

final report

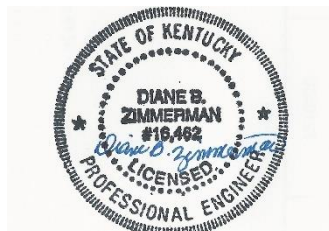
January 19, 2018
Revised February 21, 2018

Traffic Impact Study

Manor Creek Subdivision
1312 Flat Rock Road
Louisville, KY

Prepared for

Louisville Metro Planning Commission
Kentucky Transportation Cabinet



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INTRODUCTION

The development plan for Manor Creek subdivision on Flat Rock Road in Louisville, KY shows 204 single family lots. **Figure 1** displays a map of the site. Access to the subdivision will be from Flat Rock Road, Bowline View Trail and Tatton Drive. The purpose of this study is to examine the traffic impacts of the development upon the adjacent highway system. For this study, the impact area was defined to be the intersections of Flat Rock Road with Aiken Road, Curry Branch Road, Polo Fields Lane, and Shelbyville Road.



Figure 1. Site Map

EXISTING CONDITIONS

Flat Rock Road is a Metro maintained road with an estimated 2017 ADT of 2,100 vehicles per day north of Polo Fields Lane, as estimated from the turning movement count. The road is a two-lane highway with ten-foot lanes and a two-foot shoulder. The speed limit is 35 mph. There are no sidewalks. The intersection with US 60 is controlled with a traffic signal. There are dedicated left turn lanes on eastbound US 60 and southbound Flat Rock Road. The intersection with Polo Fields Lane is controlled with a stop sign on Polo Fields Lane. There are no turn lanes. The intersection with Bowline View Trail and Curry Branch Road is an all-way stop. The intersection with Aiken Road is controlled with a stop sign on Flat Rock Road. There are no turn lanes.

Peak hour traffic counts for the intersections were obtained on December 5 and 12, 2017. The a.m. peak hour occurred varied. The p.m. peak occurred between 5:00 and 6:00 p.m. **Figure 2** illustrates the existing a.m. and p.m. peak hour traffic volumes.

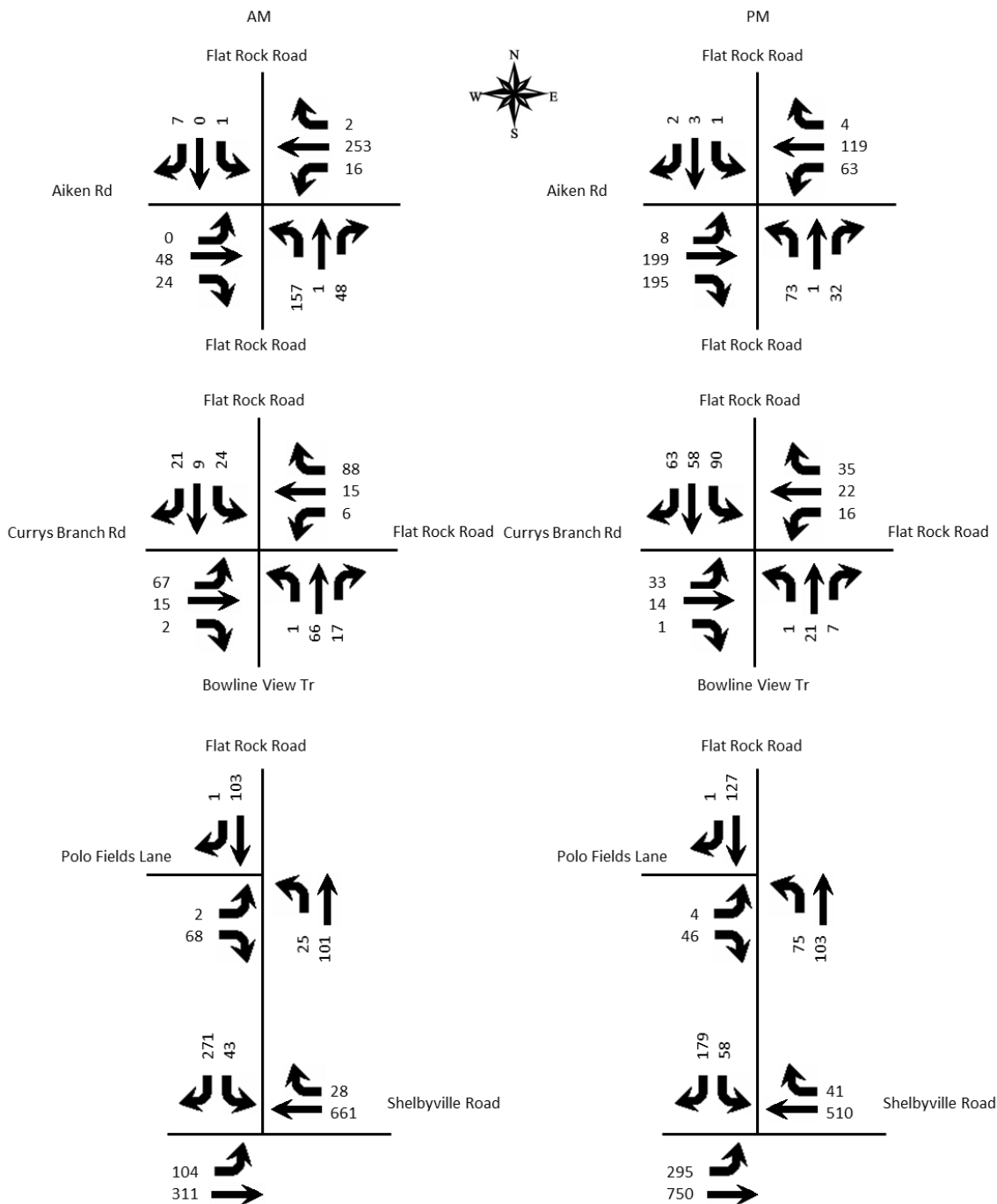


Figure 2. Existing Peak Hour Volumes

FUTURE CONDITIONS

The project completion date is 2023. An annual growth rate of 1.0 percent was applied to all volumes. Additionally, the trip generation for the developments listed in Table 1 were included. **Figure 3** displays the 2023 No Build peak hour volumes.

Table 1. Peak Hour Trips Generated by Adjacent Subdivisions

	A.M. Peak Hour			P.M. Peak Hour		
	Trips	In	Out	Trips	In	Out
Flat Rock Ridge by Ball Homes 116 lots	87	22	65	117	74	43
Inverness Homes 40 lots	33	8	25	42	27	15
Hills - Lake View 40 lots	33	8	25	42	27	15
Hills - Glen Lakes 41 lots	34	9	25	43	27	16
Bryant Farms by Ball Homes 102 lots	77	19	58	104	65	39
Total 339 lots	264	66	198	348	220	128

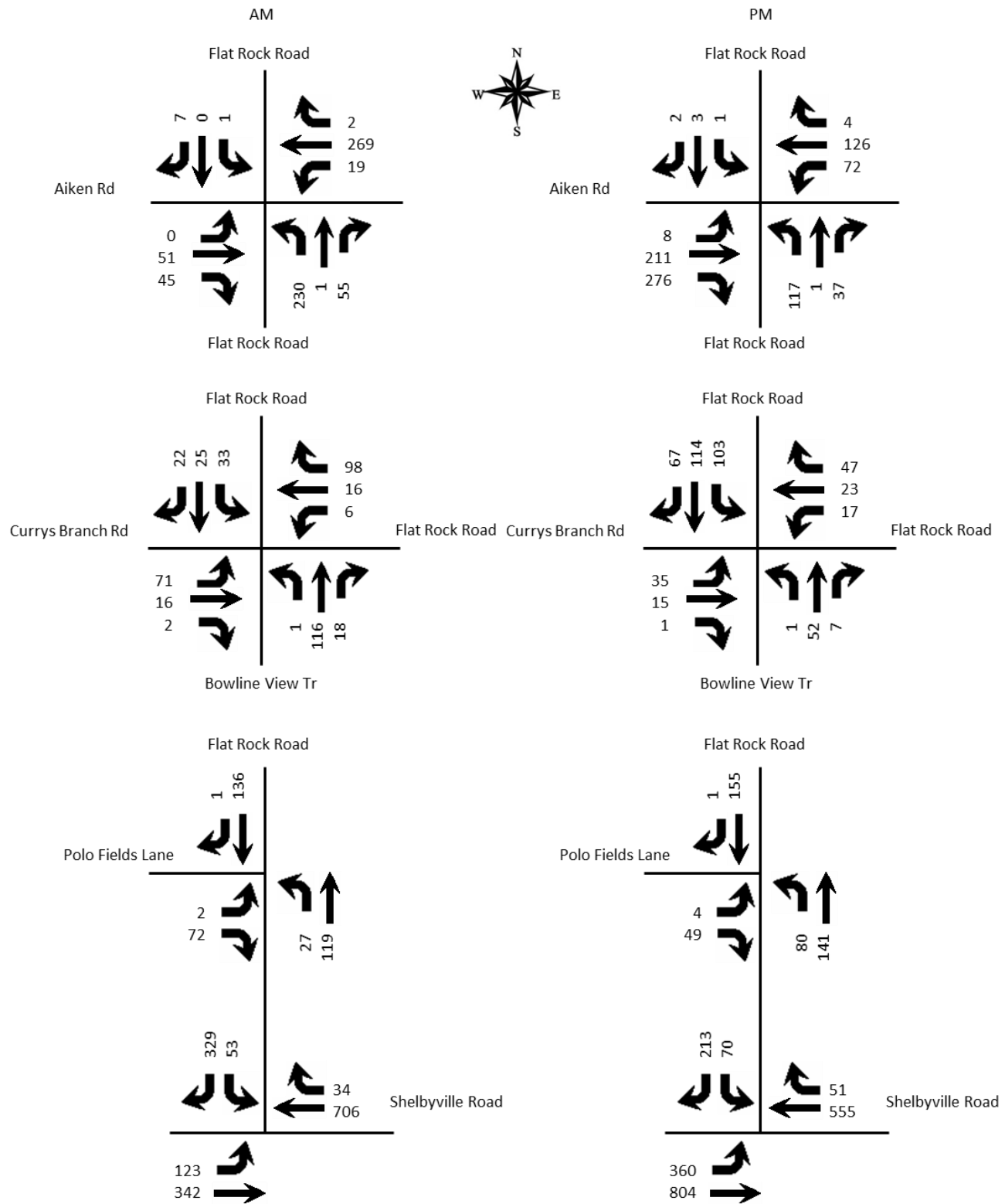


Figure 3. No Build Peak Hour Volumes

TRIP GENERATION

The Institute of Transportation Engineers Trip Generation Manual, 10th Edition contains trip generation rates for a wide range of developments. The land use of “Single Family Detached (210)” was reviewed and determined to be the best match. The trip generation results are listed in **Table 2**. The trips were assigned to the highway network with the percentages shown in **Figure 4**. **Figure 5** shows the trips generated by this development and distributed throughout the road network during the peak hours. **Figure 6** displays the individual turning movements for the peak hours when the development is completed.

Table 2. Peak Hour Trips Generated by Site

Land Use	A.M. Peak Hour			P.M. Peak Hour		
	Trips	In	Out	Trips	In	Out
Single Family Detached (204 lots)	150	38	112	201	127	74

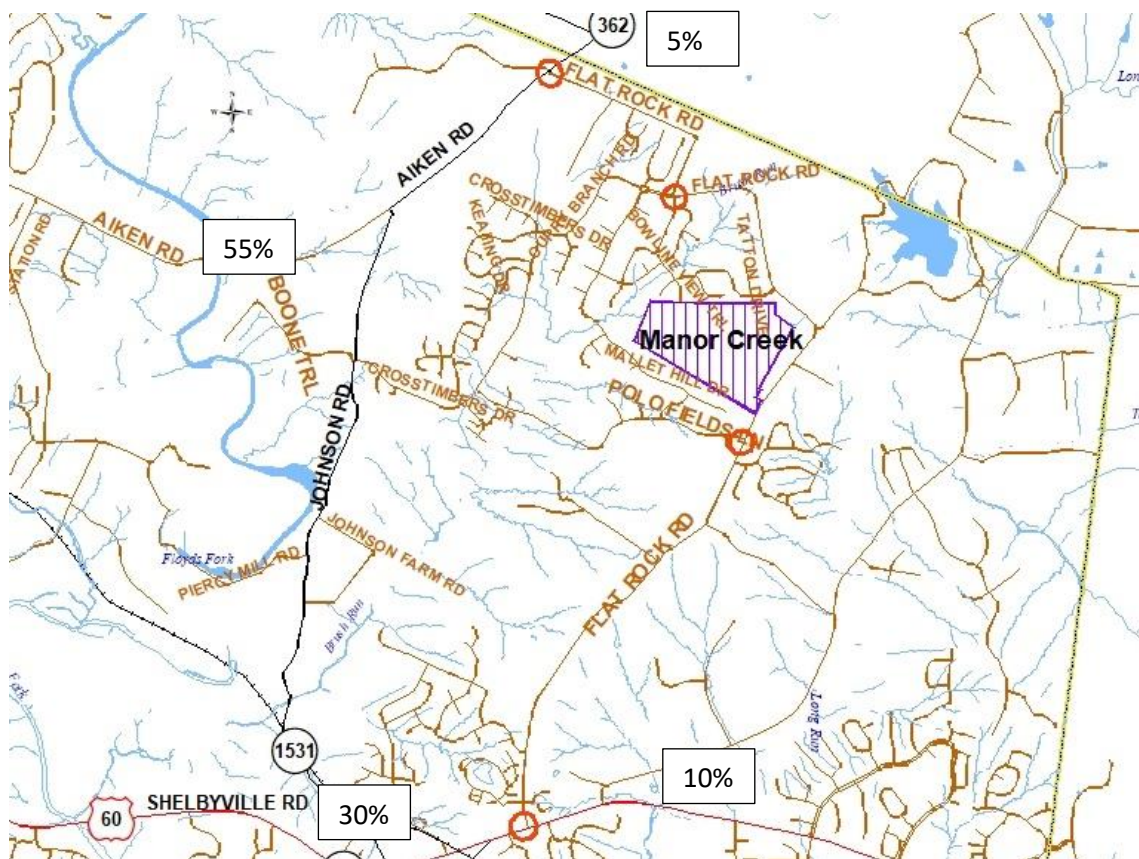


Figure 4. Trip Distribution Percentages

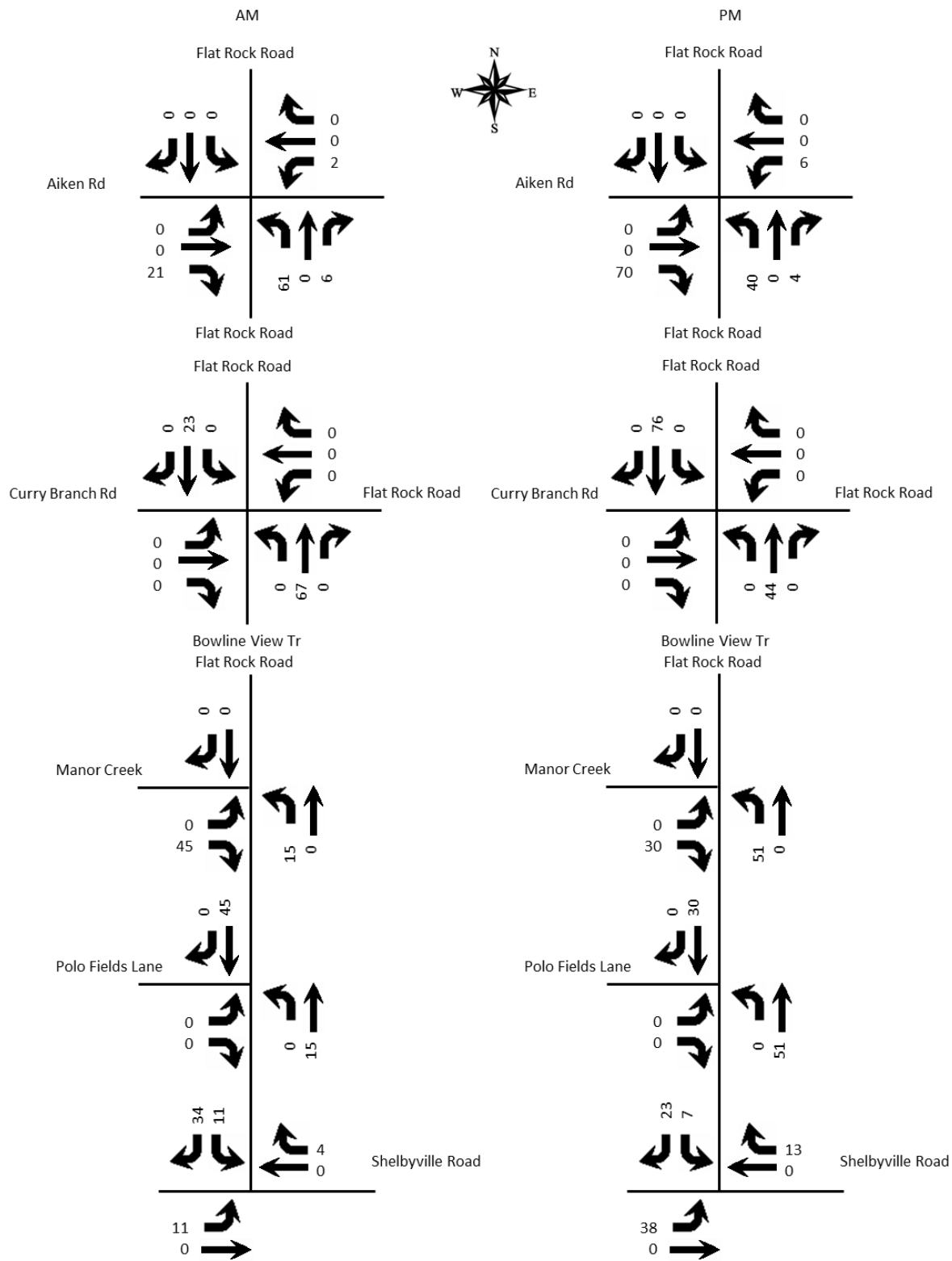


Figure 5. Peak Hour Trips Generated by Site

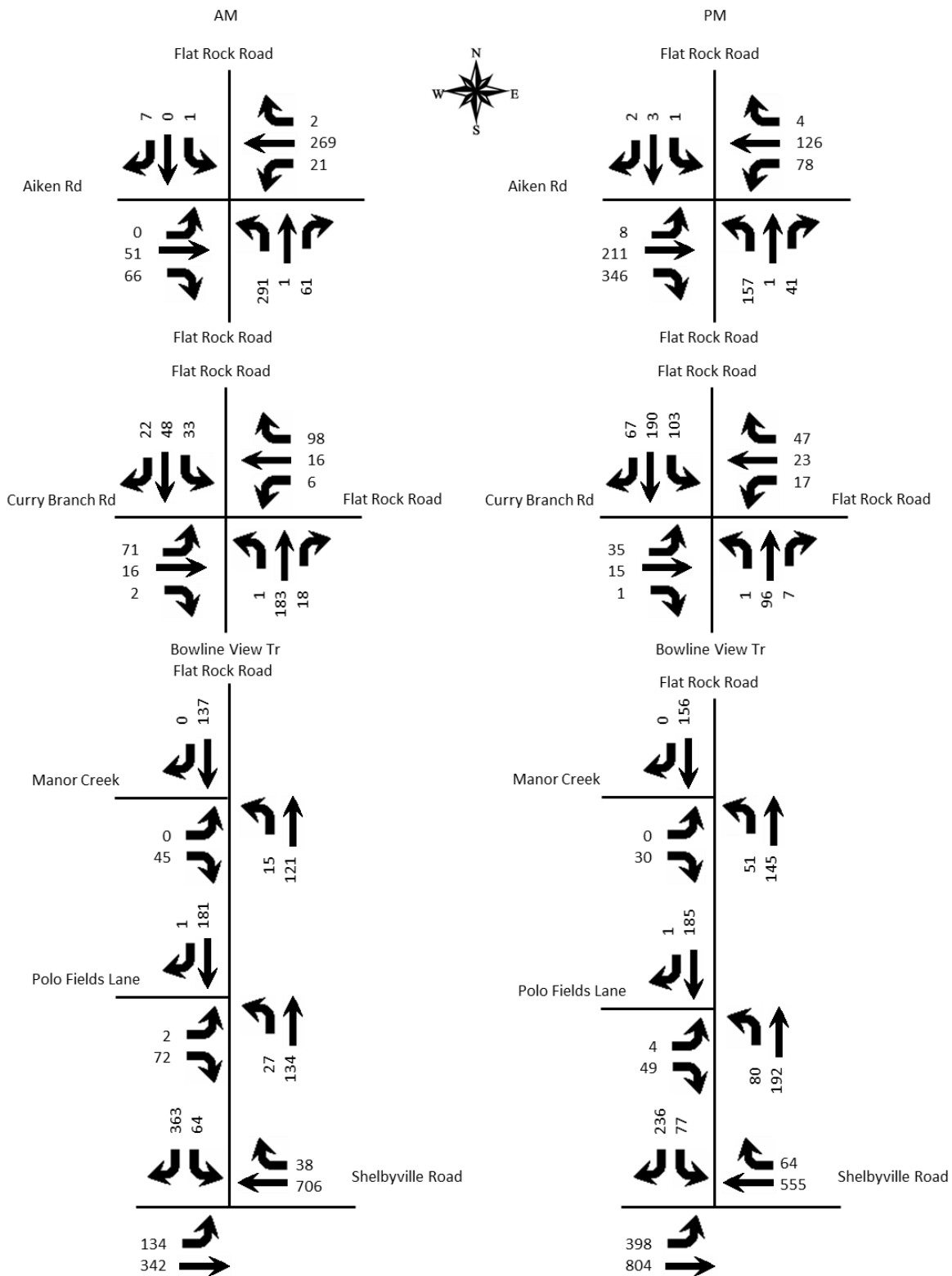


Figure 6. Build Peak Hour Volumes

ANALYSIS

The qualitative measure of operation for a roadway facility or intersection is evaluated by assigning a “Level of Service”. Level of Service is a ranking scale from A through F, “A” is the best operating condition and “F” is the worst. Level of Service results depend upon the facility that is analyzed. In this case, the Level of Service is based upon the total delay experienced at an intersection.

To evaluate the impact of the proposed development, the vehicle delays at the intersections were determined using procedures detailed in the Highway Capacity Manual, 6th edition. Future delays and Level of Service were determined for the intersections using the HCS Streets (version 7.4) software. The delays and Level of Service are summarized in **Table 3**.

Table 3. Peak Hour Level of Service

Approach	A.M.			P.M.		
	2017 Existing	2023 No Build	2023 Build	2017 Existing	2023 No Build	2023 Build
Shelbyville Road at Flat Rock Road	C 21.1	C 26.2	C 28.7	B 13.6	B 16.5	B 19.1
Shelbyville Road Eastbound	A 8.7	B 11.5	B 12.4	A 8.2	B 11.1	B 14.3
Shelbyville Road Westbound	C 21.0	C 28.8	C 31.0	B 14.1	B 18.6	C 21.7
Flat Rock Road Southbound	D 37.6	D 39.0	D 42.8	D 36.2	C 33.8	C 32.2
Flat Rock Road at Polo Fields Lane						
Polo Fields Lane Westbound	A 9.2	A 9.5	A 9.8	A 9.4	A 9.6	A 9.9
Flat Rock Road Northbound (left)	A 7.6	A 7.6	A 7.8	A 7.6	A 7.7	A 7.8
Flat Rock Road at Manor Creek Entrance						
Manor Creek Westbound			A 9.3			A 9.3
Flat Rock Road Northbound (left)			A 7.5			A 7.7
Flat Rock Road at Bowline View Trail	A 7.9	A 8.4	A 8.9	A 8.5	A 9.5	B 10.9
Currys Branck Road Eastbound	A 8.2	A 8.6	A 8.9	A 8.2	A 8.7	A 9.1
Flat Rock Road Westbound	A 7.6	A 8.0	A 8.4	A 7.9	A 8.4	A 8.9
Bowline View Trail Northbound	A 7.9	A 8.6	A 9.4	A 7.6	A 8.1	A 8.8

Approach	A.M.			P.M.		
	2017 Existing	2023 No Build	2023 Build	2017 Existing	2023 No Build	2023 Build
Flat Rock Road Southbound	A 7.9	A 8.3	A 8.7	A 8.9	B 10.3	B 12.3
Aiken Road at Flat Rock Road						
Aiken Road Eastbound (left)	A 7.8	A 7.8	A 7.8	A 7.5	A 7.5	A 7.5
Aiken Road Westbound (left)	A 7.4	A 7.4	A 7.5	A 8.4	A 8.8	A 9.1
Flat Rock Road Northbound	B 13.8	C 17.9	C 23.7	C 16.3	C 23.1	D 32.4
Flat Rock Road Southbound	B 10.2	B 10.4	B 10.4	B 13.6	C 15.1	C 16.4

Key: Level of Service, Delay in seconds per vehicle

The main entrance for Manor Creek was evaluated for turn lanes using the Kentucky Transportation Cabinet Highway Design Guidance Manual dated March, 2017. Using the volumes in Figure 6, neither a left nor right turn lane will be required.

CONCLUSIONS

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2023, there will be a manageable impact to the existing highway network, with Levels of Service remaining within acceptable limits. The delays experienced in the area will increase within acceptable limits. No roadway improvements are required.

A separate traffic study was prepared examining the impacts of intersections in the vicinity. See the study Aiken Road and Johnson Road Vicinity for full details. On Shelbyville Road at Johnson Road, this development will add three percent to the projected through volume on Shelbyville Road in 2025. Left turn lanes have been proposed on all approaches, which will significantly improve the operation of the intersection. At the intersection of Old Henry Road and Bush Farm Road, this development will add four percent to the projected volumes at the intersection. The recommended improvement at this intersection is an additional westbound left turn lane (creating dual left turn lanes) on Bush Farm Road.

APPENDIX

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

Traffic Counts



Marr Traffic
 Transportation Data Collection

Louisville, KY
 Classified Turn Movement Count

Site 1 of 4
 US-60 Shelbyville Rd (West)
 US-60 Shelbyville Rd (East)
 Flat Rock Rd

41 Peabody Street, Nashville, TN 37210
 1 (615) 431-6750
 1 (800) 615-3765

Lat/Long
 38.235922°, -85.444249°

Date
 Tuesday 5 December 2017

Weather
 Cloudy
 Temp: 8°C

	Eastbound					Westbound					Southbound					Int
	US-60 Shelbyville Rd (West)					US-60 Shelbyville Rd (East)					Flat Rock Rd					
	U-Turn	Left	Thru	Peds	App	U-Turn	Thru	Right	Peds	App	U-Turn	Left	Right	Peds	App	
0700 - 0715	0	7	36	0	43	0	187	6	0	193	0	4	88	0	92	328
0715 - 0730	0	11	57	0	68	0	199	7	0	206	0	7	74	0	81	355
0730 - 0745	0	26	95	0	121	0	178	12	0	190	0	10	67	0	77	388
0745 - 0800	0	29	93	0	122	0	145	2	0	147	0	14	58	0	72	341
Hourly Total	0	73	281	0	354	0	709	27	0	736	0	35	287	0	322	1412
0800 - 0815	0	38	66	0	104	0	139	7	0	146	0	12	72	0	84	334
0815 - 0830	0	22	92	0	114	0	132	5	0	137	0	4	51	0	55	306
0830 - 0845	0	23	62	0	85	0	145	4	0	149	0	9	63	0	72	306
0845 - 0900	0	23	69	0	92	0	122	6	0	128	0	5	37	0	42	262
Hourly Total	0	106	289	0	395	0	538	22	0	560	0	30	223	0	253	1208
1600 - 1615	0	53	142	0	195	0	100	11	0	111	0	9	31	0	40	346
1615 - 1630	0	48	178	0	226	0	100	8	0	108	0	10	41	0	51	385
1630 - 1645	0	62	185	0	247	0	122	15	0	137	0	10	30	0	40	424
1645 - 1700	0	54	176	0	230	0	102	10	0	112	0	7	38	0	45	387
Hourly Total	0	217	681	0	898	0	424	44	0	468	0	36	140	0	176	1542
1700 - 1715	0	64	203	0	267	0	129	9	0	138	0	15	46	0	61	466
1715 - 1730	0	87	207	0	294	0	122	14	0	136	0	19	39	0	58	488
1730 - 1745	0	61	175	0	236	0	137	11	0	148	0	17	50	0	67	451
1745 - 1800	0	83	165	0	248	0	122	7	0	129	0	7	44	0	51	428
Hourly Total	0	295	750	0	1045	0	510	41	0	551	0	58	179	0	237	1833
Grand Total	0	691	2001	0	2692	0	2181	134	0	2315	0	159	829	0	988	5995
Cars	0	674	1965	-	2639	0	2138	124	-	2262	0	153	812	-	965	
Trucks	0	17	36	-	53	0	43	10	-	53	0	6	17	-	23	
P/Cycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	
Cars (%)	0.00	97.54	98.20	-	98.03	0.00	98.03	92.54	-	97.71	0.00	96.23	97.95	-	97.67	
Trucks (%)	0.00	2.46	1.80	-	1.97	0.00	1.97	7.46	-	2.29	0.00	3.77	2.05	-	2.33	
P/Cycles (%)	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	

	Eastbound					Westbound					Southbound					Int
	US-60 Shelbyville Rd (West)					US-60 Shelbyville Rd (East)					Flat Rock Rd					
	U-Turn	Left	Thru	Peds	App	U-Turn	Thru	Right	Peds	App	U-Turn	Left	Right	Peds	App	
0715 - 0730	0	11	57	0	68	0	199	7	0	206	0	7	74	0	81	355
0730 - 0745	0	26	95	0	121	0	178	12	0	190	0	10	67	0	77	388
0745 - 0800	0	29	93	0	122	0	145	2	0	147	0	14	58	0	72	341
0800 - 0815	0	38	66	0	104	0	139	7	0	146	0	12	72	0	84	334
AM Peak	0	104	311	0	415	0	661	28	0	689	0	43	271	0	314	1418
1700 - 1715	0	64	203	0	267	0	129	9	0	138	0	15	46	0	61	466
1715 - 1730	0	87	207	0	294	0	122	14	0	136	0	19	39	0	58	488
1730 - 1745	0	61	175	0	236	0	137	11	0	148	0	17	50	0	67	451
1745 - 1800	0	83	165	0	248	0	122	7	0	129	0	7	44	0	51	428
PM Peak	0	295	750	0	1045	0	510	41	0	551	0	58	179	0	237	1833

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

Louisville, KY
 Classified Turn Movement Count



Marr Traffic
 Transportation Data Collection

Site 2 of 4
 Polo Fields Ln
 Flat Rock Rd (South)
 Flat Rock Rd (North)

41 Peabody Street, Nashville, TN 37210
 1 (615) 431-6750
 1 (800) 615-3765

Lat/Long
 38.256156°, -85.430013°

Date
 Tuesday 5 December 2017

Weather
 Cloudy
 Temp: 8°C

	Eastbound					Northbound					Southbound					Int
	Polo Fields Ln					Flat Rock Rd (South)					Flat Rock Rd (North)					
	U-Turn	Left	Right	Peds	App	U-Turn	Left	Thru	Peds	App	U-Turn	Thru	Right	Peds	App	
0700 - 0715	0	1	28	0	29	0	5	7	0	12	0	27	0	0	27	68
0715 - 0730	0	0	22	0	22	0	1	18	0	19	0	22	0	0	22	63
0730 - 0745	0	1	15	0	16	0	6	31	0	37	0	23	0	0	23	76
0745 - 0800	0	0	18	0	18	0	9	26	0	35	0	23	0	0	23	76
Hourly Total	0	2	83	0	85	0	21	82	0	103	0	95	0	0	95	283
0800 - 0815	0	1	13	0	14	0	9	26	0	35	0	35	1	0	36	85
0815 - 0830	0	1	7	0	8	0	8	20	0	28	0	15	0	0	15	51
0830 - 0845	0	1	20	0	21	0	4	30	0	34	0	19	0	0	19	74
0845 - 0900	0	0	7	0	7	0	9	21	0	30	0	14	0	0	14	51
Hourly Total	0	3	47	0	50	0	30	97	0	127	0	83	1	0	84	261
1600 - 1615	0	1	15	0	16	0	17	16	0	33	0	27	0	0	27	76
1615 - 1630	0	0	12	0	12	0	16	21	0	37	0	25	0	0	25	74
1630 - 1645	0	0	9	0	9	0	14	28	0	42	0	23	2	0	25	76
1645 - 1700	0	0	12	0	12	0	15	23	0	38	0	30	0	0	30	80
Hourly Total	0	1	48	0	49	0	62	88	0	150	0	105	2	0	107	306
1700 - 1715	0	0	14	0	14	0	19	22	0	41	0	42	0	0	42	97
1715 - 1730	0	1	9	0	10	0	19	32	0	51	0	26	0	0	26	87
1730 - 1745	0	1	12	0	13	0	12	25	0	37	0	29	0	0	29	79
1745 - 1800	0	2	11	0	13	0	25	24	0	49	0	30	1	0	31	93
Hourly Total	0	4	46	0	50	0	75	103	0	178	0	127	1	0	128	356
Grand Total	0	10	224	0	234	0	188	370	0	558	0	410	4	0	414	1206
Cars	0	8	222	-	230	0	180	356	-	536	0	395	4	-	399	
Trucks	0	2	2	-	4	0	8	14	-	22	0	15	0	-	15	
P/Cycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	
Cars (%)	0.00	80.00	99.11	-	98.29	0.00	95.74	96.22	-	96.06	0.00	96.34	100.00	-	96.38	
Trucks (%)	0.00	20.00	0.89	-	1.71	0.00	4.26	3.78	-	3.94	0.00	3.66	0.00	-	3.62	
P/Cycles (%)	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	-	0.00	

	Eastbound					Northbound					Southbound					Int
	Polo Fields Ln					Flat Rock Rd (South)					Flat Rock Rd (North)					
	U-Turn	Left	Right	Peds	App	U-Turn	Left	Thru	Peds	App	U-Turn	Thru	Right	Peds	App	
0715 - 0730	0	0	22	0	22	0	1	18	0	19	0	22	0	0	22	63
0730 - 0745	0	1	15	0	16	0	6	31	0	37	0	23	0	0	23	76
0745 - 0800	0	0	18	0	18	0	9	26	0	35	0	23	0	0	23	76
0800 - 0815	0	1	13	0	14	0	9	26	0	35	0	35	1	0	36	85
AM Peak	0	2	68	0	70	0	25	101	0	126	0	103	1	0	104	300
1700 - 1715	0	0	14	0	14	0	19	22	0	41	0	42	0	0	42	97
1715 - 1730	0	1	9	0	10	0	19	32	0	51	0	26	0	0	26	87
1730 - 1745	0	1	12	0	13	0	12	25	0	37	0	29	0	0	29	79
1745 - 1800	0	2	11	0	13	0	25	24	0	49	0	30	1	0	31	93
PM Peak	0	4	46	0	50	0	75	103	0	178	0	127	1	0	128	356

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Site 4 of 4
 Curry Branch Rd
 Flat Rock Rd (East)
 Bowline View Trail
 Flat Rock Rd (North)

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 1 (615) 431-6750
 1 (800) 615-3765

Lat/Long
 38.268859°, -85.434657°

Date
 Tuesday 5 December 2017

Weather
 Cloudy
 Temp: 8°C

	Eastbound Curry Branch Rd						Westbound Flat Rock Rd (East)						Northbound Bowline View Trail						Southbound Flat Rock Rd (North)						Int
	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	
0700 - 0715	0	23	10	0	0	33	0	0	0	9	0	9	0	0	11	2	0	13	0	5	0	4	0	9	64
0715 - 0730	0	23	6	0	0	29	0	1	2	10	0	13	0	0	18	3	0	21	0	6	2	2	0	10	73
0730 - 0745	0	19	6	0	0	25	0	2	1	29	0	32	1	0	17	1	0	19	0	4	1	5	0	10	86
0745 - 0800	0	16	3	1	0	20	0	1	2	20	0	23	0	0	15	1	0	16	0	9	3	7	0	19	78
Hourly Total	0	81	25	1	0	107	0	4	5	68	0	77	1	0	61	7	0	69	0	24	6	18	0	48	301
0800 - 0815	0	19	5	0	0	24	0	1	7	19	0	27	0	1	14	10	1	26	0	8	2	6	0	16	93
0815 - 0830	0	13	1	1	0	15	0	2	5	20	0	27	0	0	20	5	0	25	0	3	3	3	0	9	76
0830 - 0845	0	18	6	0	0	24	0	2	0	20	0	22	0	0	26	1	0	27	0	6	2	3	0	11	84
0845 - 0900	0	9	1	0	0	10	0	0	0	21	0	21	0	0	15	1	0	16	0	9	8	8	0	25	72
Hourly Total	0	59	13	1	0	73	0	5	12	80	0	97	0	1	75	17	1	94	0	26	15	20	0	61	325
1600 - 1615	0	4	8	0	0	12	0	1	7	4	0	12	0	0	4	4	0	8	0	20	17	14	0	51	83
1615 - 1630	0	9	6	0	0	15	0	2	6	9	0	17	0	0	2	2	0	4	0	13	14	16	0	43	79
1630 - 1645	0	7	3	0	0	10	0	3	11	8	0	22	0	1	1	6	0	8	0	18	16	8	0	42	82
1645 - 1700	0	4	1	0	0	5	0	3	5	11	0	19	0	0	4	2	0	6	0	18	8	19	0	45	75
Hourly Total	0	24	18	0	0	42	0	9	29	32	0	70	0	1	11	14	0	26	0	69	55	57	0	181	319
1700 - 1715	0	6	2	0	0	8	0	5	3	6	0	14	0	1	6	1	2	10	0	30	13	12	0	55	87
1715 - 1730	0	10	3	0	0	13	0	3	8	8	0	19	0	0	9	2	2	13	0	17	17	11	0	45	90
1730 - 1745	0	9	7	1	0	17	0	7	8	10	0	25	0	0	2	2	0	4	0	23	19	19	0	61	107
1745 - 1800	0	8	2	0	0	10	0	1	3	11	0	15	0	0	4	2	0	6	0	20	9	21	0	50	81
Hourly Total	0	33	14	1	0	48	0	16	22	35	0	73	0	1	21	7	4	33	0	90	58	63	0	211	365
Grand Total	0	197	70	3	0	270	0	34	68	215	0	317	1	3	168	45	5	222	0	209	134	158	0	501	1310
Cars	0	194	66	2	-	262	0	31	65	206	-	302	1	1	168	41	-	211	0	204	132	154	-	490	
Trucks	0	3	4	1	-	8	0	3	3	9	-	15	0	2	0	4	-	6	0	5	2	4	-	11	
P/Cycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	
Cars (%)	0.00	98.48	94.29	66.67	-	97.04	0.00	91.18	95.59	95.81	-	95.27	100.00	33.33	100.00	91.11	-	97.24	0.00	97.61	98.51	97.47	-	97.80	
Trucks (%)	0.00	1.52	5.71	33.33	-	2.96	0.00	8.82	4.41	4.19	-	4.73	0.00	66.67	0.00	8.89	-	2.76	0.00	2.39	1.49	2.53	-	2.20	
P/Cycles (%)	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	0.00	

	Eastbound Curry Branch Rd						Westbound Flat Rock Rd (East)						Northbound Bowline View Trail						Southbound Flat Rock Rd (North)						Int
	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	
0730 - 0745	0	19	6	0	0	25	0	2	1	29	0	32	1	0	17	1	0	19	0	4	1	5	0	10	86
0745 - 0800	0	16	3	1	0	20	0	1	2	20	0	23	0	0	15	1	0	16	0	9	3	7	0	19	78
0800 - 0815	0	19	5	0	0	24	0	1	7	19	0	27	0	1	14	10	1	26	0	8	2	6	0	16	93
0815 - 0830	0	13	1	1	0	15	0	2	5	20	0	27	0	0	20	5	0	25	0	3	3	3	0	9	76
AM Peak	0	67	15	2	0	84	0	6	15	88	0	109	1	1	66	17	1	86	0	24	9	21	0	54	333
1700 - 1715	0	6	2	0	0	8	0	5	3	6	0	14	0	1	6	1	2	10	0	30	13	12	0	55	87
1715 - 1730	0	10	3	0	0	13	0	3	8	8	0	19	0	0	9	2	2	13	0	17	17	11	0	45	90
1730 - 1745	0	9	7	1	0	17	0	7	8	10	0	25	0	0	2	2	0	4	0	23	19	19	0	61	107
1745 - 1800	0	8	2	0	0	10	0	1	3	11	0	15	0	0	4	2	0	6	0	20	9	21	0	50	81
PM Peak	0	33	14	1	0	48	0	16	22	35	0	73	0	1	21	7	4	33	0	90	58	63	0	211	365

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

Louisville, KY
 Classified Turn Movement Count



Site 1 of 1
 SR-1531 Aiken Rd (West)
 SR-1531 Aiken Rd (East)
 Flat Rock Rd (South)
 Flat Rock Rd (North)

41 Peabody Street, Nashville, TN 37210
 1 (615) 431-6750
 1 (800) 615-3765

Lat/Long
 38.275350°, -85.442935°

Date
 Tuesday 12 December 2017

Weather
 Mostly Sunny
 Temp: 11°C

	Eastbound						Westbound						Northbound						Southbound						Int
	SR-1531 Aiken Rd (West)						SR-1531 Aiken Rd (East)						Flat Rock Rd (South)						Flat Rock Rd (North)						
	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	
0700 - 0715	0	0	5	3	0	8	0	4	56	0	0	60	0	40	0	9	0	49	0	0	0	3	0	3	120
0715 - 0730	0	0	7	7	0	14	0	3	78	0	0	81	0	39	0	16	0	55	0	0	0	0	0	0	150
0730 - 0745	0	0	16	8	0	24	0	8	62	1	0	71	0	39	1	14	0	54	0	1	0	1	0	2	151
0745 - 0800	0	0	20	6	0	26	0	1	57	1	0	59	0	39	0	9	0	48	0	0	0	3	0	3	136
Hourly Total	0	0	48	24	0	72	0	16	253	2	0	271	0	157	1	48	0	206	0	1	0	7	0	8	557
0800 - 0815	0	0	21	11	0	32	0	2	31	2	0	35	0	36	1	7	0	44	0	2	0	3	0	5	116
0815 - 0830	0	1	15	4	0	20	0	1	39	1	0	41	0	34	0	10	0	44	0	0	1	3	0	4	109
0830 - 0845	0	2	12	7	0	21	0	5	28	0	0	33	0	61	0	9	0	70	0	0	0	1	0	1	125
0845 - 0900	0	2	11	18	0	31	0	5	52	1	0	58	0	40	0	6	0	46	0	0	0	2	0	2	137
Hourly Total	0	5	59	40	0	104	0	13	150	4	0	167	0	171	1	32	0	204	0	2	1	9	0	12	487
1600 - 1615	0	3	31	56	0	90	0	15	29	1	0	45	0	12	0	8	0	20	0	0	0	1	0	1	156
1615 - 1630	0	3	40	31	0	74	0	9	32	0	0	41	0	14	0	8	0	22	0	0	1	0	0	1	138
1630 - 1645	0	3	42	41	0	86	0	16	23	0	0	39	0	18	0	5	0	23	0	0	0	1	0	1	149
1645 - 1700	0	4	46	44	0	94	0	12	27	0	0	39	0	21	0	12	0	33	0	0	1	1	0	2	168
Hourly Total	0	13	159	172	0	344	0	52	111	1	0	164	0	65	0	33	0	98	0	0	2	3	0	5	611
1700 - 1715	0	1	48	52	0	101	0	14	33	2	0	49	0	18	1	9	0	28	0	0	0	0	0	0	178
1715 - 1730	0	1	58	56	0	115	0	20	28	0	0	48	0	22	0	5	0	27	0	0	2	1	0	3	193
1730 - 1745	0	2	47	43	0	92	0	17	31	2	0	50	0	12	0	6	0	18	0	1	0	0	0	1	161
1745 - 1800	0	1	48	34	0	83	0	13	37	0	0	50	0	13	0	6	0	19	0	0	0	1	0	1	153
Hourly Total	0	5	201	185	0	391	0	64	129	4	0	197	0	65	1	26	0	92	0	1	2	2	0	5	685
Grand Total	0	23	467	421	0	911	0	145	643	11	0	799	0	458	3	139	0	600	0	4	5	21	0	30	2340
Cars	0	22	458	415	-	895	0	140	635	7	-	782	0	449	3	133	-	585	0	4	5	20	-	29	
Trucks	0	1	9	6	-	16	0	5	8	4	-	17	0	9	0	6	-	15	0	0	0	1	-	1	
P/Cycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	
Cars (%)	0.00	95.65	98.07	98.57	-	98.24	0.00	96.55	98.76	63.64	-	97.87	0.00	98.03	100.00	95.68	-	97.50	0.00	100.00	100.00	95.24	-	96.67	
Trucks (%)	0.00	4.35	1.93	1.43	-	1.76	0.00	3.45	1.24	36.36	-	2.13	0.00	1.97	0.00	4.32	-	2.50	0.00	0.00	0.00	4.76	-	3.33	
P/Cycles (%)	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	0.00	

	Eastbound						Westbound						Northbound						Southbound						Int
	SR-1531 Aiken Rd (West)						SR-1531 Aiken Rd (East)						Flat Rock Rd (South)						Flat Rock Rd (North)						
	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	
0700 - 0715	0	0	5	3	0	8	0	4	56	0	0	60	0	40	0	9	0	49	0	0	0	3	0	3	120
0715 - 0730	0	0	7	7	0	14	0	3	78	0	0	81	0	39	0	16	0	55	0	0	0	0	0	0	150
0730 - 0745	0	0	16	8	0	24	0	8	62	1	0	71	0	39	1	14	0	54	0	1	0	1	0	2	151
0745 - 0800	0	0	20	6	0	26	0	1	57	1	0	59	0	39	0	9	0	48	0	0	0	3	0	3	136
AM Peak	0	0	48	24	0	72	0	16	253	2	0	271	0	157	1	48	0	206	0	1	0	7	0	8	557
1645 - 1700	0	4	46	44	0	94	0	12	27	0	0	39	0	21	0	12	0	33	0	0	1	1	0	2	168
1700 - 1715	0	1	48	52	0	101	0	14	33	2	0	49	0	18	1	9	0	28	0	0	0	0	0	0	178
1715 - 1730	0	1	58	56	0	115	0	20	28	0	0	48	0	22	0	5	0	27	0	0	2	1	0	3	193
1730 - 1745	0	2	47	43	0	92	0	17	31	2	0	50	0	12	0	6	0	18	0	1	0	0	0	1	161
PM Peak	0	8	199	195	0	402	0	63	119	4	0	186	0	73	1	32	0	106	0	1	3	2	0	6	700

HCS Reports

HCS7 Signalized Intersection Results Summary																
General Information						Intersection Information										
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.25									
Analyst	DBZ		Analysis Date	1/19/2018		Area Type	Other									
Jurisdiction			Time Period	AM Peak		PHF	0.91									
Urban Street	US 60		Analysis Year	2017		Analysis Period	1> 7:15									
Intersection	Flat Rock Road		File Name	AM 17.xus												
Project Description	Manor Creek															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				104	311			661	28				43		271	
Signal Information																
Cycle, s	100.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	5.7	55.7	19.6	0.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	5.0	4.0	0.0	0.0	0.0						
				Red	2.0	2.0	2.0	0.0	0.0	0.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase				5	2		6				4					
Case Number				1.0	4.0		8.3				9.0					
Phase Duration, s				11.7	74.4		62.7				25.6					
Change Period, (Y+R _c), s				6.0	7.0		7.0				6.0					
Max Allow Headway (MAH), s				2.9	0.0		0.0				3.1					
Queue Clearance Time (g _s), s				4.6							19.3					
Green Extension Time (g _e), s				0.1	0.0		0.0				0.3					
Phase Call Probability				0.96							1.00					
Max Out Probability				0.00							0.31					
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement				5	2			6	16				7		14	
Adjusted Flow Rate (v), veh/h				114	342			757				47		298		
Adjusted Saturation Flow Rate (s), veh/h/ln				1753	1841			1871				1640		1585		
Queue Service Time (g _s), s				2.6	7.4			30.1				2.4		17.3		
Cycle Queue Clearance Time (g _c), s				2.6	7.4			30.1				2.4		17.3		
Green Ratio (g/C)				0.63	0.67			0.56				0.20		0.25		
Capacity (c), veh/h				350	1241			1042				321		402		
Volume-to-Capacity Ratio (X)				0.326	0.275			0.727				0.147		0.741		
Back of Queue (Q), ft/ln (90 th percentile)				35.7	107.1			410.1				44.3		250.5		
Back of Queue (Q), veh/ln (90 th percentile)				1.4	4.2			16.3				1.6		9.9		
Queue Storage Ratio (RQ) (90 th percentile)				0.29	0.00			0.00				0.11		0.63		
Uniform Delay (d ₁), s/veh				13.3	6.5			16.5				33.3		34.3		
Incremental Delay (d ₂), s/veh				0.2	0.6			4.4				0.1		4.0		
Initial Queue Delay (d ₃), s/veh				0.0	0.0			0.0				0.0		0.0		
Control Delay (d), s/veh				13.5	7.1			21.0				33.4		38.3		
Level of Service (LOS)				B	A			C				C		D		
Approach Delay, s/veh / LOS				8.7	A		21.0	C		0.0		37.6		D		
Intersection Delay, s/veh / LOS				21.1			C									
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				0.67	A		1.89	B		1.73	B		1.96	B		
Bicycle LOS Score / LOS				1.24	A		1.74	B					F			

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.25								
Analyst	DBZ	Analysis Date	1/19/2018			Area Type	Other								
Jurisdiction		Time Period	AM Peak			PHF	0.91								
Urban Street	US 60		Analysis Year	2023 No Build		Analysis Period	1> 7:15								
Intersection	Flat Rock Road		File Name	AM 23 NB.xus											
Project Description	Manor Creek														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				123	342			706	34				53		329
Signal Information															
Cycle, s	100.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On	Green	5.9	52.0	23.1	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	5.0	4.0	0.0	0.0	0.0					
				Red	2.0	2.0	2.0	0.0	0.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2		6				4				
Case Number				1.0	4.0		8.3				9.0				
Phase Duration, s				11.9	70.9		59.0				29.1				
Change Period, (Y+R _c), s				6.0	7.0		7.0				6.0				
Max Allow Headway (MAH), s				2.9	0.0		0.0				3.1				
Queue Clearance Time (g _s), s				5.4							23.0				
Green Extension Time (g _e), s				0.1	0.0		0.0				0.1				
Phase Call Probability				0.98							1.00				
Max Out Probability				0.00							1.00				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2			6	16				7		14
Adjusted Flow Rate (v), veh/h				135	376			813				58		362	
Adjusted Saturation Flow Rate (s), veh/h/ln				1753	1841			1870				1640		1585	
Queue Service Time (g _s), s				3.4	9.3			36.9				2.8		21.0	
Cycle Queue Clearance Time (g _c), s				3.4	9.3			36.9				2.8		21.0	
Green Ratio (g/C)				0.60	0.64			0.52				0.23		0.29	
Capacity (c), veh/h				275	1176			973				379		459	
Volume-to-Capacity Ratio (X)				0.492	0.320			0.836				0.154		0.787	
Back of Queue (Q), ft/ln (90 th percentile)				55.5	137.6			523.5				52		305.6	
Back of Queue (Q), veh/ln (90 th percentile)				2.2	5.3			20.8				1.9		12.0	
Queue Storage Ratio (RQ) (90 th percentile)				0.44	0.00			0.00				0.13		0.76	
Uniform Delay (d ₁), s/veh				18.2	8.2			20.4				30.6		32.7	
Incremental Delay (d ₂), s/veh				0.5	0.7			8.5				0.1		7.6	
Initial Queue Delay (d ₃), s/veh				0.0	0.0			0.0				0.0		0.0	
Control Delay (d), s/veh				18.7	8.9			28.8				30.7		40.3	
Level of Service (LOS)				B	A			C				C		D	
Approach Delay, s/veh / LOS				11.5	B		28.8	C		0.0		39.0		D	
Intersection Delay, s/veh / LOS				26.2					C						
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				0.67	A		1.90	B		1.73	B		1.96	B	
Bicycle LOS Score / LOS				1.33	A		1.83	B					F		

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

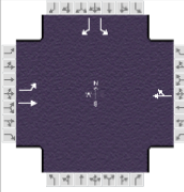
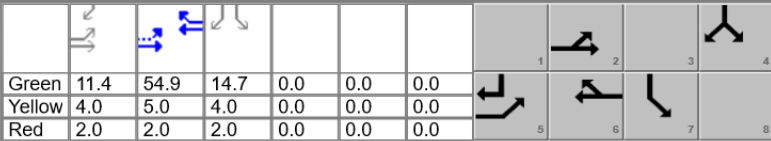
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information				Diagram																			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.25																						
Analyst	DBZ			Analysis Date	Feb 21, 2018																						
Jurisdiction				Time Period	AM Peak																						
Urban Street	US 60			Analysis Year	2023 Build																						
Intersection	Flat Rock Road			File Name	AM 23 B.xus																						
Project Description	Manor Creek																										
Demand Information				EB			WB			NB			SB														
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R															
Demand (v), veh/h	134	342			706	38				64		363															
Signal Information																											
Cycle, s	100.0	Reference Phase	2																								
Offset, s	0	Reference Point	End																								
Uncoordinated	No	Simult. Gap E/W	On	Green	5.9	51.1	24.0	0.0	0.0	0.0	0.0	0.0															
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	5.0	4.0	0.0	0.0	0.0	0.0	0.0															
				Red	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0															
Timer Results				EBL			EBT			WBL			WBT			NBL			NBT			SBL			SBT		
Assigned Phase				5			2						6									4					
Case Number				1.0			4.0						8.3									9.0					
Phase Duration, s				11.9			70.0						58.1									30.0					
Change Period, (Y+R _c), s				6.0			7.0						7.0									6.0					
Max Allow Headway (MAH), s				2.9			0.0						0.0									3.1					
Queue Clearance Time (g _s), s				5.8																		25.6					
Green Extension Time (g _e), s				0.1			0.0						0.0									0.0					
Phase Call Probability				0.98																		1.00					
Max Out Probability				0.00																		1.00					
Movement Group Results				EB			WB			NB			SB														
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R															
Assigned Movement	5	2			6	16					7		14														
Adjusted Flow Rate (v), veh/h	147	376			818						70		399														
Adjusted Saturation Flow Rate (s), veh/h/ln	1753	1841			1868						1640		1585														
Queue Service Time (g _s), s	3.8	9.5			38.1						3.4		23.6														
Cycle Queue Clearance Time (g _c), s	3.8	9.5			38.1						3.4		23.6														
Green Ratio (g/C)	0.59	0.63			0.51						0.24		0.30														
Capacity (c), veh/h	261	1160			955						394		474														
Volume-to-Capacity Ratio (X)	0.564	0.324			0.857						0.179		0.842														
Back of Queue (Q), ft/ln (90 th percentile)	65.1	141.4			548.5						62.4		352.3														
Back of Queue (Q), veh/ln (90 th percentile)	2.5	5.5			21.8						2.3		13.9														
Queue Storage Ratio (RQ) (90 th percentile)	0.52	0.00			0.00						0.16		0.88														
Uniform Delay (d ₁), s/veh	19.5	8.6			21.3						30.2		32.8														
Incremental Delay (d ₂), s/veh	0.7	0.7			9.8						0.1		12.2														
Initial Queue Delay (d ₃), s/veh	0.0	0.0			0.0						0.0		0.0														
Control Delay (d), s/veh	20.2	9.3			31.0						30.3		45.0														
Level of Service (LOS)	C	A			C						C		D														
Approach Delay, s/veh / LOS	12.4		B	31.0		C	0.0				42.8		D														
Intersection Delay, s/veh / LOS	28.7						C																				
Multimodal Results				EB			WB			NB			SB														
Pedestrian LOS Score / LOS	0.68		A	1.90		B	1.73		B	1.96		B															
Bicycle LOS Score / LOS	1.35		A	1.84		B						F															

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.25								
Analyst	DBZ	Analysis Date	1/19/2018		Area Type	Other									
Jurisdiction		Time Period	PM Peak		PHF	0.94									
Urban Street	US 60		Analysis Year	2017		Analysis Period	1> 5:00								
Intersection	Flat Rock Road		File Name	PM 17.xus											
Project Description	Manor Creek														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				295	750			510	41				58		179
Signal Information															
Cycle, s	100.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On	Green	9.0	59.0	13.0	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	5.0	4.0	0.0	0.0	0.0					
				Red	2.0	2.0	2.0	0.0	0.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2		6				4				
Case Number				1.0	4.0		8.3				9.0				
Phase Duration, s				15.0	81.0		66.0				19.0				
Change Period, (Y+R _c), s				6.0	7.0		7.0				6.0				
Max Allow Headway (MAH), s				2.9	0.0		0.0				3.1				
Queue Clearance Time (g _s), s				8.5							12.7				
Green Extension Time (g _e), s				0.5	0.0		0.0				0.4				
Phase Call Probability				1.00							1.00				
Max Out Probability				0.00							0.00				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2		6	16					7	14	
Adjusted Flow Rate (v), veh/h				314	798		586					62	190		
Adjusted Saturation Flow Rate (s), veh/h/ln				1753	1841		1860					1640	1585		
Queue Service Time (g _s), s				6.5	19.9		18.9					3.4	10.7		
Cycle Queue Clearance Time (g _c), s				6.5	19.9		18.9					3.4	10.7		
Green Ratio (g/C)				0.70	0.74		0.59					0.13	0.22		
Capacity (c), veh/h				557	1362		1098					213	349		
Volume-to-Capacity Ratio (X)				0.563	0.586		0.534					0.290	0.546		
Back of Queue (Q), ft/ln (90 th percentile)				78.1	210.2		258.2					64.5	162.2		
Back of Queue (Q), veh/ln (90 th percentile)				3.0	8.1		10.2					2.4	6.4		
Queue Storage Ratio (RQ) (90 th percentile)				0.62	0.00		0.00					0.16	0.41		
Uniform Delay (d ₁), s/veh				9.0	6.0		12.3					39.3	34.6		
Incremental Delay (d ₂), s/veh				0.3	1.8		1.9					0.3	0.5		
Initial Queue Delay (d ₃), s/veh				0.0	0.0		0.0					0.0	0.0		
Control Delay (d), s/veh				9.3	7.8		14.1					39.6	35.1		
Level of Service (LOS)				A	A		B					D	D		
Approach Delay, s/veh / LOS				8.2	A	14.1	B	0.0			36.2	D			
Intersection Delay, s/veh / LOS				13.6			B								
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				0.65	A	1.88	B	1.73	B	1.96	B				
Bicycle LOS Score / LOS				2.32	B	1.45	A				F				

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

HCS7 Signalized Intersection Results Summary																
General Information						Intersection Information										
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.25									
Analyst	DBZ	Analysis Date	1/19/2018			Area Type	Other									
Jurisdiction		Time Period	PM Peak			PHF	0.94									
Urban Street	US 60		Analysis Year	2023 No Build		Analysis Period	1> 5:00									
Intersection	Flat Rock Road		File Name	PM 23 NB.xus												
Project Description	Manor Creek															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				360	804			555	51				70		213	
Signal Information																
Cycle, s	100.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	11.4	54.9	14.7	0.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	5.0	4.0	0.0	0.0	0.0						
				Red	2.0	2.0	2.0	0.0	0.0	0.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase				5	2		6					4				
Case Number				1.0	4.0		8.3					9.0				
Phase Duration, s				17.4	79.3		61.9					20.7				
Change Period, (Y+R c), s				6.0	7.0		7.0					6.0				
Max Allow Headway (MAH), s				2.9	0.0		0.0					3.1				
Queue Clearance Time (g s), s				10.9								14.3				
Green Extension Time (g e), s				0.6	0.0		0.0					0.4				
Phase Call Probability				1.00								1.00				
Max Out Probability				0.00								0.00				
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement				5	2		6	16					7		14	
Adjusted Flow Rate (v), veh/h				383	855		645					74		227		
Adjusted Saturation Flow Rate (s), veh/h/ln				1753	1841		1857					1640		1585		
Queue Service Time (g s), s				8.9	24.1		24.0					4.1		12.3		
Cycle Queue Clearance Time (g c), s				8.9	24.1		24.0					4.1		12.3		
Green Ratio (g/C)				0.68	0.72		0.55					0.15		0.26		
Capacity (c), veh/h				511	1330		1019					242		414		
Volume-to-Capacity Ratio (X)				0.750	0.643		0.633					0.308		0.547		
Back of Queue (Q), ft/ln (90 th percentile)				122.3	261.7		332.2					76.6		180.4		
Back of Queue (Q), veh/ln (90 th percentile)				4.7	10.1		13.2					2.8		7.1		
Queue Storage Ratio (RQ) (90 th percentile)				0.98	0.00		0.00					0.19		0.45		
Uniform Delay (d 1), s/veh				13.1	7.2		15.6					38.1		31.8		
Incremental Delay (d 2), s/veh				1.5	2.4		3.0					0.3		0.4		
Initial Queue Delay (d 3), s/veh				0.0	0.0		0.0					0.0		0.0		
Control Delay (d), s/veh				14.6	9.6		18.6					38.4		32.2		
Level of Service (LOS)				B	A		B					D		C		
Approach Delay, s/veh / LOS				11.1	B	18.6	B	0.0				33.8		C		
Intersection Delay, s/veh / LOS				16.5					B							
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				0.65	A	1.89	B	1.73	B	1.96	B					
Bicycle LOS Score / LOS				2.53	C	1.55	B							F		

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.25										
Analyst	DBZ	Analysis Date	Feb 21, 2018	Area Type	Other										
Jurisdiction		Time Period	PM Peak	PHF	0.94										
Urban Street	US 60	Analysis Year	2023 Build	Analysis Period	1> 5:00										
Intersection	Flat Rock Road	File Name	PM 23 B.xus												
Project Description	Manor Creek														
Demand Information				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h	398	804			555	64					77	236			
Signal Information															
Cycle, s	100.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On	Green	13.0	52.1	15.8	0.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	5.0	4.0	0.0	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0			
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2		6				4				
Case Number				1.0	4.0		8.3				9.0				
Phase Duration, s				19.0	78.2		59.1				21.8				
Change Period, (Y+R c), s				6.0	7.0		7.0				6.0				
Max Allow Headway (MAH), s				2.9	0.0		0.0				3.1				
Queue Clearance Time (g s), s				12.5							15.4				
Green Extension Time (g e), s				0.6	0.0		0.0				0.4				
Phase Call Probability				1.00							1.00				
Max Out Probability				0.01							0.01				
Movement Group Results				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Assigned Movement	5	2			6	16				7		14			
Adjusted Flow Rate (v), veh/h	423	855			659					82		251			
Adjusted Saturation Flow Rate (s), veh/h/ln	1753	1841			1851					1640		1585			
Queue Service Time (g s), s	10.5	25.0			26.4					4.4		13.4			
Cycle Queue Clearance Time (g c), s	10.5	25.0			26.4					4.4		13.4			
Green Ratio (g/C)	0.67	0.71			0.52					0.16		0.29			
Capacity (c), veh/h	497	1310			965					260		457			
Volume-to-Capacity Ratio (X)	0.853	0.653			0.682					0.316		0.549			
Back of Queue (Q), ft/ln (90 th percentile)	190.4	278.1			370.8					83.3		191.4			
Back of Queue (Q), veh/ln (90 th percentile)	7.4	10.8			14.7					3.0		7.5			
Queue Storage Ratio (RQ) (90 th percentile)	1.52	0.00			0.00					0.21		0.48			
Uniform Delay (d 1), s/veh	15.8	7.8			17.8					37.3		30.1			
Incremental Delay (d 2), s/veh	6.6	2.5			3.9					0.3		0.4			
Initial Queue Delay (d 3), s/veh	0.0	0.0			0.0					0.0		0.0			
Control Delay (d), s/veh	22.4	10.3			21.7					37.5		30.5			
Level of Service (LOS)	C	B			C					D		C			
Approach Delay, s/veh / LOS	14.3	B		21.7	C		0.0			32.2		C			
Intersection Delay, s/veh / LOS	19.1						B								
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS	0.66	A		1.90	B		1.73	B		1.96	B				
Bicycle LOS Score / LOS	2.60	C		1.57	B							F			

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Polo Fiel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	1/19/2018							East/West Street	Polo Fields Lane							
Analysis Year	2017							North/South Street	Flat Rock Road							
Time Analyzed	AM Peak							Peak Hour Factor	0.88							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Manor Creek															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		2		68						25	101				103	1
Percent Heavy Vehicles (%)		0		1						8						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized		No					No					No				
Median Type/Storage		Undivided														
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)			80							28						
Capacity, c (veh/h)			927							1435						
v/c Ratio			0.09							0.02						
95% Queue Length, Q ₉₅ (veh)			0.3							0.1						
Control Delay (s/veh)			9.2							7.6						
Level of Service, LOS			A							A						
Approach Delay (s/veh)		9.2								1.6						
Approach LOS		A														

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Polo Fiel								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	1/19/2018							East/West Street	Polo Fields Lane								
Analysis Year	2023							North/South Street	Flat Rock Road								
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.88								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Manor Creek																
Lanes																	
<p>Major Street: North-South</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration			LR							LT						TR	
Volume, V (veh/h)		2		72						27	119					136	
Percent Heavy Vehicles (%)		0		1						8							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized		No					No					No					
Median Type/Storage		Undivided															
Critical and Follow-up Headways																	
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			84							31							
Capacity, c (veh/h)			884							1389							
v/c Ratio			0.10							0.02							
95% Queue Length, Q ₉₅ (veh)			0.3							0.1							
Control Delay (s/veh)			9.5							7.6							
Level of Service, LOS			A							A							
Approach Delay (s/veh)		9.5					1.6										
Approach LOS		A															

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Polo Fiel								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	2/21/2018							East/West Street	Polo Fields Lane								
Analysis Year	2023							North/South Street	Flat Rock Road								
Time Analyzed	AM Peak Build							Peak Hour Factor	0.88								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Manor Creek																
Lanes																	
<p>Major Street: North-South</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration			LR							LT						TR	
Volume, V (veh/h)		2		72						27	134				181	1	
Percent Heavy Vehicles (%)		0		1						8							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized		No					No					No					
Median Type/Storage		Undivided															
Critical and Follow-up Headways																	
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			84							31							
Capacity, c (veh/h)			827							1330							
v/c Ratio			0.10							0.02							
95% Queue Length, Q ₉₅ (veh)			0.3							0.1							
Control Delay (s/veh)			9.8							7.8							
Level of Service, LOS			A							A							
Approach Delay (s/veh)		9.8								1.5							
Approach LOS		A															

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Polo Fiel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	1/19/2018							East/West Street	Polo Fields Lane							
Analysis Year	2017							North/South Street	Flat Rock Road							
Time Analyzed	PM Peak							Peak Hour Factor	0.92							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Manor Creek															
Lanes																
<p style="text-align: center;">Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		4		46						75	103				127	1
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized		No					No					No				
Median Type/Storage		Undivided														
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)			54							82						
Capacity, c (veh/h)			871							1450						
v/c Ratio			0.06							0.06						
95% Queue Length, Q ₉₅ (veh)			0.2							0.2						
Control Delay (s/veh)			9.4							7.6						
Level of Service, LOS			A							A						
Approach Delay (s/veh)		9.4					3.5									
Approach LOS		A														

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

HCS7 Two-Way Stop-Control Report																				
General Information								Site Information												
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Polo Fiel											
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction												
Date Performed	1/19/2018							East/West Street	Polo Fields Lane											
Analysis Year	2023							North/South Street	Flat Rock Road											
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.92											
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25											
Project Description	Manor Creek																			
Lanes																				
<p style="text-align: center;">Major Street: North-South</p>																				
Vehicle Volumes and Adjustments																				
Approach	Eastbound				Westbound				Northbound				Southbound							
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R				
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6				
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0				
Configuration			LR							LT						TR				
Volume, V (veh/h)		4		49						80	141				155	1				
Percent Heavy Vehicles (%)		0		0						1										
Proportion Time Blocked																				
Percent Grade (%)		0																		
Right Turn Channelized		No					No					No					No			
Median Type/Storage		Undivided																		
Critical and Follow-up Headways																				
Base Critical Headway (sec)																				
Critical Headway (sec)																				
Base Follow-Up Headway (sec)																				
Follow-Up Headway (sec)																				
Delay, Queue Length, and Level of Service																				
Flow Rate, v (veh/h)			58							87										
Capacity, c (veh/h)			833							1413										
v/c Ratio			0.07							0.06										
95% Queue Length, Q ₉₅ (veh)			0.2							0.2										
Control Delay (s/veh)			9.6							7.7										
Level of Service, LOS			A							A										
Approach Delay (s/veh)		9.6								3.1										
Approach LOS		A																		

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Polo Fiel								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	2/21/2018							East/West Street	Polo Fields Lane								
Analysis Year	2023							North/South Street	Flat Rock Road								
Time Analyzed	PM Peak Build							Peak Hour Factor	0.92								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Manor Creek																
Lanes																	
<p>Major Street: North-South</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration			LR							LT						TR	
Volume, V (veh/h)		4		49						80	192				185	1	
Percent Heavy Vehicles (%)		0		0						1							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized		No					No					No					
Median Type/Storage		Undivided															
Critical and Follow-up Headways																	
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			58							87							
Capacity, c (veh/h)			791							1375							
v/c Ratio			0.07							0.06							
95% Queue Length, Q ₉₅ (veh)			0.2							0.2							
Control Delay (s/veh)			9.9							7.8							
Level of Service, LOS			A							A							
Approach Delay (s/veh)		9.9								2.7							
Approach LOS		A															

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Manor Cre								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	2/21/2018							East/West Street	Manor Creek								
Analysis Year	2023							North/South Street	Flat Rock Road								
Time Analyzed	AM Peak Build							Peak Hour Factor	0.88								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Manor Creek																
Lanes																	
<p>Major Street: North-South</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration			LR							LT						TR	
Volume, V (veh/h)		0		45						15	121				137	0	
Percent Heavy Vehicles (%)		0		0						1							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized		No					No					No					
Median Type/Storage		Undivided															
Critical and Follow-up Headways																	
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			51							17							
Capacity, c (veh/h)			895							1430							
v/c Ratio			0.06							0.01							
95% Queue Length, Q ₉₅ (veh)			0.2							0.0							
Control Delay (s/veh)			9.3							7.5							
Level of Service, LOS			A							A							
Approach Delay (s/veh)		9.3								0.9							
Approach LOS		A															

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	Diane Zimmerman							Intersection	Flat Rock Rd at Manor Cre								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	2/21/2018							East/West Street	Manor Creek								
Analysis Year	2023							North/South Street	Flat Rock Road								
Time Analyzed	PM Peak Build							Peak Hour Factor	0.92								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Manor Creek																
Lanes																	
<p>Major Street: North-South</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration			LR							LT						TR	
Volume, V (veh/h)		0		30						51	145				156	0	
Percent Heavy Vehicles (%)		0		0						1							
Proportion Time Blocked																	
Percent Grade (%)		0															
Right Turn Channelized		No					No					No					
Median Type/Storage		Undivided															
Critical and Follow-up Headways																	
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			33							55							
Capacity, c (veh/h)			879							1413							
v/c Ratio			0.04							0.04							
95% Queue Length, Q ₉₅ (veh)			0.1							0.1							
Control Delay (s/veh)			9.3							7.7							
Level of Service, LOS			A							A							
Approach Delay (s/veh)		9.3								2.2							
Approach LOS		A															

HCS7 All-Way Stop Control Report												
General Information						Site Information						
Analyst	Diane Zimmerman					Intersection	Flat Rock at Bowline View					
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC					Jurisdiction						
Date Performed	1/19/2018					East/West Street	Flat Rock					
Analysis Year	2017					North/South Street	Bowline View					
Analysis Time Period (hrs)	0.25					Peak Hour Factor	0.90					
Time Analyzed	AM Peak											
Project Description	Manor Creek											
Lanes												
Vehicle Volume and Adjustments												
Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	67	15	2	6	15	88	1	66	17	24	9	21
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	93			121			93			60		
Percent Heavy Vehicles	4			6			2			9		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.083			0.108			0.083			0.053		
Final Departure Headway, hd (s)	4.59			3.99			4.37			4.50		
Final Degree of Utilization, x	0.119			0.134			0.113			0.075		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.59			1.99			2.37			2.50		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	93			121			93			60		
Capacity	784			901			825			801		
95% Queue Length, Q ₉₅ (veh)	0.4			0.5			0.4			0.2		
Control Delay (s/veh)	8.2			7.6			7.9			7.9		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	8.2			7.6			7.9			7.9		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	7.9						A					

HCS7 All-Way Stop Control Report												
General Information						Site Information						
Analyst	Diane Zimmerman					Intersection	Flat Rock at Bowline View					
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC					Jurisdiction						
Date Performed	1/19/2018					East/West Street	Flat Rock					
Analysis Year	2023					North/South Street	Bowline View					
Analysis Time Period (hrs)	0.25					Peak Hour Factor	0.90					
Time Analyzed	AM Peak No Build											
Project Description	Manor Creek											
Lanes												
Vehicle Volume and Adjustments												
Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	71	16	2	6	16	98	1	116	18	33	25	22
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	99			133			150			89		
Percent Heavy Vehicles	4			6			2			9		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.088			0.119			0.133			0.079		
Final Departure Headway, hd (s)	4.84			4.22			4.51			4.70		
Final Degree of Utilization, x	0.133			0.156			0.188			0.116		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.84			2.22			2.51			2.70		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	99			133			150			89		
Capacity	744			853			798			767		
95% Queue Length, Q ₉₅ (veh)	0.5			0.6			0.7			0.4		
Control Delay (s/veh)	8.6			8.0			8.6			8.3		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	8.6			8.0			8.6			8.3		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	8.4						A					

HCS7 All-Way Stop Control Report												
General Information						Site Information						
Analyst	Diane Zimmerman					Intersection	Flat Rock at Bowline View					
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC					Jurisdiction						
Date Performed	2/21/2018					East/West Street	Flat Rock					
Analysis Year	2023					North/South Street	Bowline View					
Analysis Time Period (hrs)	0.25					Peak Hour Factor	0.90					
Time Analyzed	AM Peak Build											
Project Description	Manor Creek											
Lanes												
Vehicle Volume and Adjustments												
Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	71	16	2	6	16	98	1	183	18	33	48	22
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	99			133			224			114		
Percent Heavy Vehicles	4			6			2			9		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.088			0.119			0.200			0.102		
Final Departure Headway, hd (s)	5.11			4.49			4.60			4.84		
Final Degree of Utilization, x	0.140			0.166			0.287			0.154		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	3.11			2.49			2.60			2.84		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	99			133			224			114		
Capacity	705			803			782			743		
95% Queue Length, Q ₉₅ (veh)	0.5			0.6			1.2			0.5		
Control Delay (s/veh)	8.9			8.4			9.4			8.7		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	8.9			8.4			9.4			8.7		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	9.0						A					

HCS7 All-Way Stop Control Report												
General Information						Site Information						
Analyst	Diane Zimmerman					Intersection	Flat Rock at Bowline View					
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC					Jurisdiction						
Date Performed	1/19/2018					East/West Street	Flat Rock					
Analysis Year	2017					North/South Street	Bowline View					
Analysis Time Period (hrs)	0.25					Peak Hour Factor	0.84					
Time Analyzed	PM Peak											
Project Description	Manor Creek											
Lanes												
Vehicle Volume and Adjustments												
Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	33	14	1	16	22	35	1	21	7	90	58	63
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	57			87			35			251		
Percent Heavy Vehicles	4			1			0			0		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.051			0.077			0.031			0.223		
Final Departure Headway, hd (s)	4.84			4.39			4.38			4.19		
Final Degree of Utilization, x	0.077			0.106			0.042			0.292		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.84			2.39			2.38			2.19		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	57			87			35			251		
Capacity	744			821			823			859		
95% Queue Length, Q ₉₅ (veh)	0.2			0.4			0.1			1.2		
Control Delay (s/veh)	8.2			7.9			7.6			8.9		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	8.2			7.9			7.6			8.9		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	8.5						A					

HCS7 All-Way Stop Control Report												
General Information						Site Information						
Analyst	Diane Zimmerman					Intersection	Flat Rock at Bowline View					
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC					Jurisdiction						
Date Performed	1/19/2018					East/West Street	Flat Rock					
Analysis Year	2023					North/South Street	Bowline View					
Analysis Time Period (hrs)	0.25					Peak Hour Factor	0.84					
Time Analyzed	PM Peak No Build											
Project Description	Manor Creek											
Lanes												
Vehicle Volume and Adjustments												
Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	35	15	1	17	23	47	1	52	7	103	114	67
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	61			104			71			338		
Percent Heavy Vehicles	4			1			0			0		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.054			0.092			0.063			0.301		
Final Departure Headway, hd (s)	5.18			4.66			4.63			4.33		
Final Degree of Utilization, x	0.087			0.134			0.092			0.407		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	3.18			2.66			2.63			2.33		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	61			104			71			338		
Capacity	696			773			778			831		
95% Queue Length, Q ₉₅ (veh)	0.3			0.5			0.3			2.0		
Control Delay (s/veh)	8.7			8.4			8.1			10.3		
Level of Service, LOS	A			A			A			B		
Approach Delay (s/veh)	8.7			8.4			8.1			10.3		
Approach LOS	A			A			A			B		
Intersection Delay, s/veh LOS	9.5						A					

HCS7 All-Way Stop Control Report												
General Information						Site Information						
Analyst	Diane Zimmerman					Intersection	Flat Rock at Bowline View					
Agency/Co.	Diane B. Zimmerman Traffic Engineering LLC					Jurisdiction						
Date Performed	2/21/2018					East/West Street	Flat Rock					
Analysis Year	2023					North/South Street	Bowline View					
Analysis Time Period (hrs)	0.25					Peak Hour Factor	0.84					
Time Analyzed	PM Peak Build											
Project Description	Manor Creek											
Lanes												
Vehicle Volume and Adjustments												
Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	35	15	1	17	23	47	1	96	7	103	190	67
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	61			104			124			429		
Percent Heavy Vehicles	4			1			0			0		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.054			0.092			0.110			0.381		
Final Departure Headway, hd (s)	5.55			5.02			4.80			4.45		
Final Degree of Utilization, x	0.094			0.144			0.165			0.529		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	3.55			3.02			2.80			2.45		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	61			104			124			429		
Capacity	649			717			750			810		
95% Queue Length, Q ₉₅ (veh)	0.3			0.5			0.6			3.2		
Control Delay (s/veh)	9.1			8.9			8.8			12.3		
Level of Service, LOS	A			A			A			B		
Approach Delay (s/veh)	9.1			8.9			8.8			12.3		
Approach LOS	A			A			A			B		
Intersection Delay, s/veh LOS	10.9						B					

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst	Diane Zimmerman							Intersection	Aiken at Flat Rock									
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction										
Date Performed	1/19/2018							East/West Street	Aiken Road									
Analysis Year	2017							North/South Street	Flat Rock Road									
Time Analyzed	AM Peak							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Manor Creek																	
Lanes																		
<p>Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	0	1	0	0	0	1	0			0	1	0			0	1	0
Configuration			LTR				LTR				LTR				LTR			
Volume, V (veh/h)		0	48	24		16	253	2		157	1	48		1	0	7		
Percent Heavy Vehicles (%)		0				0				1	0	0		0	0	14		
Proportion Time Blocked																		
Percent Grade (%)										0				0				
Right Turn Channelized		No				No				No				No				
Median Type/Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		0				17				224				9				
Capacity, c (veh/h)		1298				1533				632				700				
v/c Ratio		0.00				0.01				0.35				0.01				
95% Queue Length, Q ₉₅ (veh)		0.0				0.0				1.6				0.0				
Control Delay (s/veh)		7.8				7.4				13.8				10.2				
Level of Service, LOS		A				A				B				B				
Approach Delay (s/veh)		0.0				0.5				13.8				10.2				
Approach LOS										B				B				

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst	Diane Zimmerman							Intersection	Aiken at Flat Rock									
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction										
Date Performed	1/19/2018							East/West Street	Aiken Road									
Analysis Year	2023							North/South Street	Flat Rock Road									
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Manor Creek																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	0	1	0	0	0	1	0			0	1	0			0	1	0
Configuration			LTR				LTR				LTR				LTR			
Volume, V (veh/h)		0	51	45		19	269	2		230	1	55		1	0	7		
Percent Heavy Vehicles (%)		0				0				1	0	0		0	0	14		
Proportion Time Blocked																		
Percent Grade (%)										0				0				
Right Turn Channelized		No				No				No				No				
Median Type/Storage		Undivided																
Critical and Follow-up Headways																		
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		0				21				311				9				
Capacity, c (veh/h)		1278				1500				586				678				
v/c Ratio		0.00				0.01				0.53				0.01				
95% Queue Length, Q ₉₅ (veh)		0.0				0.0				3.1				0.0				
Control Delay (s/veh)		7.8				7.4				17.9				10.4				
Level of Service, LOS		A				A				C				B				
Approach Delay (s/veh)		0.0				0.6				17.9				10.4				
Approach LOS										C				B				

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	Diane Zimmerman							Intersection	Aiken at Flat Rock							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	2/21/2018							East/West Street	Aiken Road							
Analysis Year	2023							North/South Street	Flat Rock Road							
Time Analyzed	AM Peak Build							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Manor Creek															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	51	66		21	269	2		291	1	61		1	0	7
Percent Heavy Vehicles (%)		0				0				1	0	0		0	0	14
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		0				23					384					9
Capacity, c (veh/h)		1278				1472					566					674
v/c Ratio		0.00				0.02					0.68					0.01
95% Queue Length, Q ₉₅ (veh)		0.0				0.0					5.1					0.0
Control Delay (s/veh)		7.8				7.5					23.7					10.4
Level of Service, LOS		A				A					C					B
Approach Delay (s/veh)		0.0				0.7				23.7				10.4		
Approach LOS										C				B		

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst	Diane Zimmerman							Intersection	Aiken at Flat Rock									
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction										
Date Performed	1/19/2018							East/West Street	Aiken Road									
Analysis Year	2017							North/South Street	Flat Rock Road									
Time Analyzed	PM Peak							Peak Hour Factor	0.91									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Manor Creek																	
Lanes																		
<p>Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	0	1	0	0	0	1	0			0	1	0			0	1	0
Configuration			LTR				LTR				LTR				LTR			
Volume, V (veh/h)		8	199	195		63	119	4			73	1	32			1	3	2
Percent Heavy Vehicles (%)		0				5					4	0	3			0	0	0
Proportion Time Blocked																		
Percent Grade (%)											0					0		
Right Turn Channelized			No				No				No					No		
Median Type/Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		9				69					116					7		
Capacity, c (veh/h)		1462				1113					435					425		
v/c Ratio		0.01				0.06					0.27					0.02		
95% Queue Length, Q ₉₅ (veh)		0.0				0.2					1.1					0.0		
Control Delay (s/veh)		7.5				8.4					16.3					13.6		
Level of Service, LOS		A				A					C					B		
Approach Delay (s/veh)		0.2				3.2				16.3					13.6			
Approach LOS		A				A				C					B			

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst	Diane Zimmerman							Intersection	Aiken at Flat Rock									
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction										
Date Performed	1/19/2018							East/West Street	Aiken Road									
Analysis Year	2023							North/South Street	Flat Rock Road									
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.91									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Manor Creek																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	0	1	0	0	0	1	0			0	1	0			0	1	0
Configuration			LTR				LTR				LTR				LTR			
Volume, V (veh/h)		8	211	276		72	126	4			117	1	37			1	3	2
Percent Heavy Vehicles (%)		0				5					4	0	3			0	0	0
Proportion Time Blocked																		
Percent Grade (%)											0					0		
Right Turn Channelized		No				No				No				No				
Median Type/Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		9				79					170					7		
Capacity, c (veh/h)		1452				1020					366					362		
v/c Ratio		0.01				0.08					0.47					0.02		
95% Queue Length, Q ₉₅ (veh)		0.0				0.3					2.4					0.1		
Control Delay (s/veh)		7.5				8.8					23.1					15.1		
Level of Service, LOS		A				A					C					C		
Approach Delay (s/veh)		0.2				3.6				23.1				15.1				
Approach LOS		A				A				C				C				

Manor Creek Subdivision
 1312 Flat Rock Road
 Traffic Impact Study

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	Diane Zimmerman							Intersection	Aiken at Flat Rock							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	2/21/2018							East/West Street	Aiken Road							
Analysis Year	2023							North/South Street	Flat Rock Road							
Time Analyzed	PM Peak Build							Peak Hour Factor	0.91							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Manor Creek															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		8	211	346		78	126	4		157	1	41		1	3	2
Percent Heavy Vehicles (%)		0				5				4	0	3		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		9				86				219				7		
Capacity, c (veh/h)		1452				955				342				323		
v/c Ratio		0.01				0.09				0.64				0.02		
95% Queue Length, Q ₉₅ (veh)		0.0				0.3				4.2				0.1		
Control Delay (s/veh)		7.5				9.1				32.4				16.4		
Level of Service, LOS		A				A				D				C		
Approach Delay (s/veh)		0.2				4.0				32.4				16.4		
Approach LOS		A				A				D				C		