Largest average movement delay (s)        =      10.7
   Largest back of queue, 95% (ft)           =       121
   Performance Index                         =     71.13
   Degree of saturation (highest)            =     0.529
   Practical Spare Capacity (lowest)         =        61 %
   Effective intersection capacity, (veh/h)  =      6150
   Total vehicle flow (veh/h)                =      3252
   Total person flow (pers/h)                =      3902
   Total vehicle delay (veh-h/h)             =      5.19
   Total person delay (pers-h/h)             =      6.23
   Total effective vehicle stops (veh/h)     =      2131
   Total effective person stops (pers/h)     =      2558
   Total vehicle travel (veh-mi/h)           =    1117.1
   Total cost ($/h)                          =    700.88
   Total fuel (gal/h)                        =      47.2
   Total CO2 (kg/h)                          =    447.49
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
-------------------------------------------------------------------------
West: WBCB
   5L L     0.96     1.15    10.1   0.80  0.96    3.4    86    8.91   21.0
   2T T     0.21     0.26     4.9   0.75  0.70    1.7    43    3.46   22.5
   2R R     0.14     0.17     6.8   0.72  0.79    0.9    23    1.79   21.9
-------------------------------------------------------------------------
South: Avon Road
   3L L     0.39     0.47    10.7   0.75  0.90    2.6    65    3.40   20.8
   8T T     0.52     0.62     4.6   0.76  0.67    2.7    68    8.62   22.5
   8R R     0.23     0.27     7.6   0.70  0.80    1.2    30    2.54   21.6
```

```
---------------------------------------------------------------------------
East: WBCB
   1L L     0.22     0.26     9.6   0.72  0.88    2.4    62    2.07   21.2
   6T T     0.20     0.24     4.0   0.72  0.59    2.4    62    3.82   22.7
   6R R     0.53     0.63     5.1   0.71  0.66    2.6    65    7.78   22.2
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.99     1.19     8.6   0.66  0.76    4.7   120    9.96   21.3
   4T T     0.51     0.61     2.5   0.65  0.38    4.8   121   13.75   22.9
   4R R     0.30     0.35     4.3   0.56  0.56    2.0    50    5.04   22.6
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Future Summer PM Peak Hour
Intersection ID: 3
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: WBCB
  577   0.450    1.32     1.58     8.2   0.77  0.87    86   14.15    21.5
---------------------------------------------------------------------------
South: Avon Road
  642   0.361    1.14     1.36     6.4   0.75  0.74    68   14.56    21.9
---------------------------------------------------------------------------
East: WBCB
  636   0.361    0.95     1.14     5.4   0.71  0.67    65   13.67    22.2
---------------------------------------------------------------------------
North: Avon Road
 1397   0.529    1.79     2.15     4.6   0.64  0.52   121   28.75    22.3
---------------------------------------------------------------------------
ALL VEHICLES:
 3252   0.529    5.19     6.23     5.7   0.70  0.66   121   71.13    22.1
---------------------------------------------------------------------------
INTERSECTION (persons):
 3902   0.529             6.23     5.7   0.70  0.66         71.13    22.1
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / W. Beaver Creek Blvd
Future Summer PM Peak Hour
Intersection ID: 3
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.    95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: WBCB
 1 L       343   763 0.450   10.1  0.96    3.4   86.2   1600.0
```

```
 2 T       157   549 0.286    4.9  0.70    1.7   42.8   1600.0
 3 R        77   473 0.163    6.8  0.79    0.9   22.7   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      245   680 0.361    8.1  0.83    2.6   64.9   1600.0
 2 T       288   798 0.361    4.4  0.63    2.7   67.6   1600.0
 3 R       109   559 0.195    7.6  0.80    1.2   30.2   1600.0
-------------------------------------------------------------
 East: WBCB
 1 LT      267   740 0.360    5.7  0.68    2.4   62.1   1600.0
 2 TR       48   543 0.089    6.2  0.70    0.5   12.2   1600.0
 3 R       321   891 0.360    5.0  0.65    2.6   65.1   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 LT      541  1023 0.529    7.3  0.69    4.7  120.5   1600.0
 2 T       606  1146 0.529    2.4  0.36    4.8  121.4   1600.0
 3 R       250   853 0.293    4.3  0.56    2.0   49.9   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / W. Beaver Creek Blvd
Future Summer PM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
-------------------------------------------------
 West: WBCB
 1 L     343    0    0  343   150  763  0.450  100
 2 T       0  157    0  157   150  549  0.286   64P
 3 R       0    0   77   77    77  473  0.163   36P
-------------------------------------------------
 South: Avon Road
 1 LT    131  114    0  245   150  680  0.361  100
 2 T       0  288    0  288   150  798  0.361  100
 3 R       0    0  109  109   109  559  0.195  100
-------------------------------------------------
 East: WBCB
 1 LT     82  185    0  267   150  740  0.360  100
 2 TR      0    0   48   48    48  543  0.089   25D
 3 R       0    0  321  321   150  891  0.360  100
-------------------------------------------------
 North: Avon Road
 1 LT    413  128    0  541   150 1023  0.529  100
 2 T       0  606    0  606   150 1146  0.529  100
 3 R       0    0  250  250   150  853  0.293  100
-------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).
  D  Lane under-utilisation due to downstream effects

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

Avon Road / W. Beaver Creek Blvd
Future Summer PM Peak Hour
Intersection ID: 3
Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: WBCB								
5L	L	343	763	0.450	10.1	B	3.4	86
2T	T	157	549	0.286	4.9	A	1.7	43
2R	R	77	473	0.163	6.8	A	0.9	23
South: Avon Road								
3L	L	131	363	0.361	10.7	B	2.6	65
8T	T	402	1114	0.361	4.6	A	2.7	68
8R	R	109	559	0.195	7.6	A	1.2	30
East: WBCB								
1L	L	82	227	0.361	9.6	A	2.4	62
6T	T	185	513	0.361	4.0	A	2.4	62
6R	R	369	1024	0.360	5.1	A	2.6	65
North: Avon Road								
7L	L	413	781	0.529*	8.6	A	4.7	120
4T	T	734	1388	0.529*	2.5	A	4.8	121
4R	R	250	853	0.293	4.3	A	2.0	50
ALL VEHICLES:		3252		0.529	5.7	A	4.8	121

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Summer Avon/WBCB PM
I:\08159\Analysis\Sidra\Future\Int 3 Avon at WBCB.aap
Processed Apr 13, 2009 11:48:41AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Future Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / Benchmark Road
Future Summer PM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 West: Benchmark
           South        2R   Right   144     3    1.00     0.92
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left    101     2    1.00     0.92
           East         8R   Right   245     5    1.00     0.92
           North        8T   Thru    506    10    1.00     0.92
-------------------------------------------------------------------
 East: Benchmark
           West         6T   Thru     11     0    1.00     0.92
```

```
            South        1L   Left    250     5    1.00     0.92
            North        6R   Right   117     2    1.00     0.92
-----------------------------------------------------------------
 North: Avon Road
            West         4R   Right   160     3    1.00     0.92
            South        4T   Thru    719    15    1.00     0.92
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / Benchmark Road
Future Summer PM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         A
   Average intersection delay (s/pers)       =       3.4
   Largest average movement delay (s)        =       8.5
   Largest back of queue, 95% (ft)           =        95
   Performance Index                         =     42.30
   Degree of saturation (highest)            =     0.478
   Practical Spare Capacity (lowest)         =        78 %
   Effective intersection capacity, (veh/h)  =      4810
   Total vehicle flow (veh/h)                =      2299
   Total person flow (pers/h)                =      2759
   Total vehicle delay (veh-h/h)             =      2.19
   Total person delay (pers-h/h)             =      2.63
   Total effective vehicle stops (veh/h)     =       932
   Total effective person stops (pers/h)     =      1118
   Total vehicle travel (veh-mi/h)           =     779.6
   Total cost ($/h)                          =    463.16
   Total fuel (gal/h)                        =      30.7
   Total CO2 (kg/h)                          =    290.98
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
   2R R     0.28     0.34     6.9   0.72  0.77    1.7    43    3.42   21.9
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.17     0.20     6.0   0.00  0.55    0.0     0    1.99   22.5
   8T T     0.07     0.09     0.5   0.00  0.07    0.0     0    7.18   24.7
   8R R     0.15     0.19     2.2   0.00  0.29    0.0     0    3.90   23.9
---------------------------------------------------------------------------
East: Benchmark
   1L L     0.60     0.72     8.5   0.54  0.76    1.6    42    5.93   21.5
   6T T     0.01     0.01     2.8   0.54  0.41    1.6    42    0.22   23.2
   6R R     0.17     0.20     5.1   0.53  0.62    0.9    22    2.44   22.6
```

```
-----------------------------------------------------------------------
North: Avon Road
   4T T     0.54     0.65     2.7   0.62  0.39    3.7    95   13.92   23.0
   4R R     0.19     0.22     4.1   0.62  0.55    3.7    95    3.31   22.6
-----------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Future Summer PM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-----------------------------------------------------------------------
West: Benchmark
  147   0.294    0.28     0.34     6.9   0.72  0.77    43    3.42    21.9
-----------------------------------------------------------------------
South: Avon Road
  869   0.278    0.40     0.48     1.6   0.00  0.19     0   13.07    24.2
-----------------------------------------------------------------------
East: Benchmark
  386   0.308    0.78     0.93     7.3   0.54  0.71    42    8.59    21.9
-----------------------------------------------------------------------
North: Avon Road
  897   0.478    0.73     0.88     2.9   0.62  0.42    95   17.23    22.9
-----------------------------------------------------------------------
ALL VEHICLES:
 2299   0.478    2.19     2.63     3.4   0.38  0.41    95   42.30    23.1
-----------------------------------------------------------------------
INTERSECTION (persons):
 2759   0.478             2.63     3.4   0.38  0.41         42.30    23.1
-----------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / Benchmark Road
Future Summer PM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
-------------------------------------------------------------
 West: Benchmark
 1 R       147   500 0.294    6.9  0.77    1.7   43.3   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      412  1485 0.277    1.9  0.19    0.0    0.0   1600.0
 2 TR      457  1648 0.277    1.4  0.19    0.0    0.0   1600.0
-------------------------------------------------------------
 East: Benchmark
```

```
 1 LT      267   877 0.305    8.2  0.75    1.6   41.8   1600.0
 2 R       119   658 0.181    5.1  0.62    0.9   22.1   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 T       448   939 0.477    2.7  0.39    3.7   95.3   1600.0
 2 TR      449   939 0.477    3.2  0.45    3.7   95.2   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / Benchmark Road
Future Summer PM Peak Hour
Intersection ID: 4
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: Benchmark
 1 R       0    0  147  147   147  500  0.294  100
--------------------------------------------------
 South: Avon Road
 1 LT    103  309    0  412   150 1485  0.277  100
 2 TR      0  207  250  457   150 1648  0.277  100
--------------------------------------------------
 East: Benchmark
 1 LT    255   12    0  267   150  877  0.305  100
 2 R       0    0  119  119   119  658  0.181   59P
--------------------------------------------------
 North: Avon Road
 1 T       0  448    0  448   150  939  0.477  100
 2 TR      0  286  163  449   150  939  0.477  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Future Summer PM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap     of    Delay          95% Back
                (veh   (veh    Satn                 (vehs)  (ft)
                  /h)    /h)   (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
```

```
  2R R            147    500   0.294     6.9    A      1.7     43
----------------------------------------------------------------
South: Avon Road
  3L L            103    371   0.278     6.0    A      0.0      0
  8T T            516   1860   0.277     0.5    A      0.0      0
  8R R            250    901   0.277     2.2    A      0.0      0
----------------------------------------------------------------
East: Benchmark
  1L L            255    837   0.305     8.5    A      1.6     42
  6T T             12     39   0.308     2.8    A      1.6     42
  6R R            119    658   0.181     5.1    A      0.9     22
----------------------------------------------------------------
North: Avon Road
  4T T            734   1537   0.478*    2.7    A      3.7     95
  4R R            163    341   0.478*    4.1    A      3.7     95
----------------------------------------------------------------
 ALL VEHICLES:   2299          0.478     3.4    A      3.7     95
----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Summer Avon/Benchmark PM
I:\08159\Analysis\Sidra\Future\Int 4 Avon at Benchmark.aap
Processed Apr 13, 2009 11:50:35AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	35	0	0	170	30	635	65	125	805	115
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	38	0	0	185	33	690	71	136	875	125
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1804	2035	500	1538	2062	380	1000			761		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1804	2035	500	1538	2062	380	1000			761		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	93	100	100	70	95			84		
cM capacity (veh/h)	29	45	516	62	43	617	688			847		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	38	185	33	460	301	136	583	417
Volume Left	0	0	33	0	0	136	0	0
Volume Right	38	185	0	0	71	0	0	125
cSH	516	617	688	1700	1700	847	1700	1700
Volume to Capacity	0.07	0.30	0.05	0.27	0.18	0.16	0.34	0.25
Queue Length 95th (ft)	6	31	4	0	0	14	0	0
Control Delay (s)	12.5	13.3	10.5	0.0	0.0	10.1	0.0	0.0
Lane LOS	B	B	B			B		
Approach Delay (s)	12.5	13.3	0.4			1.2		
Approach LOS	B	B						

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Future Summer PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

Avon Road / US 6
Future Summer PM Peak Hour
Intersection ID: 6
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale	Peak Flow Factor
West: US 6							
	South	2R	Right	48	1	1.00	0.92
	East	2T	Thru	1182	24	1.00	0.92
	North	5L	Left	245	5	1.00	0.92
South: Avon Road							
	West	3L	Left	27	1	1.00	0.92
	East	8R	Right	229	5	1.00	0.92
	North	8T	Thru	304	6	1.00	0.92

```
 East: US 6
           West         6T   Thru   1129    23    1.00     0.92
           South        1L   Left     59     1    1.00     0.92
           North        6R   Right   229     5    1.00     0.92
----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   336     7    1.00     0.92
           South        4T   Thru    426     9    1.00     0.92
           East         7L   Left    133     3    1.00     0.92
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / US 6
Future Summer PM Peak Hour
Intersection ID: 6
Roundabout

-------------------------------------------------------
   Intersection Level of Service            =         F
   Worst movement Level of Service          =         F
   Average intersection delay (s/pers)      =     157.7
   Largest average movement delay (s)       =     313.5
   Largest back of queue, 95% (ft)          =      4759
   Performance Index                        =    513.76
   Degree of saturation (highest)           =     1.668
   Practical Spare Capacity (lowest)        =       -49 %
   Effective intersection capacity, (veh/h) =      2660
   Total vehicle flow (veh/h)               =      4437
   Total person flow (pers/h)               =      5324
   Total vehicle delay (veh-h/h)            =    194.35
   Total person delay (pers-h/h)            =    233.22
   Total effective vehicle stops (veh/h)    =     19668
   Total effective person stops (pers/h)    =     23602
   Total vehicle travel (veh-mi/h)          =    1496.8
   Total cost ($/h)                         =   3162.22
   Total fuel (gal/h)                       =     157.1
   Total CO2 (kg/h)                         =   1487.87
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
---------------------------------------------------------------------------
West: US 6
   5L L    21.77    26.12   313.5   1.00  7.46  187.4  4759   49.72    3.6
   2T T    93.87   112.65   280.2   0.97  6.84  187.4  4759  217.39    3.7
   2R R     0.11     0.14     8.4   0.72  0.81    2.5    63    1.23   21.3
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.14     0.17    17.9   0.93  1.13    5.9   150    0.92   18.7
   8T T     1.07     1.28    12.4   0.93  1.10    6.0   152    9.23   19.9
   8R R     0.91     1.09    13.9   0.93  1.12    6.0   152    7.07   19.4
```

```
---------------------------------------------------------------------------
East: US 6
   1L L     2.93     3.52   176.1   1.00  5.46  119.7  3040    8.01    5.8
   6T T    54.53    65.44   170.4   1.00  5.46  119.7  3040  150.30    5.5
   6R R     0.60     0.72     9.3   0.73  0.87    3.8    96    6.08   21.0
---------------------------------------------------------------------------
North: Avon Road
   7L L     2.92     3.50    77.2   1.00  2.24   28.5   725    9.82   10.1
   4T T     8.61    10.33    71.2   1.00  2.25   29.3   745   30.13   10.1
   4R R     6.89     8.26    72.3   1.00  2.27   29.3   745   23.86   10.0
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Future Summer PM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: US 6
 1505   1.668  115.76   138.91   276.9   0.97  6.75  4759  268.34     3.8
---------------------------------------------------------------------------
South: Avon Road
  572   0.622    2.11     2.53    13.3   0.93  1.11   152   17.22    19.6
---------------------------------------------------------------------------
East: US 6
 1446   1.364   58.07    69.69   144.6   0.96  4.71  3040  164.38     6.3
---------------------------------------------------------------------------
North: Avon Road
  914   1.066   18.41    22.09    72.5   1.00  2.26   745   63.81    10.1
---------------------------------------------------------------------------
ALL VEHICLES:
 4437   1.668  194.35   233.22   157.7   0.97  4.43  4759  513.76     5.9
---------------------------------------------------------------------------
INTERSECTION (persons):
 5324   1.668           233.22   157.7   0.97  4.43        513.76     5.9
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / US 6
Future Summer PM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: US 6
 1 LT     1345   807 1.667  309.0  7.46  187.4 4759.0   1600.0
```

```
 2 TR      160   409 0.392    7.6  0.79    2.5   62.7   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      283   458 0.618   13.0  1.10    5.9  150.5   1600.0
 2 TR      289   468 0.618   13.6  1.12    6.0  152.1   1600.0
-------------------------------------------------------------
 East: US 6
 1 LT     1212   892 1.358  170.7  5.46  119.7 3039.9   1600.0
 2 R       234   459 0.510    9.3  0.87    3.8   96.3   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 LT      449   421 1.066   73.2  2.24   28.5  725.1   1600.0
 2 TR      465   437 1.066   71.9  2.27   29.3  744.6   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / US 6
Future Summer PM Peak Hour
Intersection ID: 6
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: US 6
 1 LT    250 1095    0 1345   150  807  1.667  100
 2 TR      0  111   49  160   150  409  0.392   24D
--------------------------------------------------
 South: Avon Road
 1 LT     28  255    0  283   150  458  0.618  100
 2 TR      0   55  234  289   150  468  0.618  100
--------------------------------------------------
 East: US 6
 1 LT     60 1152    0 1212   150  892  1.358  100
 2 R       0    0  234  234   150  459  0.510   38P
--------------------------------------------------
 North: Avon Road
 1 LT    136  313    0  449   150  421  1.066  100
 2 TR      0  122  343  465   150  437  1.066  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).
  D  Lane under-utilisation due to downstream effects

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Future Summer PM Peak Hour
Intersection ID: 6
```

Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: US 6								
5L	L	250	150	1.667	313.5	F	187.4	4759
2T	T	1206	723	1.668*	280.2	F	187.4	4759
2R	R	49	125	0.392	8.4	A	2.5	63
South: Avon Road								
3L	L	28	45	0.622	17.9	B	5.9	150
8T	T	310	502	0.618	12.4	B	6.0	152
8R	R	234	379	0.617	13.9	B	6.0	152
East: US 6								
1L	L	60	44	1.364	176.1	F	119.7	3040
6T	T	1152	848	1.358	170.4	F	119.7	3040
6R	R	234	459	0.510	9.3	A	3.8	96
North: Avon Road								
7L	L	136	128	1.062	77.2	E	28.5	725
4T	T	435	408	1.066	71.2	E	29.3	745
4R	R	343	322	1.065	72.3	E	29.3	745
ALL VEHICLES:		4437		1.668	157.7	F	187.4	4759

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Summer Avon/US6 PM
I:\08159\Analysis\Sidra\Future\Int 6 Avon at US6.aap
Processed May 14, 2009 01:49:18PM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	1170	120	45	1330	70	95	40	50	45	25	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1707		1770	1639	
Flt Permitted	0.09	1.00	1.00	0.09	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	173	3539	1583	170	3539	1583	1770	1707		1770	1639	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	1272	130	49	1446	76	103	43	54	49	27	109
RTOR Reduction (vph)	0	0	72	0	0	41	0	44	0	0	91	0
Lane Group Flow (vph)	71	1272	58	49	1446	35	103	53	0	49	45	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	46.2	43.1	43.1	47.6	43.8	43.8	17.2	17.2		16.2	16.2	
Effective Green, g (s)	46.2	43.1	43.1	47.6	43.8	43.8	17.2	17.2		16.2	16.2	
Actuated g/C Ratio	0.48	0.45	0.45	0.49	0.45	0.45	0.18	0.18		0.17	0.17	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	134	1584	708	147	1610	720	316	305		298	276	
v/s Ratio Prot	c0.02	0.36		0.01	c0.41		c0.06	0.03		c0.03	0.03	
v/s Ratio Perm	0.24		0.04	0.15		0.02						
v/c Ratio	0.53	0.80	0.08	0.33	0.90	0.05	0.33	0.17		0.16	0.16	
Uniform Delay, d1	20.1	22.9	15.3	17.3	24.2	14.6	34.5	33.5		34.3	34.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	3.0	0.1	1.3	7.0	0.0	2.7	1.2		1.2	1.3	
Delay (s)	23.8	26.0	15.3	18.6	31.2	14.7	37.2	34.7		35.4	35.5	
Level of Service	C	C	B	B	C	B	D	C		D	D	
Approach Delay (s)		24.9			30.0			36.0			35.5	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	96.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	75	55	15	65	80	35
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	60	16	71	87	38

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	141	16	71	125
Volume Left (vph)	0	16	0	87
Volume Right (vph)	60	0	0	38
Hadj (s)	-0.22	0.53	0.03	-0.01
Departure Headway (s)	4.2	5.4	4.9	4.4
Degree Utilization, x	0.16	0.02	0.10	0.15
Capacity (veh/h)	833	635	701	776
Control Delay (s)	8.0	7.4	7.3	8.2
Approach Delay (s)	8.0	7.3		8.2
Approach LOS	A	A		A

Intersection Summary			
Delay	7.9		
HCM Level of Service	A		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	210	95	15	245	120	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	228	103	16	266	130	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			332		579	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			332		579	280
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		72	96
cM capacity (veh/h)			1228		471	759

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	332	283	130	33
Volume Left	0	16	130	0
Volume Right	103	0	0	33
cSH	1700	1228	471	759
Volume to Capacity	0.20	0.01	0.28	0.04
Queue Length 95th (ft)	0	1	28	3
Control Delay (s)	0.0	0.6	15.5	10.0
Lane LOS		A	C	A
Approach Delay (s)	0.0	0.6	14.4	
Approach LOS			B	

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	145	185	5	180	160	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	158	201	5	196	174	22

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	359	201	196
Volume Left (vph)	0	5	174
Volume Right (vph)	201	0	22
Hadj (s)	-0.30	0.04	0.15
Departure Headway (s)	4.4	4.9	5.3
Degree Utilization, x	0.44	0.27	0.29
Capacity (veh/h)	777	692	615
Control Delay (s)	10.8	9.8	10.5
Approach Delay (s)	10.8	9.8	10.5
Approach LOS	B	A	B

Intersection Summary			
Delay	10.5		
HCM Level of Service	B		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Future Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 West Ramps
Future Winter AM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left    422     9    1.00     0.79
           North        8T   Thru    248     5    1.00     0.79
-------------------------------------------------------------------
 East: I-70 West Off Ramp
           South        1L   Left    527    11    1.00     0.79
           North        6R   Right    99     2    1.00     0.79
-------------------------------------------------------------------
 North: Avon Road
           West         4R   Right   248     5    1.00     0.79
```

```
            South        4T   Thru    819    17    1.00     0.79
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 West Ramps
Future Winter AM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         B
   Worst movement Level of Service           =         B
   Average intersection delay (s/pers)       =      11.5
   Largest average movement delay (s)        =      18.8
   Largest back of queue, 95% (ft)           =       315
   Performance Index                         =     63.88
   Degree of saturation (highest)            =     0.852
   Practical Spare Capacity (lowest)         =         0 %
   Effective intersection capacity, (veh/h)  =      2830
   Total vehicle flow (veh/h)                =      2412
   Total person flow (pers/h)                =      2894
   Total vehicle delay (veh-h/h)             =      7.68
   Total person delay (pers-h/h)             =      9.22
   Total effective vehicle stops (veh/h)     =      2329
   Total effective person stops (pers/h)     =      2795
   Total vehicle travel (veh-mi/h)           =     837.0
   Total cost ($/h)                          =    564.47
   Total fuel (gal/h)                        =      37.1
   Total CO2 (kg/h)                          =    351.22
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.72     0.86     6.0   0.00  0.55    0.0     0    8.34   22.4
   8T T     0.05     0.06     0.7   0.00  0.09    0.0     0    3.56   24.7
---------------------------------------------------------------------------
East: I-70 West Off Ramp
   1L L     1.34     1.61     9.0   0.58  0.82    2.1    54   12.83   21.4
   6R R     0.13     0.16     4.7   0.58  0.64    2.1    54    2.05   22.6
---------------------------------------------------------------------------
North: Avon Road
   4T T     4.12     4.95    17.8   0.96  1.43   12.4   315   28.42   18.3
   4R R     1.32     1.59    18.8   0.96  1.44   12.4   315    8.67   18.0
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Avon Road / I-70 West Ramps
Future Winter AM Peak Hour
Intersection ID: 1
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
South: Avon Road									
684	0.263	0.77	0.92	4.0	0.00	0.38	0	11.90	23.2
East: I-70 West Off Ramp									
639	0.374	1.47	1.76	8.3	0.58	0.79	54	14.89	21.6
North: Avon Road									
1089	0.852	5.45	6.54	18.0	0.96	1.43	315	37.10	18.2
ALL VEHICLES:									
2412	0.852	7.68	9.22	11.5	0.59	0.97	315	63.88	20.3
INTERSECTION (persons):									
2894	0.852		9.22	11.5	0.59	0.97		63.88	20.3

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Avon Road / I-70 West Ramps
Future Winter AM Peak Hour
Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
South: Avon Road								
1 L	431	1636	0.263	6.0	0.55	0.0	0.0	1600.0
2 T	253	1392	0.182	0.7	0.09	0.0	0.0	1600.0
East: I-70 West Off Ramp								
1 L	319	853	0.374	9.0	0.82	2.1	53.9	1600.0
2 LR	320	858	0.374	7.6	0.76	2.1	53.9	1600.0
North: Avon Road								
1 T	532	624	0.853	18.0	1.43	12.2	308.8	1600.0
2 TR	557	653	0.853	18.0	1.44	12.4	315.3	1600.0

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / I-70 West Ramps
Future Winter AM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------
                               Min  Tot
 Lane     Dem Flow (veh/h)     Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
-------------------------------------------------
 South: Avon Road
 1 L     431    0    0  431   150 1636  0.263  100
 2 T       0  253    0  253   150 1392  0.182   69P
-------------------------------------------------
 East: I-70 West Off Ramp
 1 L     319    0    0  319   150  853  0.374  100
 2 LR    219    0  101  320   150  858  0.374  100
-------------------------------------------------
 North: Avon Road
 1 T       0  532    0  532   150  624  0.853  100
 2 TR      0  304  253  557   150  653  0.853  100
-------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Future Winter AM Peak Hour
Intersection ID: 1
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
South: Avon Road
  3L L            431   1636   0.263     6.0    A      0.0      0
  8T T            253   1392   0.182     0.7    A      0.0      0
-----------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            538   1440   0.374     9.0    A      2.1     54
  6R R            101    270   0.374     4.7    A      2.1     54
-----------------------------------------------------------------
North: Avon Road
  4T T            836    981   0.852*   17.8    B     12.4    315
  4R R            253    297   0.852*   18.8    B     12.4    315
-----------------------------------------------------------------
 ALL VEHICLES:   2412          0.852    11.5    B     12.4    315
-----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
```

```
*   Maximum v/c ratio, or critical green periods
"   Movement Level of service has been determined using adjacent lane
    v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Winter Avon/I-70 West AM
I:\08159\Analysis\Sidra\Future\Int 1 Avon at I-70 west_min lanes.aap
Processed May 15, 2009 09:59:54AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
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SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Future Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 East Ramps
Future Winter AM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 West: I-70 East Off Ramp
           South        2R   Right   341     7    1.00     0.79
           North        5L   Left     87     2    1.00     0.79
-------------------------------------------------------------------
 South: Avon Road
           East         8R   Right   788    16    1.00     0.79
           North        8T   Thru    583    12    1.00     0.79
-------------------------------------------------------------------
 North: Avon Road
           South        4T   Thru    918    19    1.00     0.79
```

```
            East         7L   Left    428     9    1.00     0.79
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 East Ramps
Future Winter AM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         B
   Worst movement Level of Service           =         C
   Average intersection delay (s/pers)       =      10.6
   Largest average movement delay (s)        =      26.5
   Largest back of queue, 95% (ft)           =       637
   Performance Index                         =     81.97
   Degree of saturation (highest)            =     0.957
   Practical Spare Capacity (lowest)         =       -11 %
   Effective intersection capacity, (veh/h)  =      3354
   Total vehicle flow (veh/h)                =      3210
   Total person flow (pers/h)                =      3852
   Total vehicle delay (veh-h/h)             =      9.43
   Total person delay (pers-h/h)             =     11.31
   Total effective vehicle stops (veh/h)     =      2713
   Total effective person stops (pers/h)     =      3256
   Total vehicle travel (veh-mi/h)           =    1088.8
   Total cost ($/h)                          =    723.35
   Total fuel (gal/h)                        =      47.0
   Total CO2 (kg/h)                          =    445.10
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
West: I-70 East Off Ramp
   5L L     0.29     0.35    11.8   0.67  0.89    1.8    45    2.28   20.4
   2R R     0.68     0.82     7.0   0.67  0.77    1.8    46    7.72   21.8
---------------------------------------------------------------------------
South: Avon Road
   8T T     1.76     2.11    10.6   0.88  1.12   10.5   266   16.98   20.5
   8R R     5.93     7.11    26.5   1.00  1.78   25.1   637   33.84   16.1
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.72     0.87     6.0   0.00  0.55    0.0     0    8.46   22.5
   4T T     0.05     0.06     0.2   0.00  0.03    0.0     0   12.69   24.9
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Avon Road / I-70 East Ramps
Future Winter AM Peak Hour
Intersection ID: 2
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
West: I-70 East Off Ramp									
437	0.335	0.97	1.17	8.0	0.67	0.80	46	10.00	21.5
South: Avon Road									
1399	0.957	7.68	9.22	19.8	0.95	1.50	637	50.82	17.7
North: Avon Road									
1374	0.434	0.77	0.93	2.0	0.00	0.19	0	21.15	24.0
ALL VEHICLES:									
3210	0.957	9.43	11.31	10.6	0.50	0.85	637	81.97	20.6
INTERSECTION (persons):									
3852	0.957		11.31	10.6	0.50	0.85		81.97	20.6

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Avon Road / I-70 East Ramps
Future Winter AM Peak Hour
Intersection ID: 2
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
West: I-70 East Off Ramp								
1 LR	206	615	0.335	9.4	0.83	1.8	45.1	1600.0
2 R	231	690	0.335	6.8	0.77	1.8	45.9	1600.0
South: Avon Road								
1 T	595	778	0.765	10.6	1.12	10.5	266.3	1600.0
2 R	804	840	0.957	26.5	1.78	25.1	637.4	1600.0
North: Avon Road								
1 LT	649	1494	0.434	4.1	0.38	0.0	0.0	1600.0
2 T	725	1671	0.434	0.2	0.03	0.0	0.0	1600.0

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / I-70 East Ramps
Future Winter AM Peak Hour
Intersection ID: 2
Roundabout

--------------------------------------------------
                                Min  Tot
 Lane     Dem Flow (veh/h)      Cap  Cap  Deg.  Lane
 No.    -------------------   (veh (veh  Satn  Util
         Lef Thru  Rig  Tot     /h)  /h)   x     %
--------------------------------------------------
 West: I-70 East Off Ramp
 1 LR     89    0  117  206   150  615  0.335  100
 2 R       0    0  231  231   150  690  0.335  100
--------------------------------------------------
 South: Avon Road
 1 T       0  595    0  595   150  778  0.765  100
 2 R       0    0  804  804   150  840  0.957  100
--------------------------------------------------
 North: Avon Road
 1 LT    437  212    0  649   150 1494  0.434  100
 2 T       0  725    0  725   150 1671  0.434  100
--------------------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 East Ramps
Future Winter AM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
West: I-70 East Off Ramp
  5L L            89    266   0.335    11.8    B      1.8     45
  2R R           348   1040   0.335     7.0    A      1.8     46
-------------------------------------------------------------------
South: Avon Road
  8T T           595    778   0.765    10.6    B     10.5    266
  8R R           804    840   0.957*   26.5    C     25.1    637
-------------------------------------------------------------------
North: Avon Road
  7L L           437   1007   0.434     6.0    A      0.0      0
  4T T           937   2159   0.434     0.2    A      0.0      0
-------------------------------------------------------------------
 ALL VEHICLES:   3210          0.957    10.6    B     25.1    637
-------------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Winter Avon/I-70 East AM
I:\08159\Analysis\Sidra\Future\Int 2 Avon at I-70 east_min lanes.aap
Processed May 15, 2009 10:04:23AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Future Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

Avon Road / W. Beaver Creek Blvd
Future Winter AM Peak Hour
Intersection ID: 3
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale	Peak Flow Factor
West: WBCB							
	South	2R	Right	112	2	1.00	0.79
	East	2T	Thru	62	1	1.00	0.79
	North	5L	Left	595	12	1.00	0.79
South: Avon Road							
	West	3L	Left	68	1	1.00	0.79
	East	8R	Right	25	1	1.00	0.79
	North	8T	Thru	434	9	1.00	0.79

```
 East: WBCB
           West         6T   Thru     43     1    1.00     0.79
           South        1L   Left     50     1    1.00     0.79
           North        6R   Right   347     7    1.00     0.79
----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   192     4    1.00     0.79
           South        4T   Thru    850    17    1.00     0.79
           East         7L   Left    217     4    1.00     0.79
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / W. Beaver Creek Blvd
Future Winter AM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         B
   Average intersection delay (s/pers)       =       6.0
   Largest average movement delay (s)        =      12.2
   Largest back of queue, 95% (ft)           =       169
   Performance Index                         =     66.58
   Degree of saturation (highest)            =     0.690
   Practical Spare Capacity (lowest)         =        23 %
   Effective intersection capacity, (veh/h)  =      4429
   Total vehicle flow (veh/h)                =      3055
   Total person flow (pers/h)                =      3666
   Total vehicle delay (veh-h/h)             =      5.05
   Total person delay (pers-h/h)             =      6.06
   Total effective vehicle stops (veh/h)     =      1921
   Total effective person stops (pers/h)     =      2305
   Total vehicle travel (veh-mi/h)           =    1050.5
   Total cost ($/h)                          =    657.58
   Total fuel (gal/h)                        =      43.9
   Total CO2 (kg/h)                          =    415.98
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
---------------------------------------------------------------------------
West: WBCB
   5L L     2.06     2.47    12.2   0.83  1.10    6.6   169   16.86   20.3
   2T T     0.09     0.10     4.9   0.65  0.67    0.6    15    1.35   22.7
   2R R     0.21     0.25     6.6   0.67  0.75    1.1    28    2.56   22.0
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.21     0.25    10.8   0.79  0.91    2.7    69    1.82   20.7
   8T T     0.60     0.73     4.9   0.79  0.71    2.9    72    9.80   22.4
   8R R     0.06     0.07     8.2   0.69  0.73    0.3     9    0.62   21.4
```

```
---------------------------------------------------------------------------
East: WBCB
   1L L     0.17     0.21    12.2   0.76  0.89    1.3    32    1.39   20.3
   6T T     0.08     0.10     6.5   0.76  0.77    1.3    32    1.04   22.0
   6R R     0.77     0.92     7.8   0.83  0.92    3.6    92    8.67   21.5
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.42     0.50     6.8   0.39  0.58    3.2    81    4.80   21.8
   4T T     0.23     0.27     0.9   0.39  0.14    3.3    83   14.10   23.6
   4R R     0.16     0.19     2.9   0.35  0.38    1.2    31    3.59   23.1
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Future Winter AM Peak Hour
Intersection ID: 3
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: WBCB
  784   0.690    2.36     2.83    10.8   0.79  1.02   169   20.76    20.7
---------------------------------------------------------------------------
South: Avon Road
  538   0.364    0.87     1.05     5.8   0.79  0.74    72   12.24    22.1
---------------------------------------------------------------------------
East: WBCB
  449   0.424    1.02     1.22     8.2   0.82  0.90    92   11.10    21.4
---------------------------------------------------------------------------
North: Avon Road
 1284   0.412    0.80     0.97     2.3   0.38  0.25    83   22.48    23.2
---------------------------------------------------------------------------
ALL VEHICLES:
 3055   0.690    5.05     6.06     6.0   0.62  0.63   169   66.58    22.0
---------------------------------------------------------------------------
INTERSECTION (persons):
 3666   0.690             6.06     6.0   0.62  0.63         66.58    22.0
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / W. Beaver Creek Blvd
Future Winter AM Peak Hour
Intersection ID: 3
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.    95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: WBCB
 1 L       607   880 0.690   12.2  1.10    6.6  168.9   1600.0
```

```
 2 T        63   540 0.117    4.9  0.67    0.6   14.8   1600.0
 3 R       114   540 0.211    6.6  0.75    1.1   27.6   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      236   648 0.364    7.0  0.82    2.7   69.0   1600.0
 2 T       276   758 0.364    4.6  0.66    2.9   72.5   1600.0
 3 R        26   450 0.058    8.2  0.73    0.3    8.7   1600.0
-------------------------------------------------------------
 East: WBCB
 1 LT       95   483 0.197    9.6  0.84    1.3   31.8   1600.0
 2 R        47   452 0.104    8.3  0.79    0.6   16.0   1600.0
 3 R       307   723 0.424    7.7  0.94    3.6   92.2   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 LT      517  1257 0.411    3.5  0.33    3.2   81.2   1600.0
 2 T       571  1388 0.411    0.9  0.13    3.3   82.7   1600.0
 3 R       196   964 0.203    2.9  0.38    1.2   31.5   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / W. Beaver Creek Blvd
Future Winter AM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
-------------------------------------------------
 West: WBCB
 1 L     607    0    0  607   150  880  0.690  100
 2 T       0   63    0   63    63  540  0.117   17P
 3 R       0    0  114  114   114  540  0.211   31P
-------------------------------------------------
 South: Avon Road
 1 LT     69  167    0  236   150  648  0.364  100
 2 T       0  276    0  276   150  758  0.364  100
 3 R       0    0   26   26    26  450  0.058  100
-------------------------------------------------
 East: WBCB
 1 LT     51   44    0   95    95  483  0.197   46P
 2 R       0    0   47   47    47  452  0.104   25D
 3 R       0    0  307  307   150  723  0.424  100
-------------------------------------------------
 North: Avon Road
 1 LT    221  296    0  517   150 1257  0.411  100
 2 T       0  571    0  571   150 1388  0.411  100
 3 R       0    0  196  196   150  964  0.203  100
-------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).
  D  Lane under-utilisation due to downstream effects

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

Avon Road / W. Beaver Creek Blvd
Future Winter AM Peak Hour
Intersection ID: 3
Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: WBCB								
5L	L	607	880	0.690*	12.2	B	6.6	169
2T	T	63	540	0.117	4.9	A	0.6	15
2R	R	114	540	0.211	6.6	A	1.1	28
South: Avon Road								
3L	L	69	190	0.363	10.8	B	2.7	69
8T	T	443	1217	0.364	4.9	A	2.9	72
8R	R	26	450	0.058	8.2	A	0.3	9
East: WBCB								
1L	L	51	259	0.197	12.2	B	1.3	32
6T	T	44	224	0.196	6.5	A	1.3	32
6R	R	354	834	0.424	7.8	A	3.6	92
North: Avon Road								
7L	L	221	537	0.412	6.8	A	3.2	81
4T	T	867	2108	0.411	0.9	A	3.3	83
4R	R	196	964	0.203	2.9	A	1.2	31
ALL VEHICLES:		3055		0.690	6.0	A	6.6	169

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Winter Avon/WBCB AM
I:\08159\Analysis\Sidra\Future\Int 3 Avon at WBCB.aap
Processed Apr 13, 2009 11:48:42AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
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SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Future Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / Benchmark Road
Future Winter AM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 West: Benchmark
           South        2R   Right   118     2    1.00     0.79
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left     87     2    1.00     0.79
           East         8R   Right    99     2    1.00     0.79
           North        8T   Thru    341     7    1.00     0.79
-------------------------------------------------------------------
 East: Benchmark
           West         6T   Thru     12     0    1.00     0.79
```

```
            South        1L   Left     81     2    1.00     0.79
            North        6R   Right   174     4    1.00     0.79
-----------------------------------------------------------------
 North: Avon Road
            West         4R   Right   118     2    1.00     0.79
            South        4T   Thru    887    18    1.00     0.79
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / Benchmark Road
Future Winter AM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         A
   Average intersection delay (s/pers)       =       2.3
   Largest average movement delay (s)        =       8.0
   Largest back of queue, 95% (ft)           =        86
   Performance Index                         =     33.64
   Degree of saturation (highest)            =     0.445
   Practical Spare Capacity (lowest)         =        91 %
   Effective intersection capacity, (veh/h)  =      4401
   Total vehicle flow (veh/h)                =      1957
   Total person flow (pers/h)                =      2348
   Total vehicle delay (veh-h/h)             =      1.24
   Total person delay (pers-h/h)             =      1.49
   Total effective vehicle stops (veh/h)     =       547
   Total effective person stops (pers/h)     =       656
   Total vehicle travel (veh-mi/h)           =     659.0
   Total cost ($/h)                          =    384.74
   Total fuel (gal/h)                        =      25.4
   Total CO2 (kg/h)                          =    240.44
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
   2R R     0.20     0.24     6.1   0.66  0.73    1.2    30    2.66   22.2
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.15     0.18     6.0   0.00  0.55    0.0     0    1.72   22.5
   8T T     0.05     0.06     0.5   0.00  0.07    0.0     0    4.84   24.7
   8R R     0.06     0.08     2.2   0.00  0.29    0.0     0    1.57   23.9
---------------------------------------------------------------------------
East: Benchmark
   1L L     0.18     0.22     8.0   0.44  0.67    0.6    15    1.87   21.7
   6T T     0.01     0.01     2.3   0.44  0.34    0.6    15    0.23   23.5
   6R R     0.17     0.20     3.3   0.44  0.45    0.9    24    3.28   23.0
```

```
---------------------------------------------------------------------------
North: Avon Road
   4T T     0.33     0.39     1.3   0.42  0.19    3.4    86   15.27   23.5
   4R R     0.09     0.11     2.7   0.42  0.37    3.4    86    2.19   23.0
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Future Winter AM Peak Hour
Intersection ID: 4
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
  120   0.225    0.20     0.24     6.1   0.66  0.73    30    2.66    22.2
---------------------------------------------------------------------------
South: Avon Road
  538   0.172    0.26     0.31     1.7   0.00  0.19     0    8.14    24.1
---------------------------------------------------------------------------
East: Benchmark
  274   0.186    0.36     0.43     4.7   0.44  0.51    24    5.38    22.6
---------------------------------------------------------------------------
North: Avon Road
 1025   0.445    0.42     0.50     1.5   0.42  0.21    86   17.47    23.5
---------------------------------------------------------------------------
ALL VEHICLES:
 1957   0.445    1.24     1.49     2.3   0.32  0.28    86   33.64    23.4
---------------------------------------------------------------------------
INTERSECTION (persons):
 2348   0.445             1.49     2.3   0.32  0.28         33.64    23.4
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / Benchmark Road
Future Winter AM Peak Hour
Intersection ID: 4
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: Benchmark
 1 R       120   533 0.225    6.1  0.73    1.2   29.9   1600.0
---------------------------------------------------------------
 South: Avon Road
 1 LT      255  1485 0.172    2.4  0.24    0.0    0.0   1600.0
 2 TR      283  1648 0.172    1.1  0.15    0.0    0.0   1600.0
---------------------------------------------------------------
 East: Benchmark
```

```
 1 LT       96   791 0.121    7.2  0.63    0.6   14.6   1600.0
 2 R       178   956 0.186    3.3  0.45    0.9   23.5   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 T       512  1153 0.445    1.3  0.19    3.4   85.6   1600.0
 2 TR      513  1153 0.445    1.6  0.23    3.4   85.5   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / Benchmark Road
Future Winter AM Peak Hour
Intersection ID: 4
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: Benchmark
 1 R       0    0  120  120   120  533  0.225  100
--------------------------------------------------
 South: Avon Road
 1 LT     89  166    0  255   150 1485  0.172  100
 2 TR      0  182  101  283   150 1648  0.172  100
--------------------------------------------------
 East: Benchmark
 1 LT     83   13    0   96    96  791  0.121   65P
 2 R       0    0  178  178   150  956  0.186  100
--------------------------------------------------
 North: Avon Road
 1 T       0  512    0  512   150 1153  0.445  100
 2 TR      0  393  120  513   150 1153  0.445  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Future Winter AM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
```

2R R	120	533	0.225	6.1	A	1.2	30
South: Avon Road							
3L L	89	518	0.172	6.0	A	0.0	0
8T T	348	2027	0.172	0.5	A	0.0	0
8R R	101	588	0.172	2.2	A	0.0	0
East: Benchmark							
1L L	83	684	0.121	8.0	A	0.6	15
6T T	13	107	0.121	2.3	A	0.6	15
6R R	178	956	0.186	3.3	A	0.9	24
North: Avon Road							
4T T	905	2035	0.445*	1.3	A	3.4	86
4R R	120	270	0.444	2.7	A	3.4	86
ALL VEHICLES:	1957		0.445	2.3	A	3.4	86

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

* Maximum v/c ratio, or critical green periods

" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Winter Avon/Benchmark AM
I:\08159\Analysis\Sidra\Future\Int 4 Avon at Benchmark.aap
Processed Apr 13, 2009 11:50:35AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	25	0	0	150	20	285	50	45	760	50
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	27	0	0	163	22	310	54	49	826	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1312	1359	440	918	1359	182	880			364		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1312	1359	440	918	1359	182	880			364		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	95	100	100	80	97			96		
cM capacity (veh/h)	88	137	565	204	137	829	763			1191		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	163	22	207	158	49	551	330
Volume Left	0	0	22	0	0	49	0	0
Volume Right	27	163	0	0	54	0	0	54
cSH	565	829	763	1700	1700	1191	1700	1700
Volume to Capacity	0.05	0.20	0.03	0.12	0.09	0.04	0.32	0.19
Queue Length 95th (ft)	4	18	2	0	0	3	0	0
Control Delay (s)	11.7	10.4	9.9	0.0	0.0	8.2	0.0	0.0
Lane LOS	B	B	A			A		
Approach Delay (s)	11.7	10.4	0.6			0.4		
Approach LOS	B	B						

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	32.6%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Future Winter AM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

Avon Road / US 6
Future Winter AM Peak Hour
Intersection ID: 6
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale	Peak Flow Factor
West: US 6							
	South	2R	Right	118	2	1.00	0.79
	East	2T	Thru	757	15	1.00	0.79
	North	5L	Left	74	2	1.00	0.79
South: Avon Road							
	West	3L	Left	12	0	1.00	0.79
	East	8R	Right	81	2	1.00	0.79
	North	8T	Thru	236	5	1.00	0.79

```
 East: US 6
           West         6T   Thru    490    10    1.00     0.79
           South        1L   Left     50     1    1.00     0.79
           North        6R   Right   130     3    1.00     0.79
-----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   329     7    1.00     0.79
           South        4T   Thru    434     9    1.00     0.79
           East         7L   Left    211     4    1.00     0.79
-----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / US 6
Future Winter AM Peak Hour
Intersection ID: 6
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         C
   Worst movement Level of Service           =         F
   Average intersection delay (s/pers)       =      32.0
   Largest average movement delay (s)        =      99.9
   Largest back of queue, 95% (ft)           =      1450
   Performance Index                         =    125.64
   Degree of saturation (highest)            =     1.179
   Practical Spare Capacity (lowest)         =       -28 %
   Effective intersection capacity, (veh/h)  =      2531
   Total vehicle flow (veh/h)                =      2983
   Total person flow (pers/h)                =      3580
   Total vehicle delay (veh-h/h)             =     26.54
   Total person delay (pers-h/h)             =     31.85
   Total effective vehicle stops (veh/h)     =      4812
   Total effective person stops (pers/h)     =      5774
   Total vehicle travel (veh-mi/h)           =    1007.6
   Total cost ($/h)                          =    895.94
   Total fuel (gal/h)                        =      54.6
   Total CO2 (kg/h)                          =    517.51
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
West: US 6
   5L L     2.11     2.53    99.9   1.00  3.67   57.1  1450    6.78    8.6
   2T T    20.25    24.31    94.5   1.00  3.67   57.1  1450   66.73    8.4
   2R R     0.29     0.34     8.6   0.71  0.79    1.8    46    2.99   21.2
-------------------------------------------------------------------------
South: Avon Road
   3L L     0.05     0.06    14.0   0.90  0.98    3.2    82    0.39   19.8
   8T T     0.57     0.68     8.5   0.90  0.94    3.2    82    6.52   21.3
   8R R     0.23     0.28    10.1   0.90  0.96    3.2    82    2.29   20.7
```

```
---------------------------------------------------------------------------
East: US 6
   1L L     0.12     0.14     8.2   0.64  0.75    5.1   129    1.23   21.4
   6T T     0.35     0.41     2.5   0.64  0.39    5.1   129    9.59   22.9
   6R R     0.19     0.22     5.0   0.55  0.60    1.4    36    2.85   22.6
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.76     0.91    12.7   0.85  1.04    7.4   187    6.20   20.1
   4T T     0.85     1.02     6.9   0.85  0.96    7.4   187   11.30   21.8
   4R R     0.78     0.94     8.4   0.85  0.99    7.4   187    8.77   21.3
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Future Winter AM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: US 6
  968   1.179   22.65    27.18    84.2   0.96  3.31  1450   76.50     9.1
---------------------------------------------------------------------------
South: Avon Road
  337   0.382    0.85     1.02     9.1   0.90  0.94    82    9.20    21.0
---------------------------------------------------------------------------
East: US 6
  684   0.561    0.65     0.78     3.4   0.63  0.45   129   13.67    22.7
---------------------------------------------------------------------------
North: Avon Road
  994   0.646    2.39     2.87     8.7   0.85  0.99   187   26.27    21.2
---------------------------------------------------------------------------
ALL VEHICLES:
 2983   1.179   26.54    31.85    32.0   0.84  1.61  1450  125.64    15.0
---------------------------------------------------------------------------
INTERSECTION (persons):
 3580   1.179            31.85    32.0   0.84  1.61        125.64    15.0
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / US 6
Future Winter AM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.    95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: US 6
 1 LT      848   720 1.178   94.9  3.67   57.1 1449.6   1600.0
```

```
 2 R       120   376 0.319    8.6  0.79    1.8   45.8   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      168   442 0.379    8.9  0.94    3.2   81.7   1600.0
 2 TR      169   447 0.379    9.3  0.95    3.2   81.8   1600.0
-------------------------------------------------------------
 East: US 6
 1 LT      551   982 0.561    3.0  0.42    5.1  128.5   1600.0
 2 R       133   534 0.249    5.0  0.60    1.4   36.3   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 LT      497   770 0.646    9.4  0.99    7.4  187.1   1600.0
 2 TR      497   770 0.646    7.9  0.98    7.4  187.2   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / US 6
Future Winter AM Peak Hour
Intersection ID: 6
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: US 6
 1 LT     76  772    0  848   150  720  1.178  100
 2 R       0    0  120  120   120  376  0.319   27P
--------------------------------------------------
 South: Avon Road
 1 LT     13  155    0  168   150  442  0.379  100
 2 TR      0   86   83  169   150  447  0.379  100
--------------------------------------------------
 East: US 6
 1 LT     51  500    0  551   150  982  0.561  100
 2 R       0    0  133  133   133  534  0.249   44P
--------------------------------------------------
 North: Avon Road
 1 LT    215  282    0  497   150  770  0.646  100
 2 TR      0  161  336  497   150  770  0.646  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Future Winter AM Peak Hour
Intersection ID: 6
Roundabout
```

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: US 6								
5L	L	76	65	1.169	99.9	F	57.1	1450
2T	T	772	655	1.179*	94.5	F	57.1	1450
2R	R	120	376	0.319	8.6	A	1.8	46
South: Avon Road								
3L	L	13	34	0.382	14.0	B	3.2	82
8T	T	241	636	0.379	8.5	A	3.2	82
8R	R	83	219	0.379	10.1	B	3.2	82
East: US 6								
1L	L	51	91	0.560	8.2	A	5.1	129
6T	T	500	891	0.561	2.5	A	5.1	129
6R	R	133	534	0.249	5.0	A	1.4	36
North: Avon Road								
7L	L	215	333	0.646	12.7	B	7.4	187
4T	T	443	686	0.646	6.9	A	7.4	187
4R	R	336	520	0.646	8.4	A	7.4	187
ALL VEHICLES:		2983		1.179	32.0	C	57.1	1450

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

* Maximum v/c ratio, or critical green periods

" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Winter Avon/US6 AM
I:\08159\Analysis\Sidra\Future\Int 6 Avon at US6.aap
Processed May 14, 2009 01:49:18PM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	975	80	30	450	25	30	15	25	30	30	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.91		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1687		1770	1689	
Flt Permitted	0.40	1.00	1.00	0.12	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	751	3539	1583	215	3539	1583	1770	1687		1770	1689	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	1060	87	33	489	27	33	16	27	33	33	54
RTOR Reduction (vph)	0	0	53	0	0	17	0	21	0	0	44	0
Lane Group Flow (vph)	38	1060	34	33	489	10	33	22	0	33	43	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	36.8	34.6	34.6	36.8	34.6	34.6	19.3	19.3		17.3	17.3	
Effective Green, g (s)	36.8	34.6	34.6	36.8	34.6	34.6	19.3	19.3		17.3	17.3	
Actuated g/C Ratio	0.41	0.39	0.39	0.41	0.39	0.39	0.22	0.22		0.19	0.19	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	334	1370	613	127	1370	613	382	364		343	327	
v/s Ratio Prot	0.00	c0.30		c0.01	0.14		c0.02	0.01		0.02	c0.03	
v/s Ratio Perm	0.04		0.02	0.10		0.01						
v/c Ratio	0.11	0.77	0.05	0.26	0.36	0.02	0.09	0.06		0.10	0.13	
Uniform Delay, d1	16.0	24.0	17.2	18.3	19.5	16.9	28.0	27.8		29.6	29.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	2.8	0.0	1.1	0.2	0.0	0.4	0.3		0.6	0.8	
Delay (s)	16.1	26.8	17.2	19.4	19.6	16.9	28.5	28.2		30.2	30.7	
Level of Service	B	C	B	B	B	B	C	C		C	C	
Approach Delay (s)		25.7			19.5			28.3			30.5	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	89.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	55	25	5	25	30	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	27	5	27	33	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	87	5	27	38
Volume Left (vph)	0	5	0	33
Volume Right (vph)	27	0	0	5
Hadj (s)	-0.15	0.53	0.03	0.12
Departure Headway (s)	4.0	5.2	4.7	4.3
Degree Utilization, x	0.10	0.01	0.04	0.05
Capacity (veh/h)	892	676	751	811
Control Delay (s)	7.4	7.0	6.6	7.5
Approach Delay (s)	7.4	6.7		7.5
Approach LOS	A	A		A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	14.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	90	35	5	60	30	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	38	5	65	33	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			136		193	117
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			136		193	117
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	99
cM capacity (veh/h)			1448		793	935

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	136	71	33	5
Volume Left	0	5	33	0
Volume Right	38	0	0	5
cSH	1700	1448	793	935
Volume to Capacity	0.08	0.00	0.04	0.01
Queue Length 95th (ft)	0	0	3	0
Control Delay (s)	0.0	0.6	9.7	8.9
Lane LOS		A	A	A
Approach Delay (s)	0.0	0.6	9.6	
Approach LOS			A	

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	17.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	95	60	5	65	25	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	103	65	5	71	27	5

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	168	76	33
Volume Left (vph)	0	5	27
Volume Right (vph)	65	0	5
Hadj (s)	-0.20	0.05	0.10
Departure Headway (s)	3.9	4.2	4.5
Degree Utilization, x	0.18	0.09	0.04
Capacity (veh/h)	918	845	751
Control Delay (s)	7.7	7.6	7.7
Approach Delay (s)	7.7	7.6	7.7
Approach LOS	A	A	A

Intersection Summary			
Delay	7.7		
HCM Level of Service	A		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 West Ramps

Future Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 West Ramps
Future Winter PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left    440     9    1.00     0.79
           North        8T   Thru    682    14    1.00     0.79
-------------------------------------------------------------------
 East: I-70 West Off Ramp
           South        1L   Left    788    16    1.00     0.79
           North        6R   Right   428     9    1.00     0.79
-------------------------------------------------------------------
 North: Avon Road
           West         4R   Right   254     5    1.00     0.79
```

```
            South        4T   Thru    527    11    1.00     0.79
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 West Ramps
Future Winter PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         B
   Worst movement Level of Service           =         C
   Average intersection delay (s/pers)       =      17.1
   Largest average movement delay (s)        =      34.8
   Largest back of queue, 95% (ft)           =       365
   Performance Index                         =     95.41
   Degree of saturation (highest)            =     0.906
   Practical Spare Capacity (lowest)         =        -6 %
   Effective intersection capacity, (veh/h)  =      3515
   Total vehicle flow (veh/h)                =      3183
   Total person flow (pers/h)                =      3820
   Total vehicle delay (veh-h/h)             =     15.13
   Total person delay (pers-h/h)             =     18.16
   Total effective vehicle stops (veh/h)     =      3398
   Total effective person stops (pers/h)     =      4077
   Total vehicle travel (veh-mi/h)           =    1104.5
   Total cost ($/h)                          =    800.49
   Total fuel (gal/h)                        =      50.7
   Total CO2 (kg/h)                          =    480.53
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.75     0.90     6.0   0.00  0.55    0.0     0    8.69   22.4
   8T T     0.13     0.16     0.7   0.00  0.09    0.0     0    9.80   24.7
---------------------------------------------------------------------------
East: I-70 West Off Ramp
   1L L     4.68     5.61    20.9   0.89  1.43   11.2   284   27.84   17.9
   6R R     1.94     2.33    16.0   0.88  1.39   11.2   284   13.74   18.8
---------------------------------------------------------------------------
North: Avon Road
   4T T     5.13     6.16    34.4   1.00  1.66   14.4   365   23.86   14.6
   4R R     2.50     3.00    34.8   1.00  1.67   14.4   365   11.48   14.5
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / I-70 West Ramps
Future Winter PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
-------------------------------------------------------------------------
South: Avon Road
 1145   0.367    0.88     1.06     2.8   0.00  0.27     0   18.49    23.7
-------------------------------------------------------------------------
East: I-70 West Off Ramp
 1241   0.867    6.62     7.94    19.2   0.89  1.42   284   41.58    18.2
-------------------------------------------------------------------------
North: Avon Road
  797   0.906    7.63     9.16    34.5   1.00  1.66   365   35.34    14.6
-------------------------------------------------------------------------
ALL VEHICLES:
 3183   0.906   15.13    18.16    17.1   0.60  1.07   365   95.41    18.6
-------------------------------------------------------------------------
INTERSECTION (persons):
 3820   0.906            18.16    17.1   0.60  1.07         95.41    18.6
-------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / I-70 West Ramps
Future Winter PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
-------------------------------------------------------------
 South: Avon Road
 1 LT      544  1480 0.367    5.1  0.47    0.0    0.0   1600.0
 2 T       601  1636 0.367    0.7  0.09    0.0    0.0   1600.0
-------------------------------------------------------------
 East: I-70 West Off Ramp
 1 L       597   688 0.868   21.2  1.43   10.9  276.4   1600.0
 2 LR      644   742 0.868   17.3  1.40   11.2  284.0   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 T       381   422 0.904   34.8  1.65   13.6  346.4   1600.0
 2 TR      416   460 0.904   34.2  1.67   14.4  364.7   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / I-70 West Ramps
Future Winter PM Peak Hour
Intersection ID: 1
Roundabout

--------------------------------------------------
                                Min  Tot
 Lane     Dem Flow (veh/h)      Cap  Cap  Deg.  Lane
 No.    -------------------   (veh (veh  Satn  Util
         Lef Thru  Rig  Tot     /h)  /h)   x     %
--------------------------------------------------
 South: Avon Road
 1 LT    449   95    0  544   150 1480  0.367  100
 2 T       0  601    0  601   150 1636  0.367  100
--------------------------------------------------
 East: I-70 West Off Ramp
 1 L     597    0    0  597   150  688  0.868  100
 2 LR    207    0  437  644   150  742  0.868  100
--------------------------------------------------
 North: Avon Road
 1 T       0  381    0  381   150  422  0.904  100
 2 TR      0  157  259  416   150  460  0.904  100
--------------------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 West Ramps
Future Winter PM Peak Hour
Intersection ID: 1
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
South: Avon Road
  3L L            449   1222   0.367     6.0    A      0.0      0
  8T T            696   1894   0.367     0.7    A      0.0      0
-------------------------------------------------------------------
East: I-70 West Off Ramp
  1L L            804    927   0.867    20.9    C     11.2    284
  6R R            437    504   0.867    16.0    B     11.2    284
-------------------------------------------------------------------
North: Avon Road
  4T T            538    595   0.904    34.4    C     14.4    365
  4R R            259    286   0.906*   34.8    C     14.4    365
-------------------------------------------------------------------
 ALL VEHICLES:   3183          0.906    17.1    B     14.4    365
-------------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Winter Avon/I-70 West PM
I:\08159\Analysis\Sidra\Future\Int 1 Avon at I-70 west_min lanes.aap
Processed May 15, 2009 09:57:02AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / I-70 East Ramps

Future Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / I-70 East Ramps
Future Winter PM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 West: I-70 East Off Ramp
           South        2R   Right   595    12    1.00     0.79
           North        5L   Left    242     5    1.00     0.79
-------------------------------------------------------------------
 South: Avon Road
           East         8R   Right   831    17    1.00     0.79
           North        8T   Thru    881    18    1.00     0.79
-------------------------------------------------------------------
 North: Avon Road
           South        4T   Thru   1073    22    1.00     0.79
```

```
            East         7L   Left    242     5    1.00     0.79
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / I-70 East Ramps
Future Winter PM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         C
   Worst movement Level of Service           =         D
   Average intersection delay (s/pers)       =      23.4
   Largest average movement delay (s)        =      53.8
   Largest back of queue, 95% (ft)           =      1130
   Performance Index                         =    141.19
   Degree of saturation (highest)            =     1.072
   Practical Spare Capacity (lowest)         =       -21 %
   Effective intersection capacity, (veh/h)  =      3680
   Total vehicle flow (veh/h)                =      3943
   Total person flow (pers/h)                =      4732
   Total vehicle delay (veh-h/h)             =     25.68
   Total person delay (pers-h/h)             =     30.81
   Total effective vehicle stops (veh/h)     =      5194
   Total effective person stops (pers/h)     =      6233
   Total vehicle travel (veh-mi/h)           =    1332.6
   Total cost ($/h)                          =   1062.40
   Total fuel (gal/h)                        =      66.0
   Total CO2 (kg/h)                          =    624.86
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)          (mph)
---------------------------------------------------------------------------
West: I-70 East Off Ramp
   5L L     1.07     1.28    15.6   0.78  1.10    5.0   127    7.18   19.3
   2R R     1.78     2.13    10.5   0.78  1.02    5.2   131   15.64   20.5
---------------------------------------------------------------------------
South: Avon Road
   8T T    13.43    16.11    53.8   1.00  2.61   44.5  1130   55.73   11.8
   8R R     8.94    10.73    38.0   1.00  2.11   33.9   860   43.03   14.0
---------------------------------------------------------------------------
North: Avon Road
   7L L     0.41     0.49     6.0   0.00  0.55    0.0     0    4.78   22.5
   4T T     0.06     0.07     0.2   0.00  0.03    0.0     0   14.83   24.9
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

Avon Road / I-70 East Ramps
Future Winter PM Peak Hour
Intersection ID: 2
Roundabout

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
West: I-70 East Off Ramp									
854	0.645	2.84	3.41	12.0	0.78	1.04	131	22.82	20.1
South: Avon Road									
1747	1.072	22.37	26.84	46.1	1.00	2.37	1130	98.76	12.8
North: Avon Road									
1342	0.424	0.47	0.56	1.3	0.00	0.12	0	19.61	24.4
ALL VEHICLES:									
3943	1.072	25.68	30.81	23.4	0.61	1.32	1130	141.19	16.9
INTERSECTION (persons):									
4732	1.072		30.81	23.4	0.61	1.32		141.19	16.9

Queue values in this table are 95% back of queue (feet).

Table S.7 - Lane Performance

Avon Road / I-70 East Ramps
Future Winter PM Peak Hour
Intersection ID: 2
Roundabout

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back (vehs)	Queue 95% Back (ft)	Lane Length (ft)
West: I-70 East Off Ramp								
1 LR	404	626	0.645	13.9	1.07	5.0	126.7	1600.0
2 R	450	697	0.645	10.3	1.02	5.2	130.8	1600.0
South: Avon Road								
1 T	899	839	1.071	53.8	2.61	44.5	1129.5	1600.0
2 R	848	836	1.015	38.0	2.11	33.9	860.3	1600.0
North: Avon Road								
1 LT	634	1494	0.424	2.4	0.23	0.0	0.0	1600.0
2 T	708	1671	0.424	0.2	0.03	0.0	0.0	1600.0

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / I-70 East Ramps
Future Winter PM Peak Hour
Intersection ID: 2
Roundabout

--------------------------------------------------
                               Min  Tot
 Lane     Dem Flow (veh/h)     Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: I-70 East Off Ramp
 1 LR    247    0  157  404   150  626  0.645  100
 2 R       0    0  450  450   150  697  0.645  100
--------------------------------------------------
 South: Avon Road
 1 T       0  899    0  899   150  839  1.071  100
 2 R       0    0  848  848   150  836  1.015  100
--------------------------------------------------
 North: Avon Road
 1 LT    247  387    0  634   150 1494  0.424  100
 2 T       0  708    0  708   150 1671  0.424  100
--------------------------------------------------

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / I-70 East Ramps
Future Winter PM Peak Hour
Intersection ID: 2
Roundabout

-------------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-------------------------------------------------------------------
West: I-70 East Off Ramp
  5L L            247    383   0.645    15.6    B      5.0    127
  2R R            607    941   0.645    10.5    B      5.2    131
-------------------------------------------------------------------
South: Avon Road
  8T T            899    839   1.072*   53.8    D     44.5   1130
  8R R            848    836   1.014    38.0    D     33.9    860
-------------------------------------------------------------------
North: Avon Road
  7L L            247    583   0.424     6.0    A      0.0      0
  4T T           1095   2583   0.424     0.2    A      0.0      0
-------------------------------------------------------------------
 ALL VEHICLES:   3943          1.072    23.4    C     44.5   1130
-------------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Winter Avon/I-70 East PM
I:\08159\Analysis\Sidra\Future\Int 2 Avon at I-70 east_min lanes.aap
Processed May 15, 2009 10:04:45AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
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SIDRA INTERSECTION

Output Tables

Avon Road / W. Beaver Creek Blvd

Future Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / W. Beaver Creek Blvd
Future Winter PM Peak Hour
Intersection ID: 3
Roundabout

-----------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-----------------------------------------------------------------
 West: WBCB
           South        2R   Right   161     3    1.00     0.79
           East         2T   Thru    161     3    1.00     0.79
           North        5L   Left    527    11    1.00     0.79
-----------------------------------------------------------------
 South: Avon Road
           West         3L   Left    186     4    1.00     0.79
           East         8R   Right   167     3    1.00     0.79
           North        8T   Thru    738    15    1.00     0.79
-----------------------------------------------------------------
```

```
 East: WBCB
           West         6T   Thru    143     3    1.00     0.79
           South        1L   Left     74     2    1.00     0.79
           North        6R   Right   447     9    1.00     0.79
----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   385     8    1.00     0.79
           South        4T   Thru    676    14    1.00     0.79
           East         7L   Left    602    12    1.00     0.79
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / W. Beaver Creek Blvd
Future Winter PM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         C
   Worst movement Level of Service           =         E
   Average intersection delay (s/pers)       =      20.1
   Largest average movement delay (s)        =      61.7
   Largest back of queue, 95% (ft)           =       607
   Performance Index                         =    144.26
   Degree of saturation (highest)            =     0.982
   Practical Spare Capacity (lowest)         =       -13 %
   Effective intersection capacity, (veh/h)  =      4435
   Total vehicle flow (veh/h)                =      4354
   Total person flow (pers/h)                =      5225
   Total vehicle delay (veh-h/h)             =     24.31
   Total person delay (pers-h/h)             =     29.18
   Total effective vehicle stops (veh/h)     =      5056
   Total effective person stops (pers/h)     =      6068
   Total vehicle travel (veh-mi/h)           =    1499.7
   Total cost ($/h)                          =   1144.06
   Total fuel (gal/h)                        =      72.6
   Total CO2 (kg/h)                          =    687.93
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
West: WBCB
   5L L     2.42     2.90    16.2   0.95  1.25    8.7   222   16.96   19.1
   2T T     0.30     0.36     6.6   0.80  0.85    2.3    58    3.99   22.0
   2R R     0.36     0.44     8.0   0.80  0.88    2.3    58    4.08   21.4
-------------------------------------------------------------------------
South: Avon Road
   3L L     3.26     3.91    61.7   1.00  2.05   20.4   518   11.52   11.5
   8T T    11.25    13.50    53.8   1.00  2.13   23.9   607   42.98   11.8
   8R R     0.83     0.99    17.6   0.90  1.05    3.8    97    5.33   18.3
```

```
---------------------------------------------------------------------------
East: WBCB
   1L L     0.41     0.49    19.2   0.92  1.12    4.8   122    2.53   18.3
   6T T     0.55     0.66    13.6   0.92  1.08    4.8   122    4.39   19.5
   6R R     2.17     2.61    17.2   0.98  1.25    8.7   221   14.72   18.4
---------------------------------------------------------------------------
North: Avon Road
   7L L     1.65     1.97     9.6   0.73  0.84    6.5   165   15.63   21.1
   4T T     0.64     0.76     3.3   0.72  0.54    6.6   167   14.07   22.7
   4R R     0.48     0.58     4.4   0.63  0.58    3.3    83    8.07   22.5
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / W. Beaver Creek Blvd
Future Winter PM Peak Hour
Intersection ID: 3
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: WBCB
  866   0.788    3.08     3.70    12.8   0.89  1.11   222   25.03    20.0
---------------------------------------------------------------------------
South: Avon Road
 1113   0.982   15.34    18.41    49.6   0.98  1.95   607   59.83    12.4
---------------------------------------------------------------------------
East: WBCB
  678   0.728    3.13     3.76    16.6   0.96  1.20   221   21.63    18.6
---------------------------------------------------------------------------
North: Avon Road
 1697   0.609    2.77     3.32     5.9   0.70  0.66   167   37.76    22.0
---------------------------------------------------------------------------
ALL VEHICLES:
 4354   0.982   24.31    29.18    20.1   0.85  1.16   607  144.26    17.7
---------------------------------------------------------------------------
INTERSECTION (persons):
 5225   0.982            29.18    20.1   0.85  1.16        144.26    17.7
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / W. Beaver Creek Blvd
Future Winter PM Peak Hour
Intersection ID: 3
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.    95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: WBCB
 1 L       538   683 0.788   16.2  1.25    8.7  221.9   1600.0
```

```
 2 T       164   452 0.363    6.6  0.85    2.3   57.5   1600.0
 3 R       164   452 0.363    8.0  0.88    2.3   57.5   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      419   427 0.981   58.7  2.05   20.4  518.1   1600.0
 2 T       524   534 0.981   52.7  2.17   23.9  606.6   1600.0
 3 R       170   357 0.476   17.6  1.05    3.8   97.2   1600.0
-------------------------------------------------------------
 East: WBCB
 1 LT      222   396 0.560   15.5  1.09    4.8  121.5   1600.0
 2 R        63   351 0.179   10.4  0.88    1.2   29.5   1600.0
 3 R       393   540 0.728   18.3  1.31    8.7  220.7   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 L       614  1008 0.609    9.6  0.84    6.5  164.7   1600.0
 2 T       690  1134 0.609    3.3  0.54    6.6  167.3   1600.0
 3 R       393   918 0.428    4.4  0.58    3.3   83.4   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / W. Beaver Creek Blvd
Future Winter PM Peak Hour
Intersection ID: 3
Roundabout

-------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
-------------------------------------------------
 West: WBCB
 1 L     538    0    0  538   150  683  0.788  100
 2 T       0  164    0  164   150  452  0.363   46P
 3 R       0    0  164  164   150  452  0.363   46P
-------------------------------------------------
 South: Avon Road
 1 LT    190  229    0  419   150  427  0.981  100
 2 T       0  524    0  524   150  534  0.981  100
 3 R       0    0  170  170   150  357  0.476  100
-------------------------------------------------
 East: WBCB
 1 LT     76  146    0  222   150  396  0.560   77P
 2 R       0    0   63   63    63  351  0.179   25D
 3 R       0    0  393  393   150  540  0.728  100
-------------------------------------------------
 North: Avon Road
 1 L     614    0    0  614   150 1008  0.609  100
 2 T       0  690    0  690   150 1134  0.609  100
 3 R       0    0  393  393   150  918  0.428  100
-------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).
  D  Lane under-utilisation due to downstream effects

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

Avon Road / W. Beaver Creek Blvd
Future Winter PM Peak Hour
Intersection ID: 3
Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: WBCB								
5L	L	538	683	0.788	16.2	B	8.7	222
2T	T	164	452	0.363	6.6	A	2.3	58
2R	R	164	452	0.363	8.0	A	2.3	58
South: Avon Road								
3L	L	190	194	0.979	61.7	E	20.4	518
8T	T	753	767	0.982*	53.8	D	23.9	607
8R	R	170	357	0.476	17.6	B	3.8	97
East: WBCB								
1L	L	76	136	0.559	19.2	B	4.8	122
6T	T	146	261	0.559	13.6	B	4.8	122
6R	R	456	626	0.728	17.2	B	8.7	221
North: Avon Road								
7L	L	614	1008	0.609	9.6	A	6.5	165
4T	T	690	1134	0.608	3.3	A	6.6	167
4R	R	393	918	0.428	4.4	A	3.3	83
ALL VEHICLES:		4354		0.982	20.1	C	23.9	607

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Winter Avon/WBCB PM
I:\08159\Analysis\Sidra\Future\Int 3 Avon at WBCB.aap
Processed Apr 13, 2009 11:48:42AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA INTERSECTION

Output Tables

Avon Road / Benchmark Road

Future Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

```
Avon Road / Benchmark Road
Future Winter PM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------------------
 From      To          Mov           Flow Rate   Flow   Peak Flow
 Approach  Approach    ID    Turn     LV    HV   Scale    Factor
-------------------------------------------------------------------
 West: Benchmark
           South        2R   Right   130     3    1.00     0.79
-------------------------------------------------------------------
 South: Avon Road
           West         3L   Left     74     2    1.00     0.79
           East         8R   Right   205     4    1.00     0.79
           North        8T   Thru    930    19    1.00     0.79
-------------------------------------------------------------------
 East: Benchmark
           West         6T   Thru     12     0    1.00     0.79
```

```
            South        1L   Left    229     5    1.00     0.79
            North        6R   Right   161     3    1.00     0.79
----------------------------------------------------------------
 North: Avon Road
            West         4R   Right   205     4    1.00     0.79
            South        4T   Thru    707    14    1.00     0.79
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / Benchmark Road
Future Winter PM Peak Hour
Intersection ID: 4
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         A
   Worst movement Level of Service           =         A
   Average intersection delay (s/pers)       =       3.0
   Largest average movement delay (s)        =       9.8
   Largest back of queue, 95% (ft)           =        96
   Performance Index                         =     47.87
   Degree of saturation (highest)            =     0.476
   Practical Spare Capacity (lowest)         =        78 %
   Effective intersection capacity, (veh/h)  =      5686
   Total vehicle flow (veh/h)                =      2708
   Total person flow (pers/h)                =      3250
   Total vehicle delay (veh-h/h)             =      2.24
   Total person delay (pers-h/h)             =      2.68
   Total effective vehicle stops (veh/h)     =       936
   Total effective person stops (pers/h)     =      1123
   Total vehicle travel (veh-mi/h)           =     914.7
   Total cost ($/h)                          =    537.11
   Total fuel (gal/h)                        =      35.4
   Total CO2 (kg/h)                          =    335.30
```

Table S.5 - Movement Performance

```
---------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
   2R R     0.25     0.29     6.6   0.71  0.76    1.5    38    3.06   22.0
---------------------------------------------------------------------------
South: Avon Road
   3L L     0.13     0.15     6.0   0.00  0.55    0.0     0    1.47   22.5
   8T T     0.13     0.16     0.5   0.00  0.07    0.0     0   13.20   24.7
   8R R     0.13     0.16     2.2   0.00  0.29    0.0     0    3.26   23.9
---------------------------------------------------------------------------
East: Benchmark
   1L L     0.64     0.76     9.8   0.62  0.84    1.7    44    5.68   21.1
   6T T     0.01     0.02     4.1   0.62  0.62    1.7    44    0.26   22.9
   6R R     0.27     0.33     6.0   0.61  0.70    1.2    31    3.49   22.2
```

```
---------------------------------------------------------------------------
North: Avon Road
   4T T     0.46     0.55     2.3   0.59  0.34    3.8    96   13.32   23.0
   4R R     0.22     0.26     3.7   0.59  0.50    3.8    96    4.14   22.6
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / Benchmark Road
Future Winter PM Peak Hour
Intersection ID: 4
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: Benchmark
  133   0.260    0.25     0.29     6.6   0.71  0.76    38    3.06    22.0
---------------------------------------------------------------------------
South: Avon Road
 1234   0.394    0.39     0.47     1.1   0.00  0.14     0   17.93    24.4
---------------------------------------------------------------------------
East: Benchmark
  411   0.325    0.93     1.11     8.1   0.62  0.77    44    9.43    21.6
---------------------------------------------------------------------------
North: Avon Road
  930   0.476    0.68     0.81     2.6   0.59  0.37    96   17.46    22.9
---------------------------------------------------------------------------
ALL VEHICLES:
 2708   0.476    2.24     2.68     3.0   0.33  0.35    96   47.87    23.3
---------------------------------------------------------------------------
INTERSECTION (persons):
 3250   0.476             2.68     3.0   0.33  0.35         47.87    23.3
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / Benchmark Road
Future Winter PM Peak Hour
Intersection ID: 4
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: Benchmark
 1 R       133   512 0.260    6.6  0.76    1.5   38.0   1600.0
---------------------------------------------------------------
 South: Avon Road
 1 LT      585  1485 0.394    1.2  0.13    0.0    0.0   1600.0
 2 TR      649  1648 0.394    1.1  0.14    0.0    0.0   1600.0
---------------------------------------------------------------
 East: Benchmark
```

```
 1 LT      247   762 0.324    9.5  0.82    1.7   43.6   1600.0
 2 R       164   650 0.252    6.0  0.70    1.2   31.2   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 T       465   976 0.476    2.3  0.34    3.8   96.1   1600.0
 2 TR      465   976 0.476    2.9  0.41    3.8   96.1   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / Benchmark Road
Future Winter PM Peak Hour
Intersection ID: 4
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: Benchmark
 1 R       0    0  133  133   133  512  0.260  100
--------------------------------------------------
 South: Avon Road
 1 LT     76  509    0  585   150 1485  0.394  100
 2 TR      0  440  209  649   150 1648  0.394  100
--------------------------------------------------
 East: Benchmark
 1 LT    234   13    0  247   150  762  0.324  100
 2 R       0    0  164  164   150  650  0.252   78P
--------------------------------------------------
 North: Avon Road
 1 T       0  465    0  465   150  976  0.476  100
 2 TR      0  256  209  465   150  976  0.476  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / Benchmark Road
Future Winter PM Peak Hour
Intersection ID: 4
Roundabout

-----------------------------------------------------------------
 Mov     Mov    Total  Total    Deg.   Aver.   LOS  Longest Queue
 ID      Typ    Flow    Cap.     of    Delay          95% Back
                (veh   (veh     Satn                 (vehs)  (ft)
                  /h)    /h)    (v/c)  (sec)
-----------------------------------------------------------------
West: Benchmark
```

```
  2R R            133    512   0.260     6.6    A      1.5     38
----------------------------------------------------------------
South: Avon Road
  3L L             76    193   0.394     6.0    A      0.0      0
  8T T            949   2409   0.394     0.5    A      0.0      0
  8R R            209    531   0.394     2.2    A      0.0      0
----------------------------------------------------------------
East: Benchmark
  1L L            234    722   0.324     9.8    A      1.7     44
  6T T             13     40   0.325     4.1    A      1.7     44
  6R R            164    650   0.252     6.0    A      1.2     31
----------------------------------------------------------------
North: Avon Road
  4T T            721   1514   0.476*    2.3    A      3.8     96
  4R R            209    439   0.476*    3.7    A      3.8     96
----------------------------------------------------------------
 ALL VEHICLES:   2708          0.476     3.0    A      3.8     96
----------------------------------------------------------------
     Level of Service calculations are based on
     average control delay including geometric delay (HCM criteria),
     independent of the current delay definition used.
     For the criteria, refer to the "Level of Service" topic in the
     SIDRA Output Guide or the Output section of the on-line help.
  *  Maximum v/c ratio, or critical green periods
  "  Movement Level of service has been determined using adjacent lane
     v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

SIDRA SOLUTIONS

Site: Future Winter Avon/Benchmark PM
I:\08159\Analysis\Sidra\Future\Int 4 Avon at Benchmark.aap
Processed Apr 13, 2009 11:50:35AM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
Copyright 2000-2007 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	35	0	0	170	35	805	50	155	580	130
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	38	0	0	185	38	875	54	168	630	141
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1736	2043	386	1668	2087	465	772			929		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1736	2043	386	1668	2087	465	772			929		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	94	100	100	66	95			77		
cM capacity (veh/h)	29	41	612	47	38	544	839			732		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	38	185	38	583	346	168	420	351
Volume Left	0	0	38	0	0	168	0	0
Volume Right	38	185	0	0	54	0	0	141
cSH	612	544	839	1700	1700	732	1700	1700
Volume to Capacity	0.06	0.34	0.05	0.34	0.20	0.23	0.25	0.21
Queue Length 95th (ft)	5	37	4	0	0	22	0	0
Control Delay (s)	11.3	15.0	9.5	0.0	0.0	11.4	0.0	0.0
Lane LOS	B	B	A			B		
Approach Delay (s)	11.3	15.0	0.4			2.0		
Approach LOS	B	B						

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		

SIDRA INTERSECTION

Output Tables

Avon Road / US 6

Future Winter PM Peak Hour

Run Information

```
* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  HCM Delay Model option selected
  HCM Queue Model option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

  Geometric delay is less than 2 seconds for some movements.  The negotiation
  speed may be too high or the approach and exit speeds may be too low for
  given geometric design (e.g. for a large roundabout). Check Tables D.0,
  D.1 and D.4 for geometric delay data including negotiation speeds. If
  necessary, specify appropriate values of approach and exit speeds,
  negotiation radius or negotiation speed data in the
  Definitions & Path Data dialog.
```

Table B.1 - Movement Definitions and Flow Rates (Origin-Destination)

Avon Road / US 6
Future Winter PM Peak Hour
Intersection ID: 6
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale	Peak Flow Factor
West: US 6							
	South	2R	Right	31	1	1.00	0.79
	East	2T	Thru	1358	28	1.00	0.79
	North	5L	Left	366	7	1.00	0.79
South: Avon Road							
	West	3L	Left	74	2	1.00	0.79
	East	8R	Right	68	1	1.00	0.79
	North	8T	Thru	360	7	1.00	0.79

```
 East: US 6
           West         6T   Thru    955    19    1.00     0.79
           South        1L   Left     56     1    1.00     0.79
           North        6R   Right   366     7    1.00     0.79
----------------------------------------------------------------
 North: Avon Road
           West         4R   Right   292     6    1.00     0.79
           South        4T   Thru    143     3    1.00     0.79
           East         7L   Left    323     7    1.00     0.79
----------------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Table S.3 - Intersection Parameters

```
Avon Road / US 6
Future Winter PM Peak Hour
Intersection ID: 6
Roundabout

-------------------------------------------------------
   Intersection Level of Service             =         F
   Worst movement Level of Service           =         F
   Average intersection delay (s/pers)       =     186.2
   Largest average movement delay (s)        =     398.8
   Largest back of queue, 95% (ft)           =      6431
   Performance Index                         =    567.60
   Degree of saturation (highest)            =     1.860
   Practical Spare Capacity (lowest)         =       -54 %
   Effective intersection capacity, (veh/h)  =      2409
   Total vehicle flow (veh/h)                =      4481
   Total person flow (pers/h)                =      5377
   Total vehicle delay (veh-h/h)             =    231.77
   Total person delay (pers-h/h)             =    278.12
   Total effective vehicle stops (veh/h)     =     21301
   Total effective person stops (pers/h)     =     25561
   Total vehicle travel (veh-mi/h)           =    1523.3
   Total cost ($/h)                          =   3603.84
   Total fuel (gal/h)                        =     174.1
   Total CO2 (kg/h)                          =   1648.76
```

Table S.5 - Movement Performance

```
-------------------------------------------------------------------------
  Mov      Total    Total   Aver.  Prop.  Eff. Longest Queue  Perf.  Aver.
  ID       Delay    Delay   Delay Queued  Stop   95% Back     Index  Speed
         (veh-h/h)(pers-h/h)(sec)         Rate  (vehs) (ft)         (mph)
-------------------------------------------------------------------------
West: US 6
   5L L    41.32    49.58   398.8   1.00  8.54  253.2  6431   88.05    2.9
   2T T   134.57   161.49   349.5   0.97  7.66  253.2  6431  290.54    3.0
   2R R     0.07     0.09     8.4   0.72  0.83    2.9    75    0.81   21.3
-------------------------------------------------------------------------
South: Avon Road
   3L L     0.84     1.01    39.7   1.00  1.41    9.2   235    3.50   14.3
   8T T     3.43     4.12    33.7   1.00  1.41    9.6   244   15.77   14.7
   8R R     0.67     0.80    34.9   1.00  1.42    9.6   244    2.98   14.5
```

```
---------------------------------------------------------------------------
East: US 6
   1L L     2.57     3.08   162.2   1.00  5.16   95.5  2426    7.15    6.2
   6T T    42.34    50.81   156.5   1.00  5.15   95.5  2426  119.25    5.9
   6R R     1.29     1.55    12.5   0.87  1.09    7.2   182   10.91   19.9
---------------------------------------------------------------------------
North: Avon Road
   7L L     2.25     2.70    24.6   1.00  1.33   10.9   278   12.74   17.0
   4T T     0.75     0.91    18.6   1.00  1.33   11.1   282    5.20   18.0
   4R R     1.65     1.98    19.9   1.00  1.33   11.1   282   10.71   17.7
---------------------------------------------------------------------------
```

Table S.6 - Intersection Performance

```
Avon Road / US 6
Future Winter PM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------------------
 Total   Deg.   Total    Total   Aver.  Prop.  Eff. Longest Perf.   Aver.
 Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
(veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (ft)         (mph)
---------------------------------------------------------------------------
West: US 6
 1791   1.860  175.97   211.16   353.7   0.97  7.72  6431  379.40     3.0
---------------------------------------------------------------------------
South: Avon Road
  512   0.794    4.94     5.93    34.7   1.00  1.41   244   22.24    14.6
---------------------------------------------------------------------------
East: US 6
 1404   1.326   46.20    55.44   118.5   0.96  4.08  2426  137.31     7.2
---------------------------------------------------------------------------
North: Avon Road
  774   0.789    4.66     5.59    21.7   1.00  1.33   282   28.65    17.4
---------------------------------------------------------------------------
ALL VEHICLES:
 4481   1.860  231.77   278.12   186.2   0.98  4.75  6431  567.60     5.2
---------------------------------------------------------------------------
INTERSECTION (persons):
 5377   1.860           278.12   186.2   0.98  4.75        567.60     5.2
---------------------------------------------------------------------------
Queue values in this table are 95% back of queue (feet).
```

Table S.7 - Lane Performance

```
Avon Road / US 6
Future Winter PM Peak Hour
Intersection ID: 6
Roundabout

---------------------------------------------------------------
           Dem                              Q u e u e
          Flow   Cap  Deg.  Aver.  Eff.   95% Back       Lane
 Lane     (veh  (veh  Satn  Delay  Stop  ------------   Length
 No.        /h)   /h)   x   (sec)  Rate  (vehs)  (ft)    (ft)
---------------------------------------------------------------
 West: US 6
 1 LT     1602   862 1.859  394.6  8.54  253.2 6430.9   1600.0
```

```
 2 TR      189   433 0.437    7.4  0.79    2.9   74.7   1600.0
-------------------------------------------------------------
 South: Avon Road
 1 LT      247   311 0.794   36.0  1.41    9.2  234.9   1600.0
 2 TR      265   333 0.794   33.6  1.42    9.6  243.7   1600.0
-------------------------------------------------------------
 East: US 6
 1 LT     1031   778 1.325  156.8  5.15   95.5 2425.7   1600.0
 2 R       373   512 0.729   12.5  1.09    7.2  181.9   1600.0
-------------------------------------------------------------
 North: Avon Road
 1 LT      382   484 0.789   23.8  1.33   10.9  277.7   1600.0
 2 TR      392   497 0.789   19.6  1.33   11.1  281.7   1600.0
-------------------------------------------------------------
```

Table S.8 - Lane Flow and Capacity Information

```
Avon Road / US 6
Future Winter PM Peak Hour
Intersection ID: 6
Roundabout

--------------------------------------------------
                              Min  Tot
 Lane     Dem Flow (veh/h)    Cap  Cap  Deg.  Lane
 No.    -------------------  (veh (veh  Satn  Util
         Lef Thru  Rig  Tot    /h)  /h)   x     %
--------------------------------------------------
 West: US 6
 1 LT    373 1229    0 1602   150  862  1.859  100
 2 TR      0  157   32  189   150  433  0.437   24D
--------------------------------------------------
 South: Avon Road
 1 LT     76  171    0  247   150  311  0.794  100
 2 TR      0  196   69  265   150  333  0.794  100
--------------------------------------------------
 East: US 6
 1 LT     57  974    0 1031   150  778  1.325  100
 2 R       0    0  373  373   150  512  0.729   55P
--------------------------------------------------
 North: Avon Road
 1 LT    330   52    0  382   150  484  0.789  100
 2 TR      0   94  298  392   150  497  0.789  100
--------------------------------------------------
  P  Lane under-utilisation found by the "Program".  This includes cases where
     the value of lane under-utilisation due to downstream effects has been
     modified by the program during lane flow calculations (e.g. a de facto
     exclusive lane has been found).
  D  Lane under-utilisation due to downstream effects

  The capacity value for priority and continuous movements is obtained by
  adjusting the basic saturation flow for heavy vehicle and turning vehicle
  effects.  Saturation flow scale applies if specified.
```

Table S.15 - Capacity and Level of Service

```
Avon Road / US 6
Future Winter PM Peak Hour
Intersection ID: 6
```

Roundabout

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue 95% Back (vehs)	(ft)
West: US 6								
5L	L	373	201	1.856	398.8	F	253.2	6431
2T	T	1386	745	1.860*	349.5	F	253.2	6431
2R	R	32	73	0.438	8.4	A	2.9	75
South: Avon Road								
3L	L	76	96	0.792	39.7	D	9.2	235
8T	T	367	462	0.794	33.7	C	9.6	244
8R	R	69	87	0.793	34.9	C	9.6	244
East: US 6								
1L	L	57	43	1.326	162.2	F	95.5	2426
6T	T	974	735	1.325	156.5	F	95.5	2426
6R	R	373	512	0.729	12.5	B	7.2	182
North: Avon Road								
7L	L	330	418	0.789	24.6	C	10.9	278
4T	T	146	185	0.789	18.6	B	11.1	282
4R	R	298	378	0.788	19.9	B	11.1	282
ALL VEHICLES:		4481		1.860	186.2	F	253.2	6431

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

SIDRA SOLUTIONS

Site: Future Winter Avon/US6 PM
I:\08159\Analysis\Sidra\Future\Int 6 Avon at US6.aap
Processed May 14, 2009 01:49:18PM

A0129, Felsburg Holt & Ullevig, Large Office
Produced by SIDRA Intersection 3.2.0.1455
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	1340	100	40	1020	60	80	40	40	50	30	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1723		1770	1657	
Flt Permitted	0.12	1.00	1.00	0.09	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	225	3539	1583	176	3539	1583	1770	1723		1770	1657	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	1457	109	43	1109	65	87	43	43	54	33	92
RTOR Reduction (vph)	0	0	57	0	0	36	0	36	0	0	76	0
Lane Group Flow (vph)	60	1457	52	43	1109	29	87	50	0	54	49	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Split			Split		
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	49.4	44.8	44.8	44.6	42.4	42.4	16.1	16.1		16.1	16.1	
Effective Green, g (s)	49.4	44.8	44.8	44.6	42.4	42.4	16.1	16.1		16.1	16.1	
Actuated g/C Ratio	0.52	0.47	0.47	0.47	0.45	0.45	0.17	0.17		0.17	0.17	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	191	1665	745	119	1576	705	299	291		299	280	
v/s Ratio Prot	c0.02	c0.41		0.01	0.31		c0.05	0.03		c0.03	0.03	
v/s Ratio Perm	0.15		0.03	0.16		0.02						
v/c Ratio	0.31	0.88	0.07	0.36	0.70	0.04	0.29	0.17		0.18	0.17	
Uniform Delay, d1	14.8	22.7	13.8	19.2	21.3	14.9	34.6	33.9		33.9	33.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	5.5	0.0	1.9	1.4	0.0	2.5	1.3		1.3	1.3	
Delay (s)	15.7	28.1	13.8	21.1	22.8	14.9	37.0	35.1		35.2	35.2	
Level of Service	B	C	B	C	C	B	D	D		D	D	
Approach Delay (s)		26.7			22.3			36.1			35.2	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	70	45	15	65	70	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	49	16	71	76	33

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	125	16	71	109
Volume Left (vph)	0	16	0	76
Volume Right (vph)	49	0	0	33
Hadj (s)	-0.20	0.53	0.03	-0.01
Departure Headway (s)	4.2	5.4	4.9	4.4
Degree Utilization, x	0.14	0.02	0.10	0.13
Capacity (veh/h)	840	643	711	783
Control Delay (s)	7.9	7.3	7.2	8.0
Approach Delay (s)	7.9	7.2		8.0
Approach LOS	A	A		A

Intersection Summary			
Delay	7.7		
HCM Level of Service	A		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	180	85	15	210	105	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	196	92	16	228	114	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	178					
pX, platoon unblocked						
vC, conflicting volume			288		503	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			288		503	242
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		78	96
cM capacity (veh/h)			1274		522	797

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	288	245	114	33
Volume Left	0	16	114	0
Volume Right	92	0	0	33
cSH	1700	1274	522	797
Volume to Capacity	0.17	0.01	0.22	0.04
Queue Length 95th (ft)	0	1	21	3
Control Delay (s)	0.0	0.6	13.8	9.7
Lane LOS		A	B	A
Approach Delay (s)	0.0	0.6	12.9	
Approach LOS			B	

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	130	160	5	155	135	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	141	174	5	168	147	16

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	315	174	163
Volume Left (vph)	0	5	147
Volume Right (vph)	174	0	16
Hadj (s)	-0.30	0.04	0.15
Departure Headway (s)	4.3	4.7	5.2
Degree Utilization, x	0.37	0.23	0.23
Capacity (veh/h)	804	720	647
Control Delay (s)	9.8	9.1	9.7
Approach Delay (s)	9.8	9.1	9.7
Approach LOS	A	A	A

Intersection Summary			
Delay	9.6		
HCM Level of Service	A		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D BUS STOP GUIDELINES

BUS STOP GUIDELINES AND STANDARDS

Prepared for:

Felsburg Holt & Ullevig

Prepared by:

TransitPlus, Inc.

September 4, 2009

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ATTACHMENT - Lake Street Shelter Example

I. INTRODUCTION

These Bus Stop Guidelines and Standards identify expectations for bus stops and standardize bus stop design features. Standardization results in less confusion for bus operators, passengers, and motorists and create a uniform look and feel to the transit system. Consistency in design, however, can be difficult to achieve as many factors influence the choices.

These standards will be applied by the Public Works Department, the Engineering Department the Transportation Department, and the Community Development Department in response to property development, re-development, and general streetscape planning. They provide basic guidelines for establishing bus stops on streets and reflect an integration of current Town of Avon practices and facilities as well as industry best practices[1]. The West Town Center design guidelines have been used herein for illustrative purposes [2]. Signage design should be discussed during the plan review period on a site-specific basis.

The development of bus stops begins with building orientation so that pedestrians can readily access convenient bus stops. Developers are encouraged to review this document and discuss the requirements at the plan development phase with the Public Works and Transportation Department. Prior to approval of plan documents, site plans require a review by the Director of Public Works and Transportation to assure the development and siting of bus stops provide convenient access, pedestrian connectivity, pedestrian safety, and smooth vehicle operations.

These guidelines and standards address the types of bus stops, location, and the amenities required at different types of stops.

They include: general information on bus stops, a description of the types of bus stops in the Town of Avon, a section discussing factors related to traffic movements and the interface with the roadway (street-side factors), and a section on factors related to passenger access, site design, and accessibility (curb-side factors).

---

1 Transit Cooperative Research Program Report 19: Guidelines for the Location and Design of Bus Stops. Transportation Research Board, National Research Council, 1996, National Academy Press, Washington, DC

2 Town Center District Investment Plan, Design Workshop, August 2007

II. GENERAL

The Department of Transportation is responsible for establishing bus stops along Town routes, and working with ECO Transit in establishing stops for regional services. The Town will work with CDOT as needed for stops located within the Town boundaries on US Highway 6. These guidelines make references to transit zones so **Figure 1** illustrates the adopted transit zones.

- Bus stop requirements may be upgraded from time-to-time to reflect passenger, vehicle, or transit operating needs, or in response to new development, intersection improvements, or sidewalk installations.
- Bus stops with amenities may be required for developments in areas receiving "Mountain Core" transit levels of service. Stops are designated as "simple" "enhanced level 1" or enhanced level 2", each requiring a different set of amenities. Simple stops have limited requirements and "enhanced level 2 the most requirements.
- Stops presently located along some transit corridors may need to be upgraded in response to development or redevelopment or even relocated.
- In general bus stops will be required about every 1,500 feet on arterials, unless ridership warrants a less frequent spacing.
- Space for bus stops will be required on both sides of streets to allow for bi-directional service, even if bi-directional service is not provided presently.
- Bus stops to support a particular development may or may not abut the property. At times, a stop at the nearest intersection or on the opposite side of the intersection may provide for better vehicle flow, site distance, and pedestrian safety. The Town reserves the right to require right-of-way dedication and to charge developers for the cost of bus stop improvements when properties undergo development or redevelopment when such improvements are planned by the Town as shown herein and/or if the Town determines that the project necessitates the creation of a new bus stop.
- The Town will decide on whether to serve a given location with a near-side, far-side, or mid-block stop.

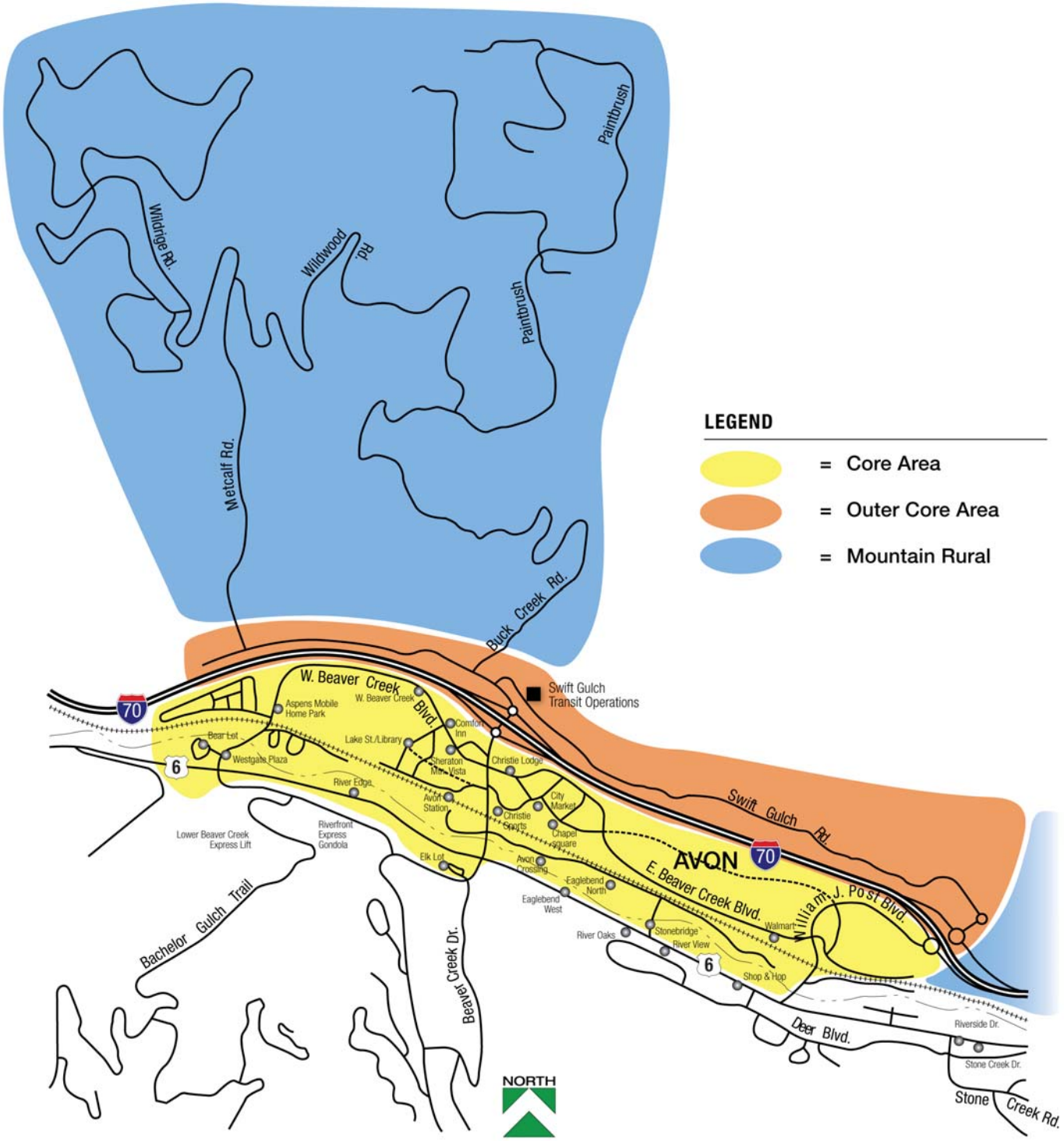
In establishing stops it is important to understand the operating constraints and issues for the automobile, transit, and pedestrian perspectives. The following safety and operating elements will be considered in bus stop placement[3]:

Safety:

- Passenger protection from passing traffic
- Passenger protection from weather
- Access for people with disabilities
- All-weather surface to step from/to the bus
- Street lighting

[3] Transit Cooperative Research Program Report 19: Guidelines for the Location and Design of Bus Stops, Transportation Research Board, National Research Council, 1996, National Academy Press, Washington, DC, adapted from page 19.

Figure 1. Map of Transit Zones



- Proximity to passenger crosswalks and curb ramps
- Proximity of stop for transfers to routes in the opposite direction

Operating:

- Impact of the bus stop on adjacent properties
- On-street automobile parking and designated delivery zones
- Snow plowing considerations
- Bus routing patterns (i.e. individual bus movements at intersections)
- Width of roadway and intersecting streets
- Types of traffic controls (signal, stop, yield, or round-about)
- Volumes and turning movements of other traffic
- Width of sidewalks

III. TYPES OF BUS STOPS

The basic types of bus stops are standard on-street stops and transfer centers.

- **Standard on-street bus stops** are located on municipal streets and roads. These stops may be:
  - **Simple** stops, marked by a bus stop sign (e.g. Avon Library). A bear-proof garbage can is also required. Bicycle racks and newspaper racks are optional. These stops are anticipated to have less than 25 passenger boardings on a peak travel day.
  - **Enhanced** stops with amenities based on passenger use. The stop on the west side of Lake Street is a prototype example of one with a shelter. In addition to signage and garbage can, amenities may include benches, shelters, bike racks, or other items, as described below. Stops with 25 to 50 passenger peak season boardings will have benches and signs only; stops with 50 or more passenger boardings will have shelters and amenities. These are denoted as Enhanced Level I and Enhanced Level II, respectively.
- **Transfer centers** or hubs are locations where multi-mode connections are made. For example: two or more buses meet, a bus meets a train, or bus-gondola or bus-parking connections are possible and passengers transfer between routes or services. These may be in the public right-of-way or on private property. Presently Avon Station is the only transfer center used by Avon Transit and ECO transit. ECO transit also uses the stop near Walmart which is adjacent to public parking garage located within the Traer Creek Metro District. A future transit hub linking car, bus, train, bike, and pedestrians, is expected for the East Avon area near Post Road.

Table 1 summarizes the requirements for each type of stop by transit service zone. At the end of these Bus Stop Guidelines and Standards is a list of current stops and essential future stops by type.

Generally all bus stops are required to have a pullout, an area of asphalt large enough for the bus to pull out of the lane of traffic.

Transit hubs shall be custom designed to match the passenger demand characteristics and existing multi-modal connections provided at the site. Transit hubs shall be designed with the same basic principles set forth for upgraded stops but will necessarily be larger in size because of the number of vehicles and passengers they must accommodate.

Transfer centers or hubs need to have room for passenger vehicles and for passenger loading, including those who use wheelchairs. A minimum of fifteen minute parking for passenger vehicles is also recommended in a loading zone. Adequate pedestrian room is also needed for passengers to wait and circulate. All amenities are required at transfer centers.

Facilities for passengers include benches and shelters; signage to inform people how to use the system (including all routes stopping there, schedules, and system maps); a restroom access, and possibly ticket machines for regional bus or rail services. Adequate room is needed for the buses to lay-over and for drivers to take a break. The layover space may be at the primary bus stop or nearby.

Table 1. Matrix of Bus Stop Requirements

Area	"Simple" < 25 Pass/Day	"Enhanced Level I" 25-50 Pass/Day	"Enhanced Level II" 50 + Pass/Day
Town Core	Sign only – Type C or D	Sign Type B plus schedule	Sign – Type A, schedule, map
	Lighted but no amenities	Lighted, amenities as desired (trash can, bench, bike rack)	Shelter, trash can, lighted, bike rack
Outer Core	Sign only	Sign plus schedule	Sign, schedule, map
	Lighted but no amenities	Lighted, amenities as desired (trash can, bench, bike rack)	Lighted, amenities as desired (trash can, bench, bike rack)
Mountain Rural	Sign only	Sign plus schedule	Sign plus schedule
	Place near light when possible	Lighted but no amenities	Amenities as appropriate

Note:
(1) All stops are required to have solar lighting and a pull-out suitable for a 40-foot bus.
(2) Passenger boardings reflect average winter boardings

3.1 Street-side and Curbside Factors

Bus stops are considered from the perspective of "street-side" and "curb-side". The following sections discuss factors and design standards for each. The street-side factors focus on traffic movements and the interface with the roadway. The curb-side considerations focus on passenger movements and amenities for each type of stop. The curb-side section also addresses site development issues.

Street-side: The Roadway Interface

Location of Stops: Near-side, far-side, or mid-block

Decisions on bus stop placement will be made on a case-by-case basis. Each location has advantages and disadvantages. The Department of Public Works and Transportation will balance the safety and operating concerns for vehicles and pedestrians when making decisions on stop locations. Site distance for pedestrians and vehicles, vehicle turning movements, traffic congestion, pedestrian walking distances, and other issues will be considered.

Length of Bus Stops

Bus stop zones will be sized for 40-foot length buses plus an additional five feet to accommodate ski boxes and/or bicycle racks. Minimum no-parking zone distances for each type are:

- **Near-side**: 100' measured from the extreme outside end of curb radius
- **Far-side**: 90' measured from cross-walk. For stops made after a right turn, measure the 90' distance from the end of the radius.
- **Mid-block**: 150'

Roadway Design – Clearance Requirements

- Overhead obstructions should be a minimum of 12-feet above the street
- Obstructions including tree branches and signs should not be located within 2-feet of the edge of the street to avoid being struck by a mirror
- Traffic lanes should be no narrower than 12-feet and a desirable curb-lane width (including gutter) is 14-feet.
- Snow plowing considerations should be addressed.

Bus Stop Signage Design[4]

The purpose of this section is to provide guidelines for exterior wayfinding signs and to establish a consistent and controlled transit sign program. Use of consistent design, color, materials, logo, topography and size relationships will help build a cohesive identity in the transit system. Many illustrations in this section are from the West Town Center Design Guidelines.

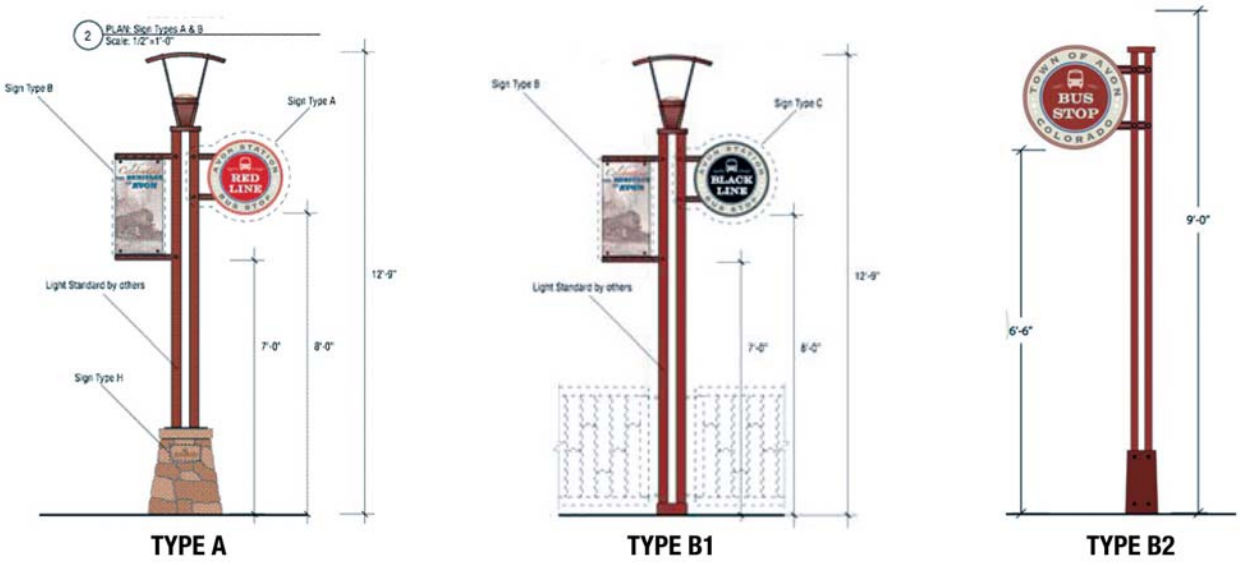
Sign requirements vary from location to location specifically relating to the bus stop usage guidelines listed above (i.e. simple vs. enhanced and whether the area received Mountain Core or Mountain Rural levels of transit service).

Generally the sign and route information will be the responsibility of the Town of Avon, but the Town's sign application process must be followed if the developer wishes to install signage.

- Simple bus stops require a freestanding bus stop sign and any signage required to denote a no parking zone.
- Enhanced bus stops require signage denoting the stop name and schedules. Shelters will have a map case that allows for posting current route maps and schedules.
- For all transit sign messages, the town utilizes both Copperplate Gothic 33BC and Engravers MT; all caps and/or big and small caps are preferred.
- If possible all bus stops should be equipped with Avon Sign Types A and B: Banner and Bus Identification (Light Standard). The specifications for the sign and identification details are illustrated in **Figure 2**. Contact the Engineering Department for detailed specifications of compliant bus stops signs by type.

4 Town Center District Investment Plan, Design Workshop, August 2007

Figure 2. Bus Stop Sign Types

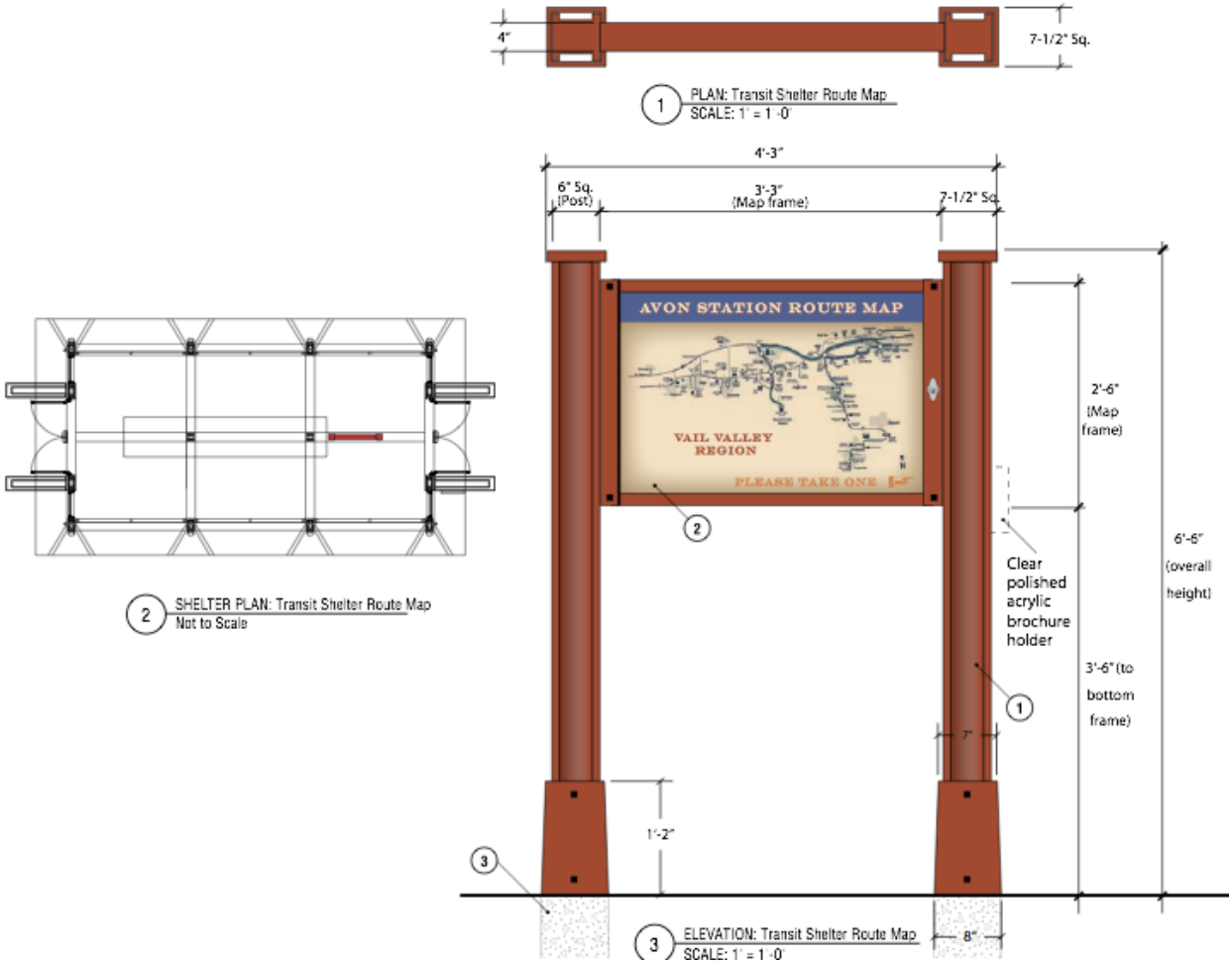


NOTE: Contact the Engineering Department for detailed specifications of compliant bus stop signage by type.

- All text, symbols and directional arrows must match the spacing and placement shown. Messages are double sided. The post base should be fabricated aluminum on all four sides and exposed services are to be powder coated. The number of signs needed at specific stops shall be determined by the department of transportation. Contact the Engineering Department for detailed specification of compliant bus stop signage by type.

- The freestanding route map case should be installed at bus stops as indicated in **Table 1**. The map should have a Engravers MT typeface and be constructed of 6" square fabricated aluminum "I-Beam" posts. Paint or powder coat on all exposed surfaces. Contact the engineering department for detailed specification of compliant bus stop signage by type. **Figure 3** illustrates a freestanding route map.

Figure 3. Freestanding Route Map



Placement of Bus Stop Signage

Signs should be placed at the location where people board at the front door of the bus. The bottom of the sign should be at least 6.5-feet above ground level and should not be located closer than 2-feet from the curb face. Snow plowing considerations shall be addressed.

In some cases a shared sign post or placing the sign on a shelter can be used to reduce the number of poles and obstructions. Break-away sign posts are recommended to minimize injuries and vehicular damage and to facilitate replacement of the post.

Signs should not be obstructed by trees, buildings, or other signs.

Safety

- Lighting is important for safety, making it easier for transit passengers to observe waiting passengers, for motorists to see pedestrians, and for passengers to judge distances and the location of steps. Photovoltaic lighting shall be provided at bus stops whenever possible. Contact Engineering for more information on PV lighting specifications and for lighting at bus shelters. The towns standard components for shelters are:
  - Kyocera KC857 high efficiency muti-cry 62 W pv panel.
  - Sunlight solar lighting controller 12v-10 amp
  - 12v-20hr low-loss sealer gei battery for cold weather 8 hours
  - NEMA 4 enclosure
  - 12VDC LED lighting with 70w min bulb
  - Performance for 36 hours of operations between charging
  - Smaller systems may be approved for simple-type stops without shelters
- Adjacent street light with bus stop sign (with or without banner) shall be per Type A (**Figure 2**) (with stone clad base if space allows)
- The stopped bus will affect site distance for pedestrians and vehicles and must be considered in locating the stop.
- Turning lanes and round-a-bouts require special accommodations to incorporate bus stops in a manner that provides for smooth vehicle operations and safe pedestrian crossings. These will be addressed on a case-by-case basis.
- When bicycle lanes and a bus stop are both present, the operators need to be able to see cyclists in both directions while approaching the stop. Sufficient site distance for cyclists to stop safely upon encountering a stopped bus is also needed.

3.2 Curb-side: Amenities and Access

Curb-side factors include those factors and issues that can affect the comfort, safety, and convenience of bus patrons. The Avon Transportation Department and developers should utilize this section as guidelines for providing safe, clean facilities and improving access and convenience to create a pedestrian-friendly community. This section includes discussion about shelter design and placement, amenities, and comfort at the bus stop.

Pedestrian Access

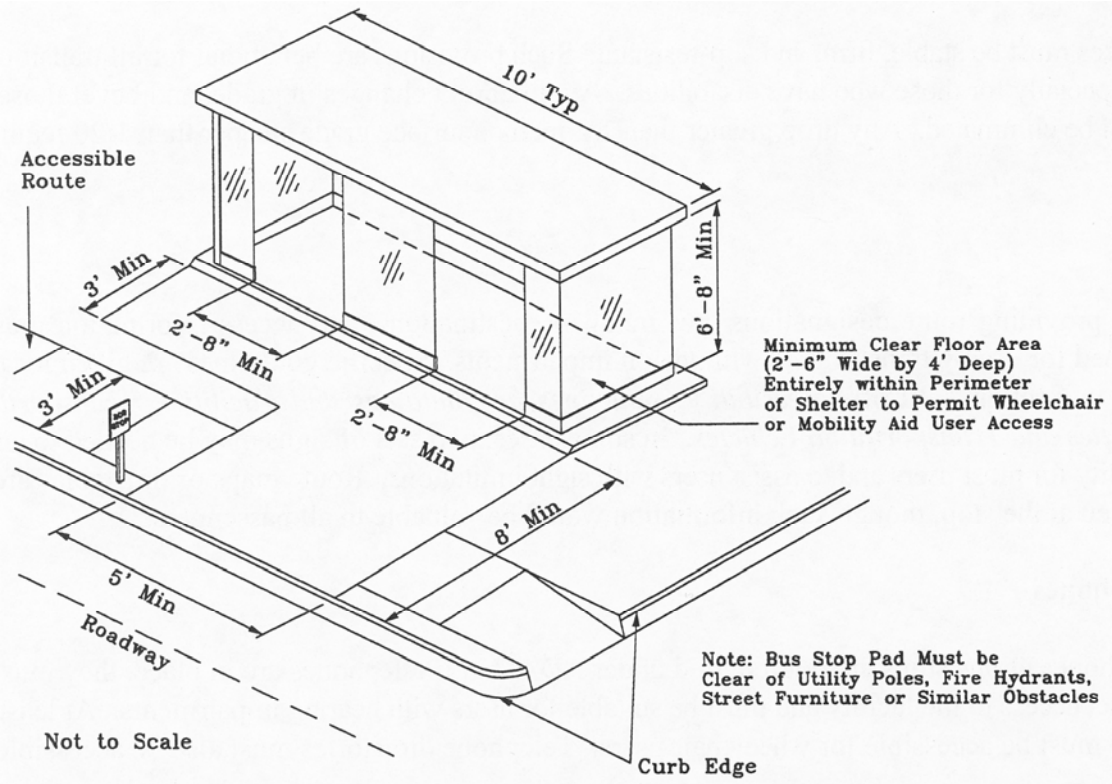
The needs of riders extend beyond the bus stop to and from the surrounding neighborhood. Building sidewalks, pedestrian bridges, and other safe and convenient crossings are essential, especially for midblock bus stops on busy roads.

- Riders should not have to walk through grass or exposed soil to reach the bus. During inclement areas such walkways can become worn and muddy and snow accumulation can create additional problems.
- Adequate space free suitable for snow storage shall be provided so the bus stop and passenger waiting area can be kept clear of snow.
- Coordinate sidewalks and other pedestrian enhancements to make access to the bus stop as direct as possible. Sidewalk placement that is coordinated with land use and bus stop locations is critical to encouraging the use of transit. Sidewalk design and placement can be used to reduce walking times from the development to the bus stop.
- Coordinate bus stops with pedestrian crosswalks to encourage safe access across streets and minimize jaywalking.
- Walkways and accessible ramps may be constructed of paving materials (asphalt or small aggregate paving gravel) if there is a slight slope over a relatively short distance, but decisions on materials will be the responsibility of the Town Engineer.
- It is desirable that ramps throughout town share consistent design elements in the form of handrail design and materials and ramp base materials wherever possible.
- ADA accessibility guidelines must be followed when constructing a ramp.

ADA Accessibility

- All new stops must conform to ADA requirements.
- Examine all paths planned from the bus stop to the land use destinations. Determine whether there are any obstacles that may restrict wheelchair movements or the movements of persons with vision impairments. Protrusions higher than 27 inches or lower than 80 inches may not be detectable to a person with a cane.
- Surfaces must be stable, firm, and slip resistant. Avoid abrupt changes in grade and bevel those that cannot be eliminated. A ramp must be installed on any surface with a drop greater than ½ inch or surface grade steeper than 1:20.
- Signs must be designed for use by transit riders with vision impairments. Specific guidelines are given in Section 4.30 of Accessibility Guidelines for Buildings and Facilities, Transportation Facilities and Transportation Vehicles. In some cases, two signs may be needed to ensure visibility for most users and to assist users with sight limitations.

Figure 4. Accessible Bus Stop Pad and Shelter – Minimum Dimensions

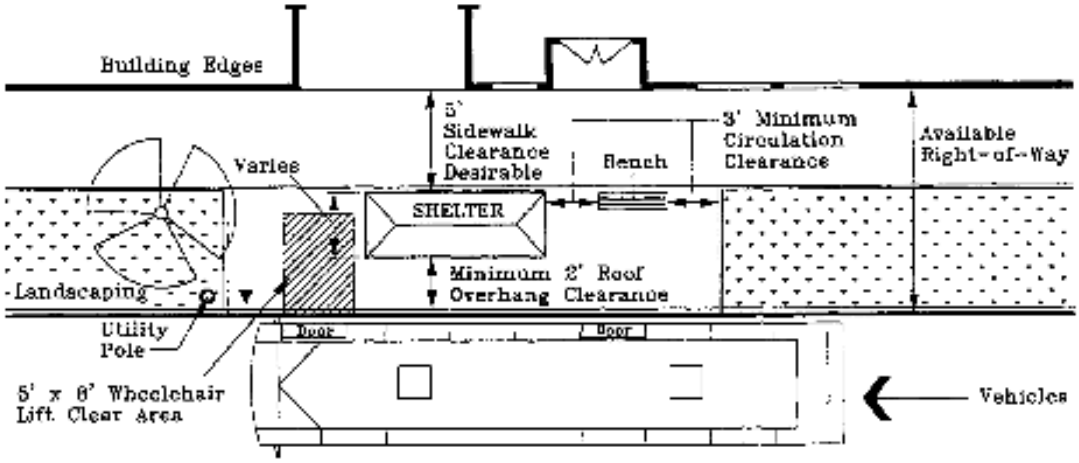


Source: TCRP Report 19: Guidelines for Location and Design of Bus Stops

3.3 Waiting Areas

- Five feet of clearance should be preserved on sidewalks to reduce potential pedestrian conflicts and limit congestion during boarding times.
- Depending on the availability of right-of-way space, utility poles, or buildings, the pad can be located on either side of the sidewalk. A paved surface should be provided from the waiting pad to the back-face of the curb to enhance access and comfort. Waiting pads separated from the sidewalk preserve general pedestrian flow.
- The pad should accommodate a 5-foot (measured parallel to the street) by 8-foot (measured from the back face of the curb) wheelchair landing pad that is free of all street furniture and overhangs.
- Provide additional square footage and equipment racks for bikes, skis and snowboards.

Figure 5. Example of Influential Factors on Waiting Pad Size



Source: TCRP Report 19: Guidelines for Location and Design of Bus Stops

3.4 Shelters

From the rider's point of view, an ideal shelter is one that allows visibility and easy access to the bus, is comfortable and convenient, provides clear information, and is safe. From the perspective of the system, a good shelter is one that has low maintenance requirements and is vandal-resistant. These design recommendations are intended to fulfill both perspectives.

Bus stops with 50 or more passenger boardings per day will have a bus shelter.

Location

The bus stop shelter should be located to enhance the circulation patterns of riders, reduce the amount of pedestrian congestion at a bus stop, and reduce conflict with nearby pedestrian activities. Specific guidelines for locating bus shelters are:

- Bus shelters near intersections should be set back from the crosswalk approximately 10 feet to avoid conflicts with pedestrian traffic. If a bus stop is on the far side of an intersection, the shelter should be located a minimum of 40 feet from the crosswalk to allow adequate room for the bus to stop.
- A minimum of 4 feet should be allowed between the bus shelter and the curb for free movement in boarding and exiting from the bus.
- Bus shelters should have their long side parallel to the sidewalk to minimize interference with pedestrian traffic.
- Exit and entry openings should be oriented so that people are protected from the wind and weather. However, it is important to keep the side of the shelter facing the street open to allow passengers to board or exit the bus easily.
- Provide proper orientation for roof drainage and snow removal (watch potential for icicle formation).
- When shelters are directly adjacent to a building, a 12-inch clear space should be preserved to permit trash removal or cleaning of the shelter.

- Elements such as signs, information kiosks or vendors (where permitted) that can obstruct the view of oncoming buses should be located "down-stream" from the shelter.

Design

A bus shelter should be designed to reflect the place in which it is located. This is accomplished through the use of local materials and by the design details. Our recommended standards for shelter design can be adapted to reflect the unique characteristics of each particular neighborhood, but should in general have a consistent theme. All well-designed bus shelters have the following five general qualities: visibility, accessibility, comfort and convenience, public information, and ease of maintenance.

One example shelter is that installed on Lake Street. Engineering information for this shelter is attached to these guidelines and available through the Town Engineer.

General Characteristics and Size

- The general aesthetic of the site – uncomplicated shapes, uncluttered façade surfaces shall be respected wherever possible.
- A weathered, scrubbed look is desirable for buildings and improvements on the site reflecting the overall nature of the site and Colorado ranching and mining architectural themes. The look of the aspens, logs, cedar shakes weathered shingles are all icons of this area.
- Renewable resource systems and materials are strongly encouraged to showcase sustainable approaches provided that they match these other requirements.
- The size of a bus shelter depends on the climate as well as the number of people who are expected to use it and the expected use determined by the Department of Transportation.

Building Massing and Roof Height

- All bus shelters shall be 3-sided. Open canopy designs are not permitted as they do not protect users from the harsh mountain weather conditions.
- Clerestories and skylights are permitted on a case-by-case basis provided that they are weather-tight. These features help to bring natural light into the bus stop but tend to result in higher maintenance and increase the risk of leakage.

Exterior Materials

- Exterior cladding shall be composed of natural or recycled materials.
- No vinyl or aluminum cladding shall be used for siding or trim except in the case of recycled materials that meet the guidelines set forth in this section.
- Cladding should not change or alternate from front to side to rear elevations if this would be inconsistent with other surrounding buildings.
- Preferred exterior cladding materials include cedar siding and clapboards, cedar plywood sheathing, and composite/cement cladding with appropriate shingle or clapboard-type finish (preferably with recycled materials used). The use of cedar

eliminates ongoing maintenance and painting requirements and may be left to weather naturally.

- Recycled, “green” materials, and materials obtained locally are encouraged. These materials should be compatible with natural wood materials and stone. Exterior Insulation and Finish Systems (EIFS) may be used where masonry materials are needed to repair or rehabilitate existing masonry structures.
- Bus shelters should be composed of structural bolt-together members and inset panels, not snap-together "curtain walls" or decorative sections that are easily vandalized. Steel (with protective coating) or wood structures are allowed. Concrete is not allowed as it is monolithic in appearance and tends to discolor and soil easily.
- Photovoltaic systems on façades or roofs and solar water systems are encouraged.

Seating

- The amount of seating should be based on both the number of people who will use the shelter and the amount of time people will spend waiting. Where people wait for a long time, or where the shelter is used by the elderly or infirm, more seating is generally needed than in areas where the bus comes more frequently.
- The Towns standard material for interior bench seats is a textured light grey TREX or HPDE lumber with a maximum support spacing of 12 inches due to elastic property of these materials.
- A bench rail should be provided and located about 3 feet 6 inches above the ground. Materials of construction should be cedar, Trex, or dimensional lumber made of recycled materials.

Windows, Doors and Side Panels

- Side panels should generally not be used on the curbside of the shelter, except on very narrow streets with heavy traffic. If side panels are used on the curbside, an opening at least 3 feet wide needs to be provided to allow people access to the buses.
- Side panels should be mounted 3 inches off the ground so that debris will not collect inside the shelter. If more than 3 inches off the ground, they will not keep out drafts.
- Side panels, windows and doors shall be clear, e.g., colorless safety glass, Herculite, Lexan or other vandalism resistant material, and sized in relatively small sections for ease of replacement (e.g., due to vandalism). Plastic or Plexiglas, mirrored or colored glass is not allowed.
- New windows shall be natural/protected wood finish, except in cases of limited replacement where windows shall match color of existing fenestration. Vinyl (red or green) clad windows are allowed.
- Only fixed, non-opening windows are allowed.
- Protruding bay windows are not allowed.
- New windows may be constructed of wood, vinyl or aluminum clad, or “plastic” wood composite materials.

Roof

- A pitched roof must be used to prevent the collection of snow, rain, and debris.
- Roofing shall standing seam metal for longevity, ease of maintenance and snow and ice removal.
- Roofs shall drain away from heavy pedestrian traffic areas (e.g., note icicle formation potential).
- Mechanical equipment shall not be located on roof tops, except for photovoltaic panels, solar hot water panels, special ventilation systems, and related types of equipment.
- Roof color shall be Toyota Green unless otherwise pre-approved by the Town.

Other

- All color decisions shall be made by the Town of Avon.
- Natural materials that weather well, such as cedar, are encouraged wherever possible and are preferred over materials that must be painted, stained or sealed.
- Lighting shall be as listed in section 3.16. Shelter lights should be housed in a protective casing to reduce vandalism, and directed to illuminate the waiting and boarding areas. An intensity of 20 lumens per square foot is recommended for safety.
- Solar-powered lighting is encouraged for shelters.
- Adjacent street light and bus stop sign (with or without banner) shall be per Elevation 4 on sheets GR9 (with stone clad base if space allows) or GR10 (without stone clad base) of the West Town Center Design Guidelines.
- Schedule, route information, and a map case should be located in or next to bus shelters but not so that the view of the oncoming bus is blocked. The Transportation Department will provide information on the standard sign frame design and size to facilitate display of the same core transit information at all stops. Bus stop sign text shall be determined for each stop by the Transportation Department.
- Advertising panels – to be considered on a case by case basis

3.5 Amenities

Benches

All bus stops with more than 25 boardings per day are required to install a bench with the following guidelines:

- Coordinate bench locations with existing street lights to increase visibility and enhance the security of a stop.
- Do not locate benches in completely exposed locations, if possible. Coordinate bench locations with existing shade trees or install landscaping to provide protection from the elements.
- Install benches on a non-slip, properly drained, pad.
- Install benches away from driveways.

- Maintain a minimum separation of 2 feet between the bench and the back-face of the curb.
- At bench-only stops additional waiting room near the bench should be provided.
- All street furnishings should be compatible with one another in appearance, style, color and construction quality.
- The Town's standard component for exterior benches is Landscape Forms, Model "Chase Park 3-Seat Backed Unit, Surface Mount" 74" in length minimum cast aluminum back and seat in Toyota Green (olive, stock color) Substitutions may be permitted by the Department of Transportation with written pre-approval.

Signage and Route Information

Placement and design guidelines for each sign discussed in the street-side section. The Town will be responsible for the design of the information and providing updated information when changes are made to the routes and schedules.

Recreational Equipment Storage Facilities

Properly designated and located recreational equipment storage facilities discourage users from locking bikes or resting skis in nuscience locations such as onto the bus facilities or on an adjacent property. Proper storage can reduce the amount of visual clutter at a stop by confining this equipment to one area. Recommendations regarding recreational equipment storage facilities are as follows:

- Bicycle racks should be installed when demand warrants, specifically at those stops where commuters and residents are prevalent.
- Bike racks shall be U-lock compatible.
- Locate the bicycle storage area away from other pedestrian activities.
- Coordinate the storage facilities near on-site lighting.
- Provide space to lean both skis and snowboards (2-4 per stop) wherever possible.

Trash Receptacles

Provide one bear-proof garbage can per shelter (Bearsaver Model HA-P (brown) with M__ Kit Model HA-C/Cedar) The Town has experimented with other types and found no other equal.

Anchor the receptacle securely to the ground. Locate the receptacle away from the wheelchair landing pad areas and allow for at least a 3-foot separation from other street furniture. Locate the receptacle at least 2 feet from the back of the curb.

If the receptacle is adjacent to the roadway, ensure it does not obstruct the site distance of nearby driveways or land uses.

Security*

** Also see "Lighting" in Street-side section 3.16*

Some guidelines regarding security at bus stops are as follows:

- From the security perspective, landscaping, walls, and solid structures can restrict sight lines and provide places to hide.
- Bus stop shelters include windows that provide an unobstructed of and to patrons waiting inside.
- The stops themselves should be highly visible to permit bus drivers and vehicles to clearly see the stop.
- Landscaping elements should include low-growing shrubbery and ground cover reducing the visual barriers present with higher-growing landscaping and trees.
- Coordinate stops with existing street lighting.
- Stops should be placed near existing land uses to enhance surveillance of the site.

Table 2. Current Bus Stops by Type, As of June, 2009

Existing Stops	Ridership 2/18/2008	Ridership 6/26/2008	Type	Shelter	Bench	Trash Can	Schedule Post	Schedule Holder	Pull-out	Comments / Other
The Aspens	199	140	E2	√	√	√	√		√	
Avon Crossing	1,351	386	E2		√	√	√		√	Shelter needed
Chapel Square	31	4	E1				√		√	Upgrade to E2
Christie Lodge	331	37	E2				√		√	Shelter, signage upgrades needed. Uses right turn lane.
Christy Sports	16	1	S				√		√	
City Market SB	n/a	n/a	E2		√ (2)				√	E2 recommended for both w/ 2-way service. Shelter needed on both sides.
City Market NB	238	162	E2				√		√	
Comfort Inn	104	n/a	E2				√			Upgrade
Eaglebend North	41	21	E1				√		√	
Eaglebend West	89	32	E2					√	√	Shared with ECO. Shelter improvements desirable.
Lake Street - Recreation Center	252	n/a	E2						√	
River Edge	66	26	E2				√		√	Shared with ECO.
Sheraton Mtn Vista	20	9	E2					√	√	E2 recommended based on growth potential
Stonebridge Drive	77	41	E2		√	√	√		√	Shelter desirable but limited land area available.
Westgate	80	82	E2	√		√	√		√	
W. Beaver Creek Blvd.	10	5	S		√ (2)	√	√		√	

Bus Stop Types
S = Simple
E1 – Enhanced Level I
E2 = Enhanced Level II

Table 3. Proposed Bus Stops by Type

Location	Side	Direction	Recommended Type	Comments
Opposite Aspens	West	SB	E2	Pull-out exists
W. Beaver Creek Blvd, west end	North	WB	S	Identify best location given ROW and drainage channels
W. Beaver Creek Blvd east end	North	WB	S	Identify best location given ROW and drainage channels
Lake Street - NB	East	NB	E2	Pullout Exists
Post Office (W. BC Blvd)	North	WB	E2	May be desirable with bi-directional service
Opposite Christie Lodge	South	EB	E2	Engineer to develop best location
Several stops on US 6	South	EB	E2	Share with ECO Transit; All have shelters but some upgrades may be desirable. Maps and signage needed
US 6 between Post Rd and Stonebridge (2 stops)	North	WB	E2	Share with ECO Transit; Have shelters but some upgrades may be desirable. Maps and signage needed.
Hurd Lane, opposite Avon Crossing	North	WB	E2	Identify best location
Hurd Lane, opposite Eaglebend North stop	North	WB	E1	Identify best location
Stonebridge	East	NB	E2	Identify best location given ROW and stream
East of Chapel Square	North	WB	E2	Locate east of intersection to serve new development and avoid
Village at Avon	North and South	EB and WB	E2	12 paired stops at 6 locations have been identified. Final locations will depend on roadway patterns.
Swift Gulch	N and S	EB and WB	Most E1	11 stops have been identified on road, most paired but only one on north side near Buffalo Ridge. Shelters might be desirable at 2 -4 of the busiest stops.
Wildridge Route	All	All	Most S	13 to 14 potential stops have been identified on this route. Final locations will need to consider grade and traffic considerations. Coordinate with school district; stops on grades should be on shoulder areas, and some base work and paving is anticipated to be needed.

Bus Stop Types
S = Simple
E1 – Enhanced Level I
E2 = Enhanced Level II

Attachment - Lake Street Shelter Example

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**Structure Erection: Installation of this structure is to be done with a competent supervisor in the construction trades. This supervisor must be capable of reading the drawing(s) & following Cedar Forest Products' installation instructions using good construction practices and procedures. The contractor will be required to shim, cut and make adjustments of fitting for proper building erection.

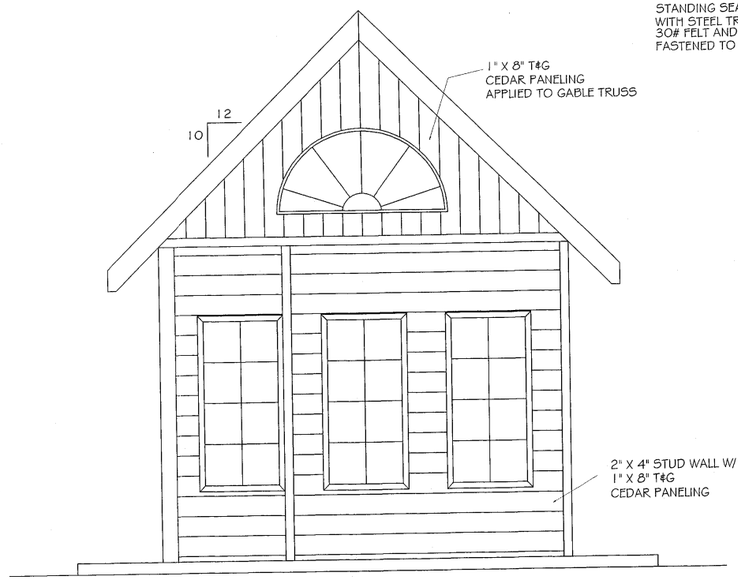
** Returns: After receipt of materials, the general contractor is responsible for the condition. No merchandise can be returned without written authorization. Merchandise with return authorization must be in saleable condition. A 35% restocking fee will be charged. Merchandise to be returned must be shipped insured and freight prepaid.

**Cedar Forest Products will not be liable for any unauthorized field work purchases to repair/replace/furnish materials. Any purchases must have prior written approval from Cedar Forest Products.

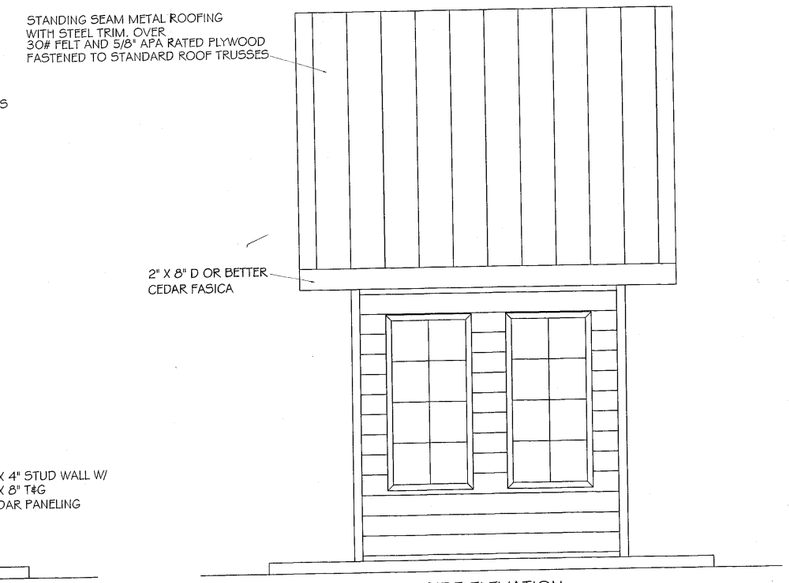
THE FOLLOWING WILL BE THE RESPONSIBILITY OF OTHERS

1. ALL CONSTRUCTION SHOULD MEET STATE & LOCAL BLDG. CODE RQMTS.
2. ASSUMED SOIL BEARING CAPACITY = 3,000 P.S.F. ALL FOOTINGS TO BEAR ON UNDISTURBED SOIL.
3. CONSULT WITH A LOCAL REGISTERED STRUCTURAL ENGINEER IF SOIL BEARING CONDITIONS ARE OTHER THAN ABOVE.
4. DESIGN, EXCAVATION AND CONSTRUCTION OF THE STRUCTURE(S) FOUNDATION MUST BE VERIFIED BY A REGISTERED STRUCTURAL ENGINEER.
5. DETERMINE ALL DESIGN LOADS PER LOCAL CODES.
6. CONCRETE TO BE 3,000 P.S.I. COMPRESSIVE STRENGTH IN 28 DAYS.
7. REINFORCING STEEL TO BE A.S.T.M. A-305 DEFORMED.
8. ALL CONSTRUCTION SURVEYING AND FIELD VERIFACATION OF ALL DIMENSIONS.
9. PROVIDE AND INSTALL: ALL CONCRETE, REINFORCING STEEL, & ANCHOR BOLTS.
10. UNLOAD ALL TRUCK(S) DELIVERING C.F.P. MATERIALS.
11. ERECTION OF THE STRUCTURE(S).

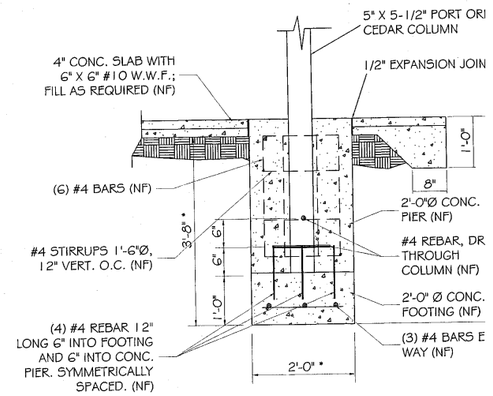
DESIGN DATA
SNOW LOAD= 75 PSF
DEAD LOAD= 15 PSF
WIND LOAD= 90 MPH
NOTE: CUSTOMER TO VERIFY ALL STATE AND LOCAL CODES



FRONT ELEVATION
SCALE: 1/2" = 1'-0"

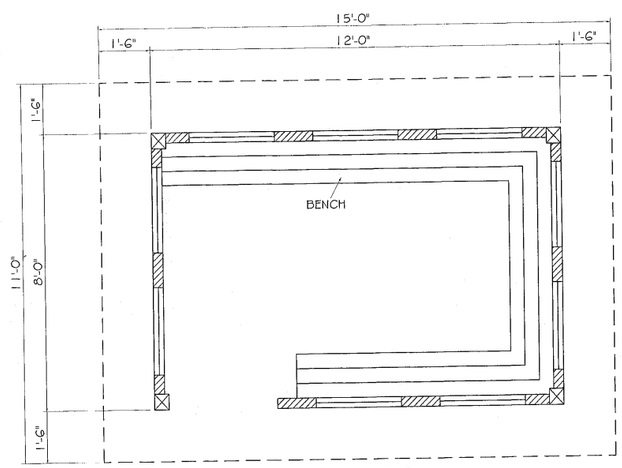


SIDE ELEVATION
SCALE: 1/2" = 1'-0"

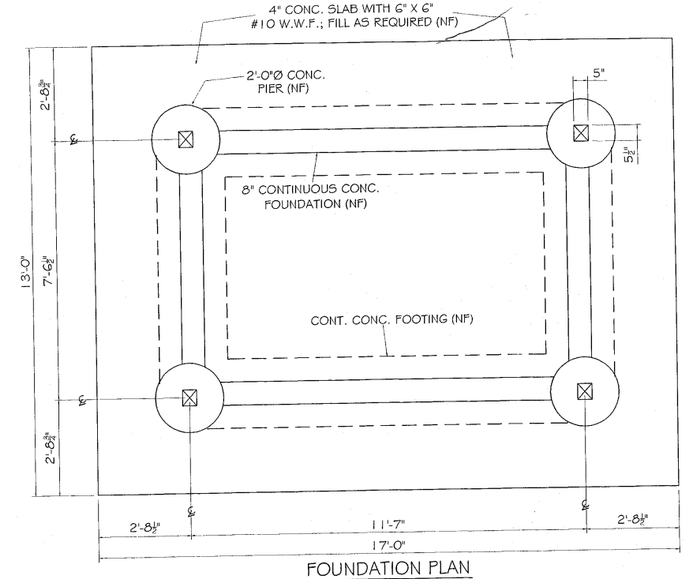


" * " - DIMENSIONS TO SUIT LOCAL CODES

COLUMN CROSS SECTION
SCALE 3/4"= 1'-0"



FLOOR PLAN
SCALE: 1/2" = 1'-0"



FOUNDATION PLAN
SCALE: 1/2" = 1'-0"

CFP
CEDAR FOREST PRODUCTS CO.
1008 S. DIVISION - BOX 98
POLO, ILLINOIS 61064
(815)-946-3994
(815)-946-2479 FAX
WWW. CEDARFORESTPRODUCTS.COM

REVIEWED BY:	NF-DENOTES NOT FURNISHED BY CEDAR FOREST PRODUCTS		QTY- 1	BUS STOP	REVISION DATES
	DEALER NAME:	MADE IN THE SCHADE	OWNER NAME:	LAKE STREET TRANSIT CENTER	REV: 2/29/08
	CITY/STATE:	EVERGREEN, CO.	CITY/STATE/ZIP:	AVON, CO.	REV:
	SALESPERSON:	DIANE SCHADE			REV:
					REV:

RECEIVED JUN 23 REC'D

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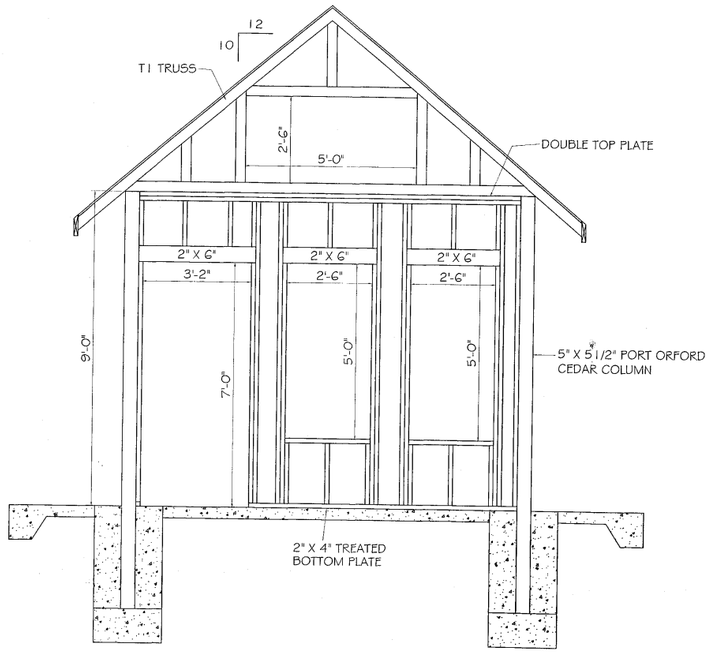
**Structure Erection: Installation of this structure is to be done with a competent supervisor in the construction trades. This supervisor must be capable of reading the drawing(s) & following Cedar Forest Products' installation instructions using good construction practices and procedures. The contractor will be required to shim, cut and make adjustments of fitting for proper building erection.

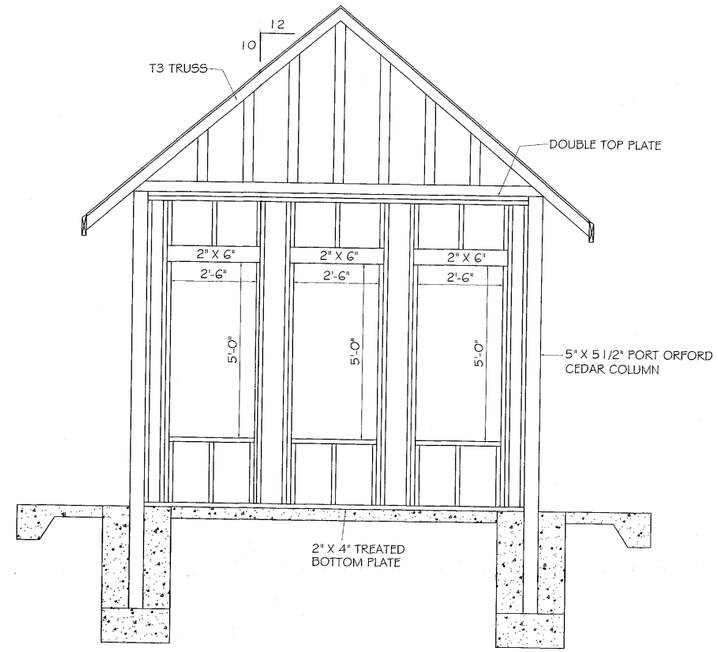
** Returns: After receipt of materials, the general contractor is responsible for the condition. No merchandise can be returned without written authorization. Merchandise with return authorization must be in saleable condition. A 35% restocking fee will be charged. Merchandise to be returned must be shipped insured and freight prepaid.

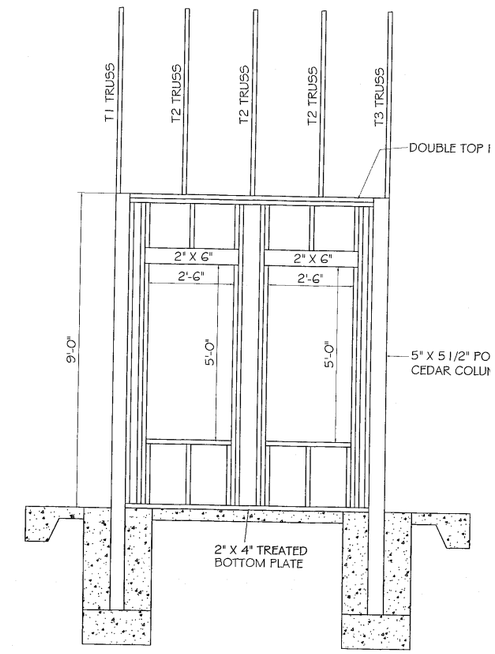
**Cedar Forest Products will not be liable for any unauthorized field work purchases to repair/replace/furnish materials. Any purchases must have prior written approval from Cedar Forest Products.

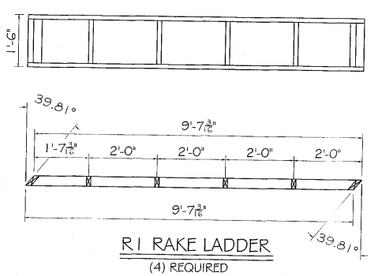
THE FOLLOWING WILL BE THE RESPONSIBILITY OF OTHERS

1. ALL CONSTRUCTION SHOULD MEET STATE & LOCAL BLDG. CODE RQMTS.
2. ASSUMED SOIL BEARING CAPACITY = 3,000 P.S.F. ALL FOOTINGS TO BEAR ON UNDISTURBED SOIL.
3. CONSULT WITH A LOCAL REGISTERED STRUCTURAL ENGINEER IF SOIL BEARING CONDITIONS ARE OTHER THAN ABOVE.
4. DESIGN, EXCAVATION AND CONSTRUCTION OF THE STRUCTURE(S) FOUNDATION MUST BE VERIFIED BY A REGISTERED STRUCTURAL ENGINEER.
5. DETERMINE ALL DESIGN LOADS PER LOCAL CODES.
6. CONCRETE TO BE 3,000 P.S.I. COMPRESSIVE STRENGTH IN 28 DAYS.
7. REINFORCING STEEL TO BE A.S.T.M. A-305 DEFORMED.
8. ALL CONSTRUCTION SURVEYING AND FIELD VERIFACATION OF ALL DIMENSION
9. PROVIDE AND INSTALL ALL CONCRETE, REINFORCING STEEL, & ANCHOR BOLT
10. UNLOAD ALL TRUCK(S) DELIVERING C.F.P. MATERIALS.
11. ERECTION OF THE STRUCTURE(S).

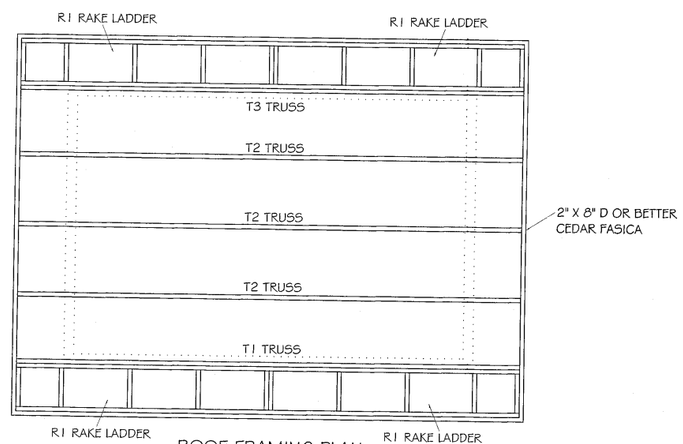




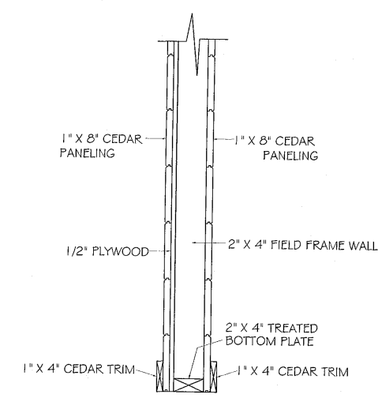




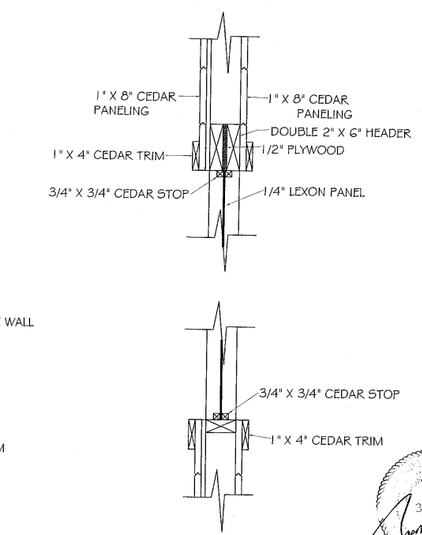
R1 RAKE LADDER
(4) REQUIRED



ROOF FRAMING PLAN
SCALE: 1/2" = 1'-0"



WALL CROSS SECTION



WINDOW CROSS SECTION

CFP
CEDAR FOREST PRODUCTS CO.
1008 S. DIVISION - BOX 98
POLO, ILLINOIS 61064
(815)-946-3994
(815)-946-2479 FAX
WWW. CEDARFORESTPRODUCTS.COM

REVIEWED BY:	NF-DENOTES NOT FURNISHED BY CEDAR FOREST PRODUCTS		QTY- 1	BUS STOP	REVISION DATES	DRAWN
	DEALER NAME:	MADE IN THE SCHADE	OWNER NAME:	LAKE STREET TRANSIT CENTER	REV:	KLY
	CITY/STATE:	EVERGREEN, CO.	CITY/STATE/ZIP:	AVON, CO.	REV:	2
	SALESPERSON:	DIANE SCHADE			REV:	
					REV:	

APPENDIX E APPROVED STREET PLANTINGS

Pre-approved Plantings for Avon Public Rights of Way

Common Name	Botanical Name	Minimum Planting Size (ft)	Approx. Full Grown Size	Selection/Planting Tips	Minimum Allowable Setbacks and Prune Height[1]
Evergreen Trees					
Engleman Spruce*	*Picea englemanni*	8	50'-80'	Slow growing, hardy. Not Drought tolerant.	20' setback- 6' Prune ht.
Colorado Blue Spruce*	*Picea pungens*	8	40'-60'	Not for extremely dry locations. Not Drought tolerant.	20' setback- 6' Prune ht.
Bristlecone Pine**	*Pinus aristata*	8	20'-40'	Pines need well drained soils.	15' setback- 6' Prune ht.
Pinyon Pine***	*Pinus edulis*	8	10'-20'	Very low water use.	10' setback- 4'-6' Prune
Ponderosa Pine**	*Pinus ponderosa scopulorum*	8	60'-80'	Drought & fire resistant ornamental.	20'-30' setback- 6'-8' Prune
Rocky Mountain Juniper**	*juniperous scopulorum & var.*	8	10'-30'	Available in native form or a wide selection of varieties offering different size, shape and foliage colors.	15' setback- 6' Prune ht.
Austrian Pine	*pinus nigra*	8	50'-60'	dense pyrimidal pine, withstands overwatering.	20'-30' setback- 6'-8' Prune
Dwarf Mugo Pine	*Pinus mugo 'Pumillo'*	8	4'-6'	Toplerates full sun. Low water.	5' setback
White Fir	*Abies concolor*	8	40'-60'		20'-30' setback- 6'-8' Prune
Rocky Mountain Douglas Fir	*Pseudotsuga menziesii*	8	50'-80'	Native Colorado Plant. Adaptable	25'-40' setback- 6'-8'- Prune
Deciduous Trees					
Tartarian Maple*	*Acer tartaricum*	2	20'-25'	Fairly drought tolerant, and less susceptible to chlorosis than Amur Maple.	15' setback- 6' prune
Ginnala Maple, Dwarf Amur Maple, Rocky Mountain Maple	*Acer ginnala,Acer ginnala "Compacta", Acer glabrum*	2	15'-20'	Full sun, very water usage.	15' setback- 6' prune
Rocky Mountain Maple**	*Acer glabrum*	2	10'-15'	In protected locations with adequate deep soil moisture.	15' setback- 6' prune
European Birch, varieties*	*Betula pendula & var.*	2	10'20'	Use where soils stay moist in top 18". Not recommended for southern aspects.	15' setback- 6' prune
Western Hackberry**	*Celtis occidentalis*	2	50'	Low water use. Ornamental.	30' setback- 6'-8' prune
Russian Hawthorn	*Ctataegus ambigua*	2	15'25'	Full sun to part shade. Xeric. Great for attracting birds.	20' setback- 6' prune
Thornless Honeylocust	*Gleditsia triacanthos inermis*	2	20'-30'	Survival of young trees may be questionable in exposed situations. Protect bark for first two years.	15' setback- 6' prune
Varieties: Shademaster, Skyline, Imperial*		2	30'-40'	Hardy to at least 8,500'. Small tree or large multi-trunked shrub.	15' setback- 6' prune
Native Chokecherry*, varieties**	*Prunus virginiana melanocarpa*	2	4'-8'	Native. Best with moist soils. Will show stress of drought conditions.	6' setback
White Poplar*	*Populus alba*	2	10'-20'	Group plantings only. Requires moderate water use and moist soils.	10' setback- 6' prune
Quaking Aspen*	*Populus tremuloides*	2	20'-30'	Fast growing, glossy green, white leaves. Low water use once established.	15' setback- 6' prune
Bur Oak***	*Uercus macrocarpa*	2	50'-60'	Small tree or large multi-trunk shrub.	30' setback- 6'-8' prune
Shubert Chokecherry***	*Prunus virginiana shubert*	2	20'-30'	Survival of young trees may be questionable in exposed situations. Hardy to at least 7,500'.	15' setback- 6' prune
European Mountain Ash*	*Sorbus aucuparia*	2	15'-25'		10' setback- 6' prune
Lanceleaf Cottonwood	*Populus acuminate*	2	40'-60'	Fast growing native tree. Moderate water needs.	25' setback- 6'-8' prune
Narrowleaf Cottonwood	*Populus angustifolia*	2	40'-60'		25' setback- 6'-8' prune

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Dir. of Public Works Transportation

Approval Date: 10/23/2007

Pre-approved Plantings for Avon Public Rights of Way

Common Name	Botanical Name	Minimum Planting Size (ft)	Approx. Full Grown Size	Selection/Planting Tips	Minimum Allowable Setbacks and Prune Height[1]
Evergreen Shrubs					
Pfitzer Juniper* **	*Juniperous chinensis*	5	Varies	Fast growing, hardy, low water use.	5' setback
Chinese Juniper varieties* **	*Juniperous chinensis var.*	5	Varies	Fast growing, hardy, low water use.	5' setback
Prostrata Juniper varieties* **	*Juniperous horizontalis var.*	5	Varies	Snow cover may be desirable for winter hardiness. Fast growing, hardy, low water use.	5' setback
Tammy Juniper* **	*Juniperous sabina tammariscifolia*	5	Varies	Fast growing, hardy, low water use.	5' setback
Creeping Grape Holly **	*Mahonia repens*	5	Varies	Native, low creeping evergreen. Best used with dark mountain soils. Drought tolerant.	5' setback
Mugho Pine **	*Pinus mugo mugus*	5	Varies	Slow growing, small tree or large shrub.	5' setback
Deciduous Shrubs					
Serviceberry* **	*Amelanchier*	5	15'-25'	Plant up to 10,000'. Attractive to wildlife.	20' setback- 6' prune
Japanese Barberry varieties **	*Berberis thunbergi var.*	5	6'-12'	Susceptible to winter burn.	6' setback
Siberian Peashrub **	*Caragana arborescens*	5	10'-15'	Tolerates dry sites well. Yellow, sweet, pea like flowers in early summer.	10' setback- 6' prune
Cinquefoil*	*Potentilla fruitcosa and var.*	5	varies	Hardy to 11,000'.	5' setback
Winged Euonymus*	*Euonymus alatus*	5	6'-12'	Hardiness may be questionable in exposed situations	10' setback- 6' prune
Forsythia	*Forsythia intermedia*	5	2'-8'	Early bloomer, needs pruning. Moist soils.	5' setback
Rubber Rabbitbrush* **	*Chrysothamnus nauseosus*	5	2'-6'	Hardy to 10,000'. Attracts butterflies and wildlife.	5' setback
Bearberry Honeysuckle*	*Lonicera involucrate*	5	3'-6'	Hardy to 10,000'. Native in moist soils.	5' setback
Oregon Grape Holly **	*Mahonia aquifolium*	5	3'-6'	Hardiness may be questionable in exposed situations.	5' setback
Potentilla varieties **	*Potentilla var.*	5	varies	Hardy to 10,000'.	5' setback
Chokecherry*	*Prunus melonocarpa*	5	15'-30'	Hardy to 9,000'. Moist locations only.	15' setback- 6' prune
Western Sand Cherry **	*Prunus besseyl*	5	4'-6'	Native. Hardy to 8,500'. Attractive to birds.	5' setback
Woods rose **	*Rosa woodsii*	5	4'-6'	Native. Hardy to 10,500'. Attractive to birds.	5' setback
Staghorn Sumac*	*Rhus typhina*	5	6'-8'	Native. Often more shrublike at higher elevations. Likes dry slopes.	5' setback
Dogwood, varieties "Varigated","Redosier", "Redtwig"	*Cornus var.*	5	varies, 6'-8'	Native. Adaptable to sun and water conditions. Tolerates moist areas.	5' setback
Western or Alpine Currant **	*Ribes Inerme or alpinum*	5	3'-6'	Native. Hardy to 10,000'. Attracts birds.	5' setback
Gooseberry varities	*Ribes hirtellum var.*	5	3'-4'	Full to partial sun. Adaptable to dry conditions.	5' setback
Peking Cotoneaster* **	*Cotoneaster acutifolia*	5	3'-6'	Hardy above 10,000'. Tolerates dry, rocky sites.	5' setback
Spreading Cotoneaster	*Cotoneaster divaricatus*	5	4'-6'		5' setback
Redberried Elder	*Sambucus pubens*	5	4'-12'	Native. Hardy to 12,000'. Needs moist soils.	5' setback
Vanhoutte Spirea*	*Spiraea vanhouttei*	5	5'-7'	Native. Probably Hardy to 9,000' but may suffer some winter kill.	5' setback
Spiraea varieties- "Goldflame", "Limemound","Snowmound"	*Spiraea japonica "Goldflame",Spiraea japonica "Limemound", Spiraea nipponica "Snowmound".*	5	varies, 2'-24'	Full to partial sun. Adaptable to most water conditions.	varies, 5'-15'
Snowberry*	*Symphoricarpos albus laevigatus*	5	3'-4'	Shade tolerant. Hardy to 8,500'. Attracts birds and small mammals.	5' setback
Antelope Brush **	*Purshia tridentate*	5	2'-10'	Native. Hardy to 9,000'. Good for rocky south slopes.	5' setback

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Common Name	Botanical Name	Minimum Planting Size (ft)	Approx. Full Grown Size	Selection/Planting Tips	Minimum Allowable Setbacks and Prune Height[1]
Deciduous Shrubs (continued)					
Late Lilac (& var.)*	*Syringa villosa*	5	2'-10'	Native. Among last to bloom of lilacs (July in high elevations).	5' setback
Wayfaringtree viburnum*	*Viburnum lantana*	5	4'-12'	Hardy to 8,000'. Grey-green foliage.	5' setback
European Cranberrybush*	*Viburnum opulus*	5	4'-5'	Best with supplied water. Hardy to 10,000'.	5' setback
Golden Elder	*Sambucus canadensis*	5	8'-12'	Tolerates full sun and dry areas. Hardy to 8000'.	6' setback
Russian Sage	*Perovskia*	5	3'-4'	Tolerates dry conditions, full sun.	
Purple Leaf Plum	*Prunus var.*	5	6'-8'	Adaptable to water and sun conditions.	5' setback
Lilac var.	*Syringia*	5	4'-12'	Adapts to water and sun conditions.	5' setback
Rose Species	*Rosa var*	5	varies	Full to sun. Adaptable to dry conditions.	5' setback
Raspberry Species	*Rubus var.*	5	varies	native species are very adaptable to all growing conditions.	5' setback
Ground Covers					
Carpet Bugle**	*Ajuga reptans*	1	4"-6"	Fast growing. Low water use.	
Snow on the Mountain*	*Aegopodium variegatum*	1	6"-12"	Most ground covers will require snow cover or mulch to insure winter hardiness	
Ice plant	*Delosperma var.*	1	3"-6"	Perennial, spreading dense, tufty mats of silvery-gray leaves, white flowers.	
Kinnikinnick**	*Arctostaphylos uva-ursi*	1	3"-6"	Leathery brown ground cover.	
Wintercreeper Euonymus*	*Euonymus vegetus "Coloratus"*	1	12"-18"	Evergreen ground cover.	
Thyme species	*Thymus var.*	1	1"-2"	Low water use once established.	
Golden Carpet Stonecrop***	*Sedum acre 'Utah'*	1	8"-12"	Low water use once established. Good for rock gardens.	
Orange Sedum***	*Sedum kamtschaticum*	1	8"-12"	Low water use once established.	
Two-Row Stonecrop***	*Sedum spurium*	1	8"-12"	Low water use once established.	
Cereping Colorado Holly	*Mahonia repens*	1	12"-18"	Full to partial sun. Tolerates shade. Adaptable to water conditions.	
Grasses					
Kentucky Bluegrass (Improved Disease Resistant Varieties only)	*Poa pretensis*			High water use, in most fescue mixes. Likes moist soils.	
Park Kentucky Bluegrass (Improved Disease Resistant Varieties only)	*Poa pratensis "Park"*			High water use. Likes moist fertile soils.	
Red Fescue	*Festuca rubra & var.*			Not for high traffic areas. Cool season grass. Medium to clay soils.	
Buffalograss**	*Buchioe dactyloides*			Low water use. Medium to fine texture soils. Can combine with cool season types.	
Blue Grama**	*Bouteloua gracilis*			Low water use. Medium to fine texture soils. Can combine with cool season types.	

1. "Set back" shall be measured from edge of asphalt, edge of sidewalk, or back crest of ditch; whichever is more restrictive for plant in question. "Prune height" shall be measured from the ground at the base of the plant and must be sufficient to maintain visibility from the adjacent r.o.w.. In the event of a conflict, the Director of Public Works shall establish the set back and prune height.

Water demands are noted by these ratings:
*Moderate Water Use (14"/season)
**Low Water Use (8"/season)
*** Very Low Water Use (4"/season)

DISCLAIMER: This is a list of plants known to grow reletively well in Avon. However, due to microclimantes and site constraints, the inclusion of a plant on this list does not guarantee survival. Consult your local landscaping professional for more information.

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Dir. of Public Works Transportation

Approval Date: 10/23/2007

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