final report

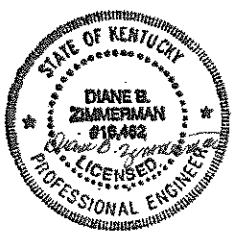
February 23, 2021

Traffic Impact Study

Aiken North Subdivision
16907 Aiken Road
Louisville, KY

Prepared for

Louisville Metro Planning Commission
Kentucky Transportation Cabinet



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INTRODUCTION

The development plan for Aiken North subdivision on Aiken Road in Louisville, KY shows 892 single family lots. **Figure 1** displays a map of the site. Access to the subdivision will be from Aiken Road, and Flat Rock Road. 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 Aiken Road with Johnson Road and Flat Rock Road.

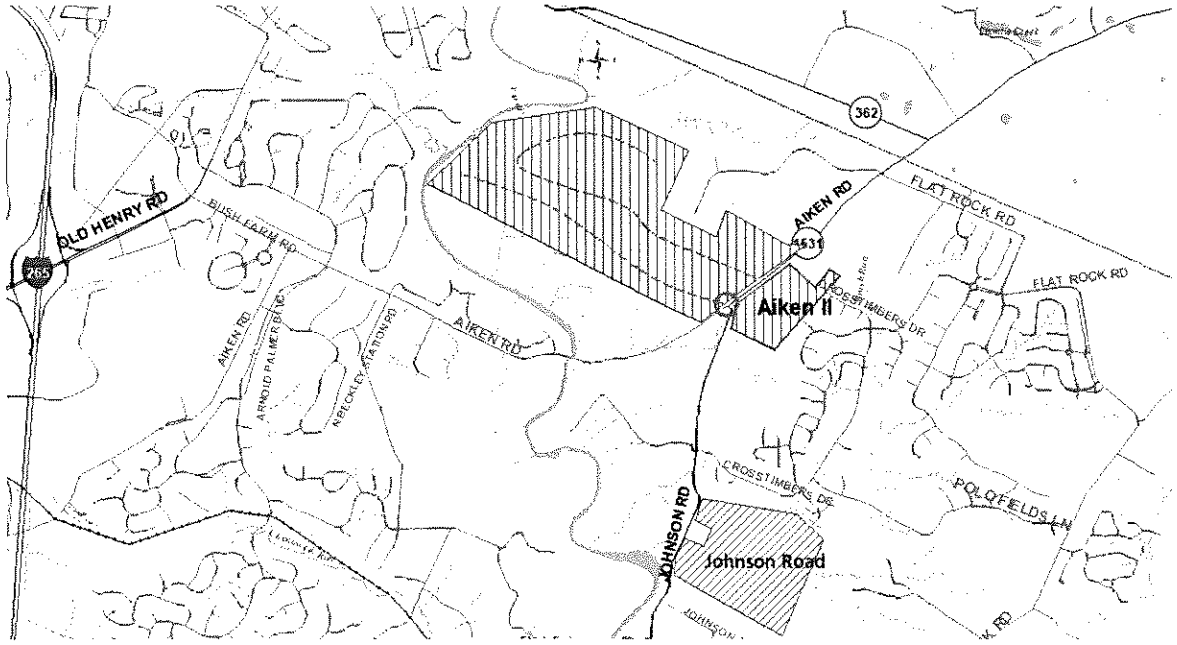


Figure 1. Site Map

EXISTING CONDITIONS

Aiken Road, KY 1531, is maintained by the Kentucky Transportation Cabinet with an estimated 2020 ADT of 5,200 vehicles per day between Johnson Road and the Shelby County line, as estimated from the 2017 count at Kentucky Transportation Cabinet station 131. The road is a two-lane highway with nine-foot lanes with four-foot shoulders through the study area (provided by the Kentucky Transportation Cabinet). The speed limit is 45 mph. There are no sidewalks. Aiken Road is a Metro Louisville maintained road between Johnson Road and Bush Farm Road with an estimated 2020 ADT volume of 8,000 vehicles per day west of Johnson Road, as estimated from the 2019 count at KYTC station 132. The road is two lanes with ten-foot lanes and a one-foot shoulder. The speed limit is 35 mph. There are no sidewalks. The intersection with Johnson Road is controlled with a stop sign on Johnson Road. The intersection with Flat Rock Road is controlled with a stop sign on Flat Rock Road.

Peak hour traffic counts for the intersections were obtained on August 21, 2019, and December 12, 2017 at Flat Rock Road. The a.m. and p.m. peak hour varied between the intersections. **Figure 2** illustrates the existing a.m. and p.m. peak hour traffic volumes. The volumes at Flat Rock Road were adjusted to the 2019 count at Johnson Road.

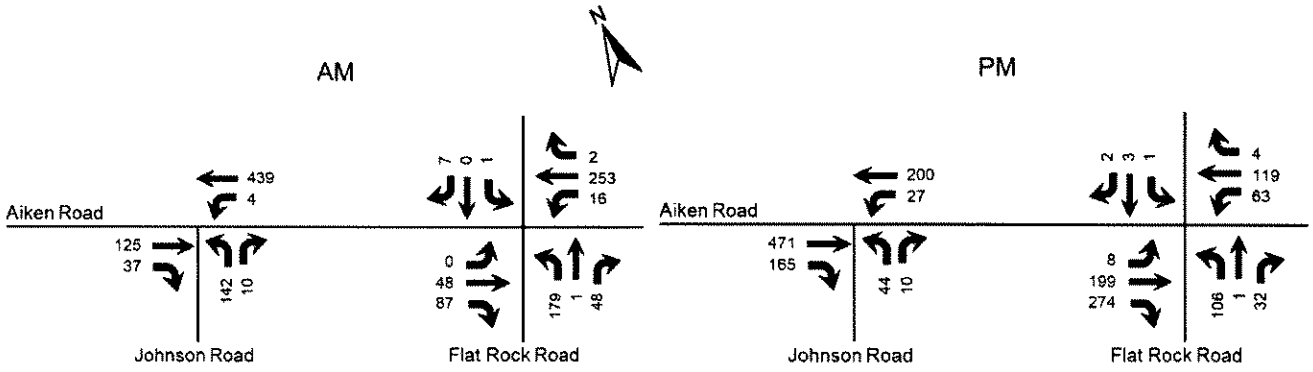


Figure 2. Existing Peak Hour Volumes

FUTURE CONDITIONS

The project completion date is 2031. 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. The connection to Keating Drive and Crosstimbers Drive within Aiken II is expected to divert trips from 142 existing residences that are currently using Johnson Road to access Aiken Road. **Figure 3** displays the 2031 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
Johnson Road (321 lots)	236	59	177	302	190	112
Aiken II (178 lots)	131	33	98	177	111	66
Total 499 lots	**367**	**92**	**275**	**479**	**301**	**178**

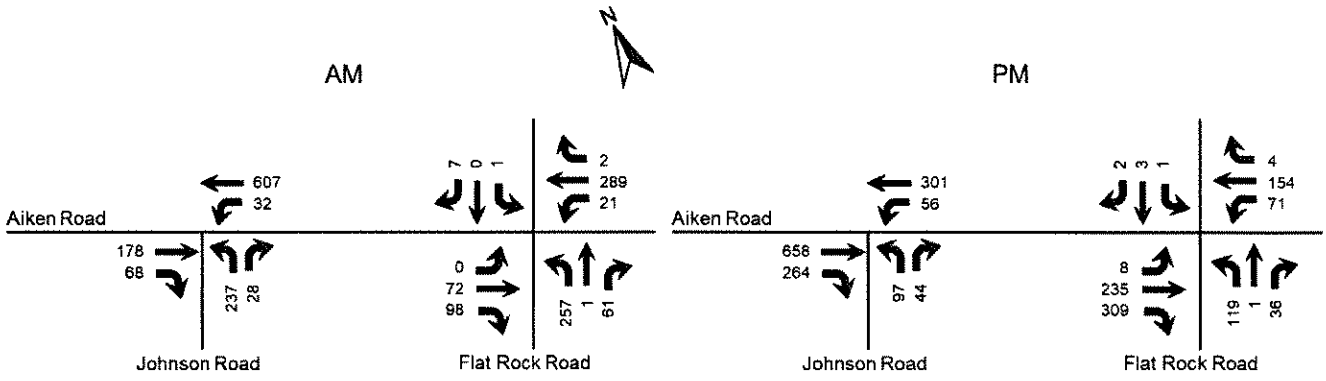


Figure 3. No Build Peak Hour Volumes

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 7** displays the individual turning movements for the peak hours when the development is completed.

Table 2. Peak Hour Trips Generated by Site

	A.M. Peak Hour			P.M. Peak Hour		
Land Use	Trips	In	Out	Trips	In	Out
Single Family Detached (892 lots)	638	159	479	830	523	307

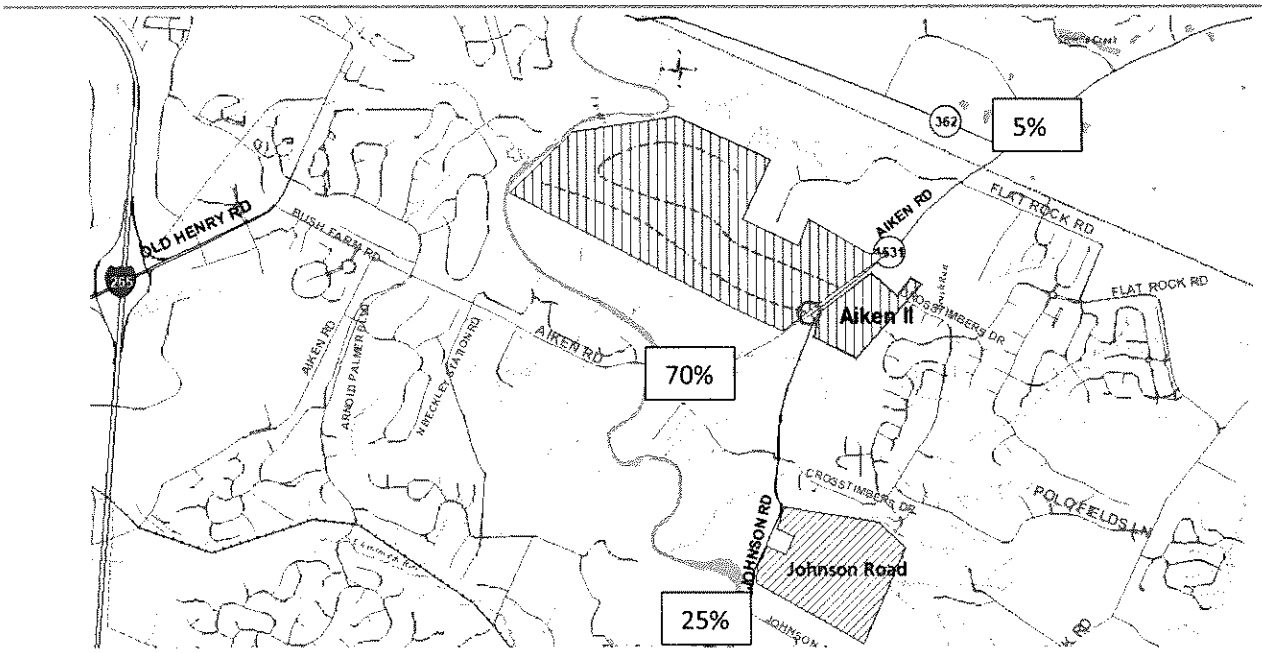


Figure 4. Trip Distribution Percentages

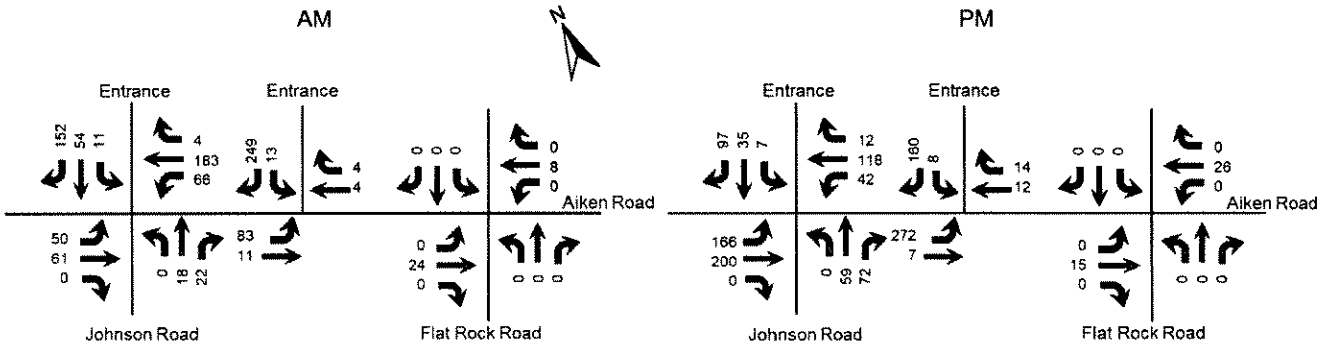


Figure 5. Peak Hour Trips Generated by Site

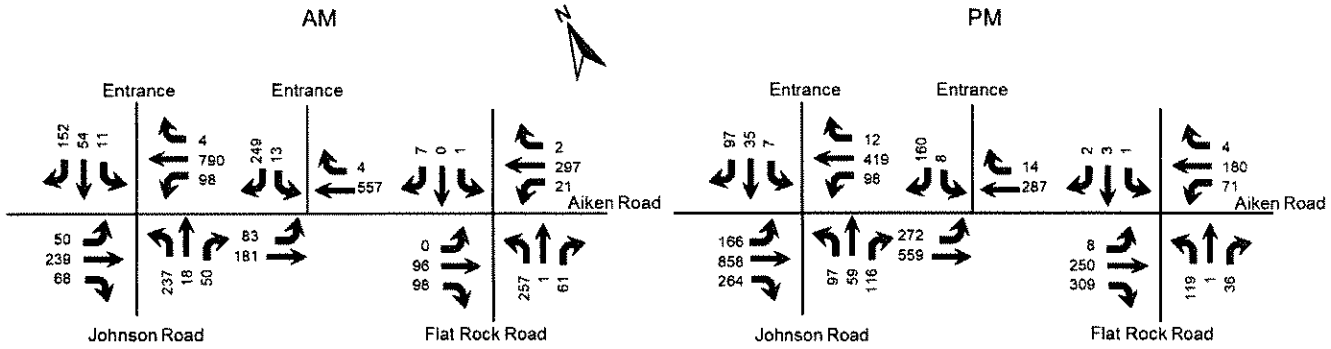


Figure 6. Build Peak Hour Volumes

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 average 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 7.9) software. The delays and Level of Service are summarized in **Table 3**. The 2031 Build results for the Aiken Road at Johnson Road are for a traffic signal. The peak hour volumes will meet the Manual on Uniform Traffic Control Devices warrant 1A for four hours. A full warrant analysis will need to be completed prior to the installation of a traffic signal.

Table 3. Peak Hour Level of Service

	A.M.			P.M.		
Approach	2019 Existing	2031 No Build	2031 Build	2019 Existing	2031 No Build	2031 Build
Aiken Road at Johnson Road			**C 22.8**			**B 13.5**
Aiken Road Eastbound			B 13.2			A 9.2
Aiken Road Westbound (left)	A 7.6	A 7.9	C 23.4	A 9.1	B 10.7	A 8.3
Johnson Road Northbound	C 18.9	D 33.2	C 31.2	C 15.9	C 17.9	C 34.2
Street "A" Southbound			C 24.5			C 32.8

	A.M.			P.M.		
Approach	2019 Existing	2031 No Build	2031 Build	2019 Existing	2031 No Build	2031 Build
Aiken Road at Flat Rock Road						
Aiken Road Eastbound (left)	A 7.8	A 7.9	A 7.9	A 7.5	A 7.6	A 7.6
Aiken Road Westbound (left)	A 7.5	A 7.6	A 7.7	A 8.7	A 9.1	A 9.1
Flat Rock Road Northbound	C 15.3	C 24.5	D 27.5	C 20.1	D 27.7	D 31.0
Flat Rock Road Southbound	B 10.3	B 10.7	B 10.8	B 14.5	C 16.4	C 17.2
Aiken Road at Entrance						
Aiken Road Eastbound (left)			A 9.0			A 8.8
Entrance Southbound			C 21.0			B 12.7

Key: Level of Service, Delay in seconds per vehicle

The no-build results include a westbound left turn lane on Aiken Road at Johnson Road and an eastbound right turn lane on Aiken Road at Johnson Road. These improvements are required with the Aiken II Johnson Road subdivisions.

The entrances were evaluated for turn lanes using the Kentucky Transportation Cabinet Highway Design Guidance Manual dated July, 2020. Using the volumes in Figure 6, a left turn lane will be required at each entrance.

CONCLUSIONS

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2031, 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. A left turn lane on Aiken Road will be required at each entrance. The study anticipates a traffic signal will be warranted for the intersection of Aiken Road and Johnson Road.

APPENDIX

Traffic Counts

Louisville, KY
Classified Turn Movement Count

Site 1 of 1
Local Access
Aiken Rd (East)
KY-1531 Johnson Rd
Aiken Rd (West)

Marr Traffic
Transportation Data Collection

41 Peabody Street, Nashville, TN 37210
10 Glenlake Parkway, Suite 130, Atlanta, GA 30328
555 Fayetteville Street, Suite 201, Raleigh, NC 27601
1229 South Shelby Street, Louisville, KY 40203
6565 North MacArthur Boulevard, Suite 225, Dallas, TX 75039

hello@marrtraffic.com
www.marrtraffic.com

1 (800) 615-3765

Lat/Long
38.268184°, -85.453393°

Date
Wednesday, August 21, 2019

Weather
Mostly Cloudy
83°F

	Westbound						Northbound						Eastbound						
	Aiken Rd (East)						KY-1531 Johnson Rd						Aiken Rd (West)						
	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	Int
TIME	1.5	1.6	1.7	1.8	1b	Total	1.9	1.10	1.11	1.12	1c	Total	1.13	1.14	1.15	1.16	1d	Total	Total
0700 - 0715	0	4	118	0	0	122	0	38	0	2	0	40	0	0	15	3	0	18	180
0715 - 0730	0	1	106	0	0	107	0	39	0	2	0	41	0	0	22	6	0	28	176
0730 - 0745	0	0	133	0	0	133	0	37	0	2	0	39	0	0	36	13	0	49	221
0745 - 0800	0	2	96	0	0	98	0	24	0	4	0	28	0	1	36	10	0	47	173
Hourly Total	**0**	**7**	**453**	**0**	**0**	**460**	**0**	**138**	**0**	**10**	**0**	**148**	**0**	**1**	**109**	**32**	**0**	**142**	**752**
0800 - 0815	0	1	104	0	0	105	0	42	1	2	0	45	0	0	31	8	0	39	190
0815 - 0830	0	1	103	0	0	104	0	37	0	1	0	38	0	0	27	8	0	35	178
0830 - 0845	0	0	94	0	0	94	0	35	0	3	0	38	0	0	26	5	0	31	163
0845 - 0900	0	0	80	0	0	80	0	27	0	3	0	30	0	0	27	14	0	41	151
1600 - 1615	0	3	50	0	0	53	0	9	0	5	0	14	0	0	95	33	0	128	195
1615 - 1630	0	6	49	0	0	55	0	8	0	1	0	9	0	0	95	39	0	134	198
1630 - 1645	0	6	38	0	0	44	0	13	0	2	0	15	0	0	118	24	0	142	201
1645 - 1700	0	5	37	0	0	42	0	7	0	5	0	12	0	0	132	47	0	179	234
1700 - 1715	0	10	58	0	0	68	0	11	0	0	0	11	0	0	118	48	0	166	245
1715 - 1730	0	8	60	0	0	68	0	12	0	4	0	16	0	0	111	36	0	147	232
1730 - 1745	0	4	45	1	0	50	0	14	0	1	0	15	0	1	110	34	0	145	211
1745 - 1800	0	3	46	2	0	51	0	15	0	0	0	15	0	1	77	35	0	113	179

0715 - 0730	0	1	106	0	0	107	0	39	0	2	0	41	0	0	22	6	0	28	178
0730 - 0745	0	0	133	0	0	133	0	37	0	2	0	39	0	0	36	13	0	49	221
0745 - 0800	0	2	96	0	0	98	0	24	0	4	0	28	0	1	36	10	0	47	173
0800 - 0815	0	1	104	0	0	105	0	42	1	2	0	45	0	0	31	8	0	39	190
AM PEAK	**0**	**4**	**439**	**0**	**0**	**443**	**0**	**142**	**1**	**10**	**0**	**153**	**0**	**1**	**125**	**37**	**0**	**163**	**762**
1645 - 1700	0	5	37	0	0	42	0	7	0	5	0	12	0	0	132	47	0	179	234
1700 - 1715	0	10	58	0	0	68	0	11	0	0	0	11	0	0	118	48	0	166	245
1715 - 1730	0	8	60	0	0	68	0	12	0	4	0	16	0	0	111	36	0	147	232
1730 - 1745	0	4	45	1	0	50	0	14	0	1	0	15	0	1	110	34	0	145	211
PM PEAK	**0**	**27**	**200**	**1**	**0**	**228**	**0**	**44**	**0**	**10**	**0**	**54**	**0**	**1**	**471**	**165**	**0**	**637**	**922**

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)

Marr Traffic
Transportation Data Collection

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 SR-1531 Aiken Rd (West)						Westbound SR-1531 Aiken Rd (East)						Northbound Flat Rock Rd (South)						Southbound 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	Int
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	

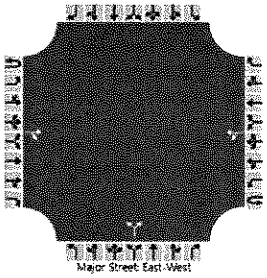
	Eastbound SR-1531 Aiken Rd (West)						Westbound SR-1531 Aiken Rd (East)						Northbound Flat Rock Rd (South)						Southbound Flat Rock Rd (North)						
	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	Int
0700 - 0715	0	0	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	706

HCS Reports

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Johnson at Aiken
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/20	East/West Street	Aiken Road
Analysis Year	2019	North/South Street	Johnson Road
Time Analyzed	AM Peak	Peak Hour Factor	0.86
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			125	37		4	439			142		10				
Percent Heavy Vehicles (%)						0				1		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.41		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						5					177					
Capacity, c (veh/h)						1386					433					
v/c Ratio						0.00					0.41					
95% Queue Length, Q_{95} (veh)						0.0					1.9					
Control Delay (s/veh)						7.6					18.9					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.1				18.9							
Approach LOS									C							

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HCS™ TWSC Version 7.9
Johnson AM 19.xtw
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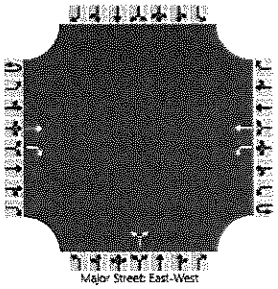
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Johnson at Aiken
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/20	East/West Street	Aiken Road
Analysis Year	2031	North/South Street	Johnson Road
Time Analyzed	AM Peak No Build	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	0	1	1	0		0	1	0		0	0	0
Configuration			T	R		L	T				LR					
Volume (veh/h)			178	68		32	607			237		28				
Percent Heavy Vehicles (%)						0				1		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No													
Median Type | Storage					Left Only							1				

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.41		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						36					294					
Capacity, c (veh/h)						1291					410					
v/c Ratio						0.03					0.72					
95% Queue Length, Q_{95} (veh)						0.1					5.5					
Control Delay (s/veh)						7.9					33.2					
Level of Service (LOS)						A					D					
Approach Delay (s/veh)					0.4				33.2							
Approach LOS									D							

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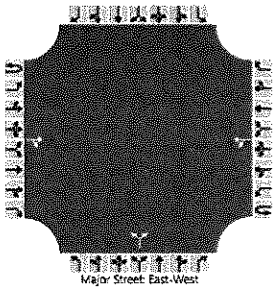
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Johnson at Aiken
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/20	East/West Street	Aiken Road
Analysis Year	2019	North/South Street	Johnson Road
Time Analyzed	PM Peak	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			471	165		27	200			44		10				
Percent Heavy Vehicles (%)						11				0		10				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.21				6.40		6.30				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						29					57					
Capacity, c (veh/h)						899					388					
v/c Ratio						0.03					0.15					
95% Queue Length, Q_{95} (veh)						0.1					0.5					
Control Delay (s/veh)						9.1					15.9					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					1.4				15.9							
Approach LOS									C							

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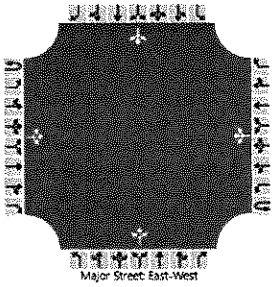
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Aiken at Flat Rock
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2019	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	Aiken North		

Lanes



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 (veh/h)		0	48	87		16	253	2		179	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																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.11	6.50	6.20		7.10	6.50	6.34
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.51	4.00	3.30		3.50	4.00	3.43

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				17					248				9	
Capacity, c (veh/h)		1297				1448					593				693	
v/c Ratio		0.00				0.01					0.42				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.0					2.1				0.0	
Control Delay (s/veh)		7.8				7.5					15.3				10.3	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	0.0				0.5				15.3				10.3			
Approach LOS									C				B			

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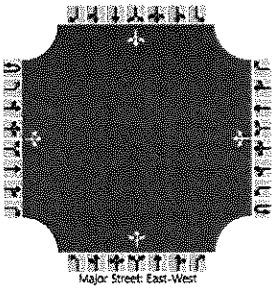
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Aiken at Flat Rock
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2031	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	Aiken North		

Lanes



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 (veh/h)		0	72	98		21	289	2		257	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																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.11	6.50	6.20		7.10	6.50	6.34
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.51	4.00	3.30		3.50	4.00	3.43

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				23					347				9	
Capacity, c (veh/h)		1255				1402					522				646	
v/c Ratio		0.00				0.02					0.66				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.0					4.9				0.0	
Control Delay (s/veh)		7.9				7.6					24.5				10.7	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	0.0				0.7				24.5				10.7			
Approach LOS									C				B			

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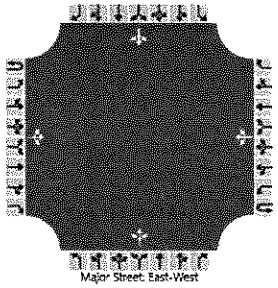
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Aiken at Flat Rock
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2031	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	Aiken North		

Lanes



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 (veh/h)		0	96	98		21	297	2		257	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																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.11	6.50	6.20		7.10	6.50	6.34
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.51	4.00	3.30		3.50	4.00	3.43

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				23					347				9	
Capacity, c (veh/h)		1246				1372					495				633	
v/c Ratio		0.00				0.02					0.70				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.1					5.4				0.0	
Control Delay (s/veh)		7.9				7.7					27.5				10.8	
Level of Service (LOS)		A				A					D				B	
Approach Delay (s/veh)	0.0				0.6				27.5				10.8			
Approach LOS									D				B			

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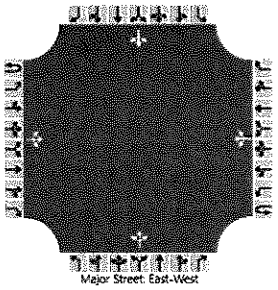
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Aiken at Flat Rock
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2019	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	Aiken North		

Lanes



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 (veh/h)		8	199	274		63	119	4		106	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																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.15				7.14	6.50	6.23		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.24				3.54	4.00	3.33		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		9				69					153				7	
Capacity, c (veh/h)		1462				1033					390				387	
v/c Ratio		0.01				0.07					0.39				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.2					1.8				0.1	
Control Delay (s/veh)		7.5				8.7					20.1				14.5	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	0.2				3.4				20.1				14.5			
Approach LOS									C				B			

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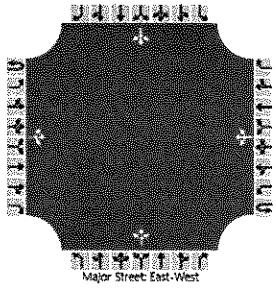
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Aiken at Flat Rock
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2031	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	Aiken North		

Lanes



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 (veh/h)		8	235	309		71	154	4		119	1	36		1	3	2
Percent Heavy Vehicles (%)		0				5				4	0	3		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.15				7.14	6.50	6.23		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.24				3.54	4.00	3.33		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		9				78					171				7	
Capacity, c (veh/h)		1415				966					326				323	
v/c Ratio		0.01				0.08					0.53				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.3					2.9				0.1	
Control Delay (s/veh)		7.6				9.1					27.7				16.4	
Level of Service (LOS)		A				A					D				C	
Approach Delay (s/veh)	0.2				3.4				27.7				16.4			
Approach LOS									D				C			

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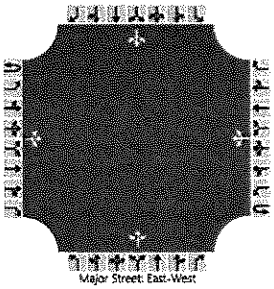
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Aiken at Flat Rock
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2031	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	Aiken North		

Lanes



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 (veh/h)		8	250	309		71	180	4		119	1	36		1	3	2
Percent Heavy Vehicles (%)		0				5				4	0	3		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.15				7.14	6.50	6.23		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.24				3.54	4.00	3.33		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		9				78					171				7	
Capacity, c (veh/h)		1382				953					305				303	
v/c Ratio		0.01				0.08					0.56				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.3					3.2				0.1	
Control Delay (s/veh)		7.6				9.1					31.0				17.2	
Level of Service (LOS)		A				A					D				C	
Approach Delay (s/veh)	0.2				3.1				31.0				17.2			
Approach LOS									D				C			

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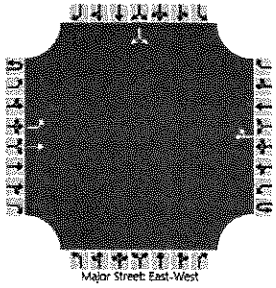
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Entrance E on Aiken
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2031	North/South Street	Entrance
Time Analyzed	AM Peak	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		83	181				557	4						13		249
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		88													279	
Capacity, c (veh/h)		985													499	
v/c Ratio		0.09													0.56	
95% Queue Length, Q_{95} (veh)		0.3													3.4	
Control Delay (s/veh)		9.0													21.0	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	2.8												21.0			
Approach LOS													C			

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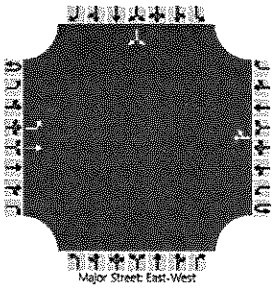
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Entrance E on Aiken
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	12/16/2020	East/West Street	Aiken Road
Analysis Year	2031	North/South Street	Entrance
Time Analyzed	PM Peak	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		272	559				287	14						8		160
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		289													179	
Capacity, c (veh/h)		1245													642	
v/c Ratio		0.23													0.28	
95% Queue Length, Q_{95} (veh)		0.9													1.1	
Control Delay (s/veh)		8.8													12.7	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	2.9												12.7			
Approach LOS													B			

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final report

January 19, 2018
Revised February 21, 2018
Revised June 30, 2021

Traffic Impact Study

Aiken Road and Johnson Road Vicinity
Louisville, KY

Prepared for

Louisville Metro Planning Commission
Kentucky Transportation Cabinet

DIANE B. ZIMMERMAN
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Prospect, KY 40059
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Table of Contents

INTRODUCTION

This update of the February 21, 2018 study will add the traffic from the proposed Aiken North subdivision to the previous study. Aiken North is proposed with 866 single-family lots. **Figure 1** displays a map of the vicinity. The purpose of this study is to examine the traffic impacts of these developments upon the adjacent highway system. For this study, the impact area was defined to be the intersections of Aiken Road with Johnson Road, N. Beckley Station Road, Arnold Palmer Drive and Bush Farm Road; the intersection of Johnson Road with Shelbyville Road; and the intersection of Bush Farm Road with Old Henry Road. See the separate traffic impact study analyzing the proposed entrances.

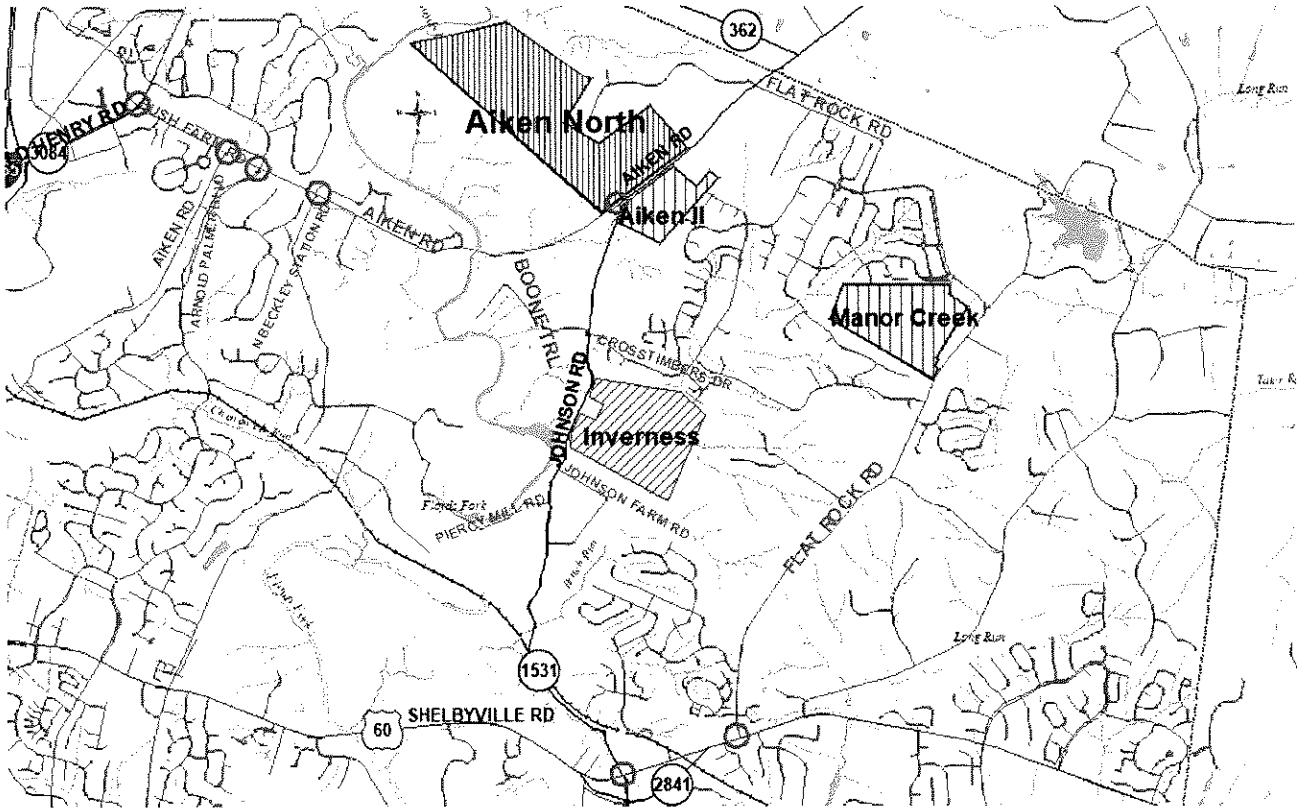


Figure 1. Site Map

FUTURE CONDITIONS

The data for these intersections originates in the 1313 Johnson Road Traffic Impact Study, dated October 5, 2017. The 1313 Johnson Road Traffic Impact Study includes traffic specifically generated by the developments listed in **Table 1.** This analysis will use the Aiken Road and Johnson Road Vicinity, dated February 21, 2018, Figures 4 and 5 2025 Build volumes as the No-Build for this analysis. **Figures 2 and 3** are the 2025 No Build peak hour volumes.

Table 1. Developments Included in No Build Volumes

Development Current Name	Traffic Impact Study Name
Twin Lakes (137 lots)	Stapleton Ridge 15528 Aiken Road
Manor at Floyds Fork, Meadows at Floyds Fork, and Villas at Floyds Fork (237 lots)	Sutherland Pointe 15905 Aiken Road
Jefferson Development Group St. Joseph Property	
Ball Homes on Factory Lane (405 lots)	St. Joseph Orphanage Site
Old Henry Crossing Phases 2 and 3	
1313 Johnson Road (323 lots)	
Aiken II (178 lots)	
Manor Creek (204 lots)	

Table 2. 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**

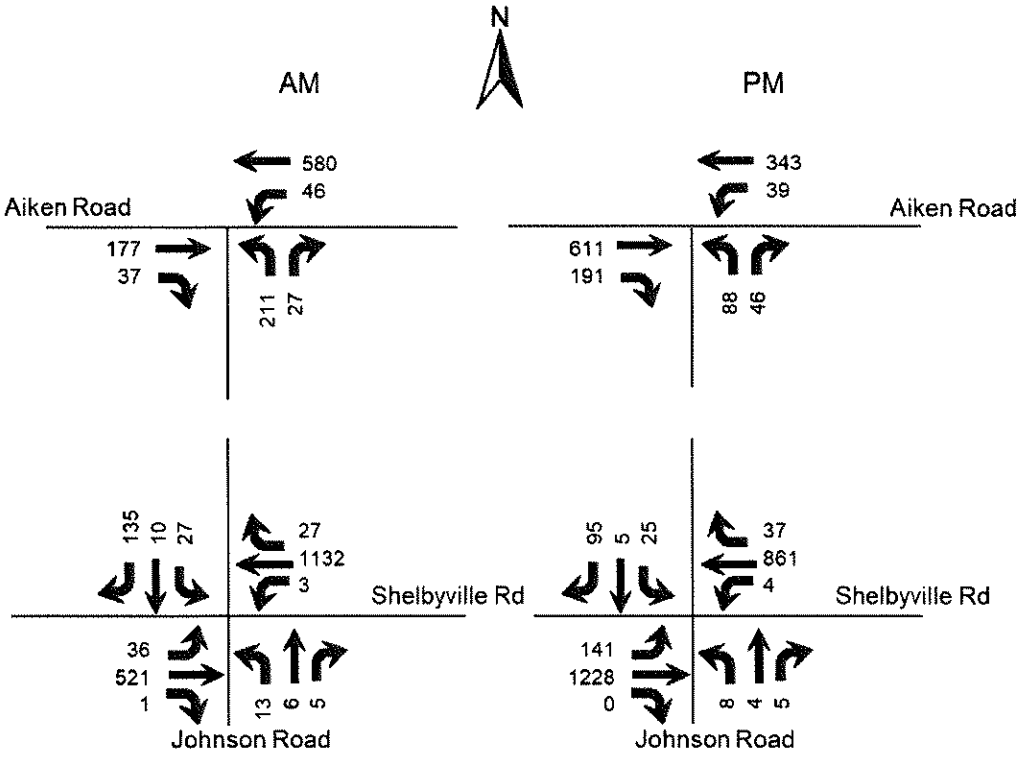


Figure 2. 2025 No Build Peak Hour Volumes Johnson Road

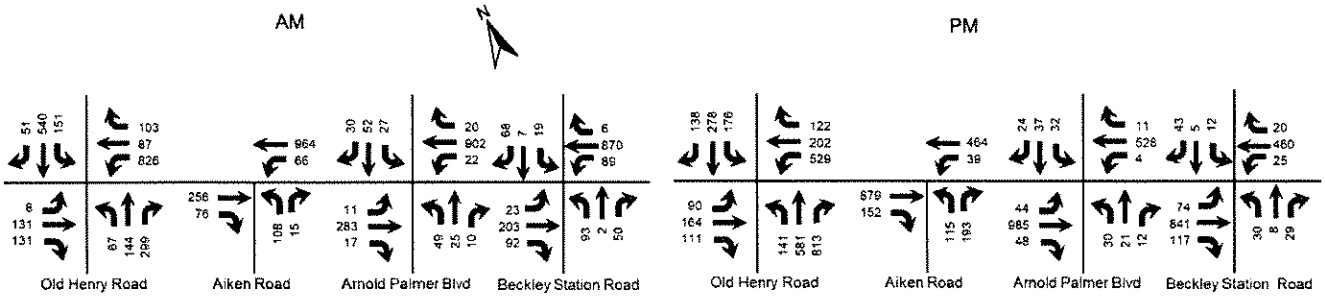


Figure 3. 2025 No Build Peak Hour Volumes Aiken Road

Table 3. Aiken North Trip Generation

	A.M. Peak Hour			P.M. Peak Hour		
Land Use	Trips	In	Out	Trips	In	Out
Single Family Detached (866 lots)	620	155	465	807	508	299

Figures 4 and 5 are the 2025 Build peak hour volumes. The Build volumes include the trips generated by Aiken North.

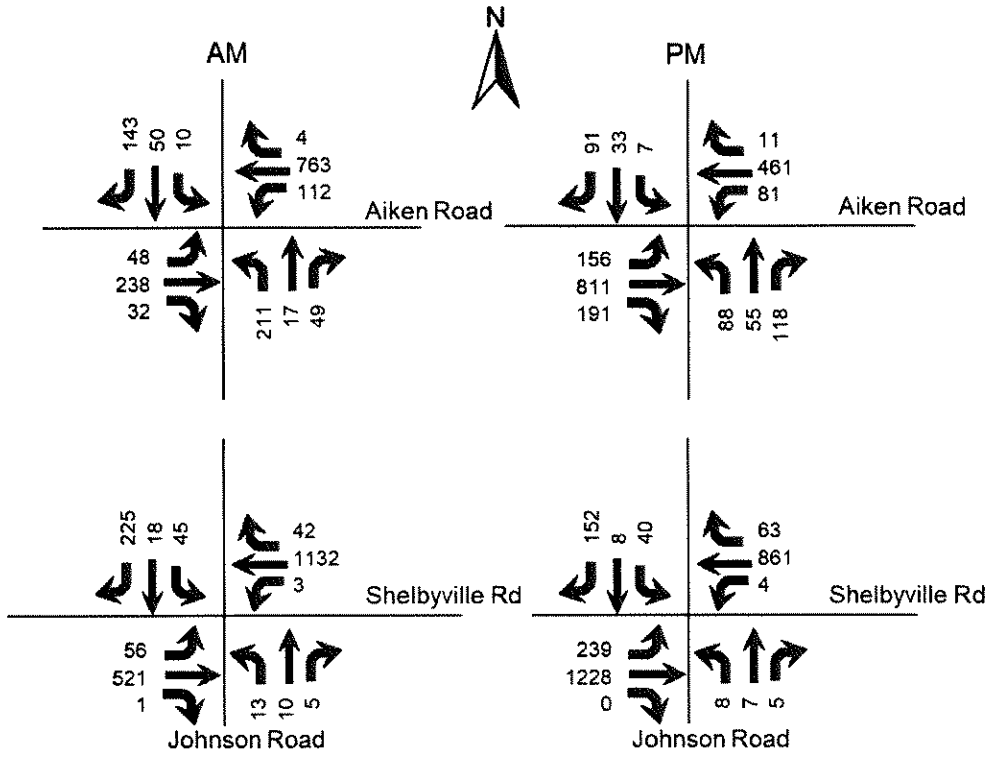


Figure 4. 2025 Build Peak Hour Volumes Johnson Road

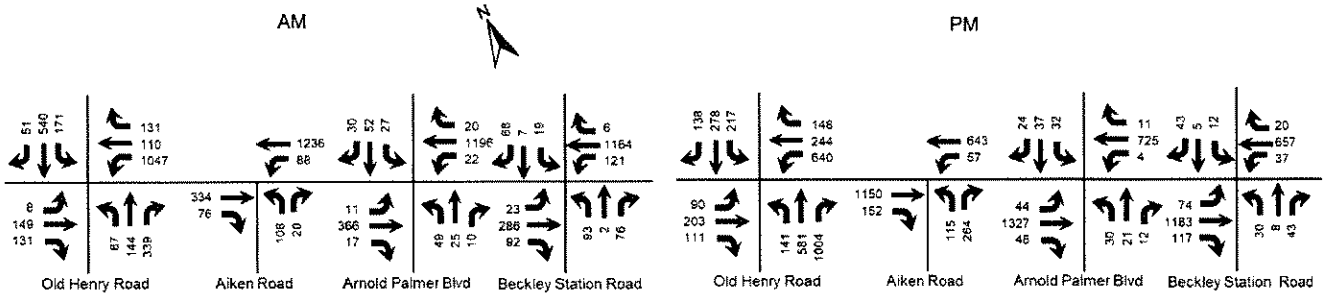


Figure 5. 2025 Build Peak Hour Volumes Aiken Road

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 7.9.5) software. The delays and Level of Service are summarized in **Tables 4 and 5**. The 2025 Build includes the recently constructed improvements at the Shelbyville Road intersection with Johnson Road, and the northbound right turn lane on Aiken at Bush Farm. The 2025 Build includes the improvements shown on the Aiken North plan for the intersection of Aiken Road with Johnson Road. The appendix includes on the Build and Improved column results.

Table 4. Peak Hour Level of Service Johnson Road

	A.M.				P.M.			
Approach	2017 Existing	2025 No Build	2025 Build	2025 Improved	2017 Existing	2025 No Build	2025 Build	2025 Improved
Aiken Road at Johnson Road			**C 20.2**				**B 12.9**	
Aiken Road Eastbound			B 11.8				A 8.3	
Johnson Road Westbound (left)	A 7.4	A 7.8	B 18.6		A 8.5	A 9.9	A 7.2	
Johnson Road Northbound	B 13.6	D 27.7	C 30.8		B 12.0	B 14.3	D 35.1	
Subdivision Road Southbound			C 25.8				C 33.4	
Shelbyville Road at Johnson Road								
Shelbyville Road Eastbound (left)	B 10.6	B 11.9	B 12.3	B 12.3	A 9.7	B 11.3	B 13.0	B 13.0
Shelbyville Road Westbound (left)	A 9.5	A 9.8	A 9.8	A 9.8	B 10.8	B 11.8	B 11.8	B 11.8
Eastwood Fishersville Road Northbound	F 63.2	F 647.9	F ~	F ~	F 113.4	F ~	F 326.6	F 258.3
Johnson Road Southbound	D 31.6	F 338.1	F 459.2	F 258.4	F 59.3	F 6561	F 1713.8	F 488.0

Key: Level of Service, Delay in seconds per vehicle

Table 5. Peak Hour Level of Service Aiken Road

	A.M.				P.M.			
Approach	2017* Existing	2025 No Build	2025 Build	2025 Improved	2017* Existing	2025 No Build	2025 Build	2025 Improved
Aiken Road at Beckley Station Road								
Aiken Road Eastbound (left)		B 10.7	B 12.8			A 8.6	A 9.4	
Aiken Road Westbound (left)	A 7.8	A 8.3	A 8.7		A 8.6	B 10.4	B 12.6	
Beckley Station Road Northbound	C 20.4	F 237.1	F 2921		B 14.8	D 27.5	F 56.7	
Beckley Station Road Southbound		D 29.3	F 65.2			C 20.3	F 52.2	
Aiken Road at Arnold Palmer Blvd								
Aiken Road Eastbound (left)	A 8.6	B 10.3	B 12.1	B 12.1	A 7.9	A 8.7	A 9.5	A 9.5
Aiken Road Westbound (left)	A 7.6	A 8.0	A 8.2	A 8.2	A 8.6	B 10.6	B 12.6	B 12.6
Arnold Palmer Blvd Northbound	D 25.3	F 214.9	F 1871.4	F 922.8	C 24.9	F 297.4	F ~	F ~
Arnold Palmer Blvd Southbound	C 21.3	F 108.3	F 511.8	F 102.5	C 24.0	F 271.5	F 2478	F 580
Aiken Road at Bush Farm Road								
Aiken Road Eastbound (left)	A 7.8	A 8.2	A 8.6	A 8.6	A 8.9	B 11.1	B 13.4	B 13.4
Aiken Road Northbound	C 23.6	F 165.1	F 953	F 91.8	D 25.5	F 456.7	F 508.1	F 221.1
Old Henry Road at Bush Farm Road	**B 17.1**	**F 124.7**	**F 228.0**	**E 59.6**	**B 16.3**	**F 97.2**	**F 153.6**	**E 62.3**
Old Henry Road Eastbound	B 15.2	D 48.2	D 49.7	E 66.1	B 13.6	F 112.7	F 169.1	E 73.4
Old Henry Road Westbound	B 17.8	D 41.6	D 40.1	D 50.4	B 14.9	C 28.3	C 29.9	C 29.1
Bush Farm Road Northbound	B 18.9	F 254.8	F 460.8	E 59.3	C 24.8	F 136.3	F 242.3	E 68.1
Bush Farm Southbound	A 10.0	B 16.5	B 18.3	E 73.7	B 17.5	E 64.0	E 72.3	E 70.7

*Beckley Station Road, Arnold Palmer Boulevard and Aiken Road are 2015

RECOMMENDATIONS

The cumulative impact of the approved residential developments has resulted in a need for additional improvements to Aiken Road and Shelbyville Road. The column in the table above labeled "2025 Improved" reflects the projects below. Funding for these projects needs to be identified. Note the intersection of Aiken Road at Beckley Station Road is being improved as part of the current development at this intersection and no additional improvements are recommended. The recommended projects are:

- Shelbyville Road at Johnson Road – The improvements included are the widening of Johnson Road to have a thru/left and a right turn lane on both north and southbound approaches. The only option to reduce delays on Johnson Road would be to install a signal at this intersection. Signal installation is not warranted with the volumes in Figure 4.
- Aiken Road at Arnold Palmer Boulevard – construct left turn lanes on Aiken Road at Arnold Palmer Boulevard.
- Aiken Road at Bush Farm Road – construct a left turn lane on all approaches. The volumes in Figure 4 indicate the warrants for installing a traffic signal could be met.
- Bush Farm Road at Old Henry Road – construct a dual left turn lane on the westbound approach of Bush Farm Road. The Old Henry Road construction project has been modified to include this improvement. Construction is anticipated in the fall of 2022.

CONCLUSIONS

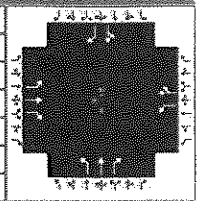
Based upon the volume of traffic forecasted for the year 2025, the projects identified in the Recommendations should be funded. The implementation of the roadway projects will improve the Level of Service. Traffic signals may be needed to reduce the delays experienced on the minor street approaches.

APPENDIX

HCS Reports

HCS7 Signalized Intersection Results Summary

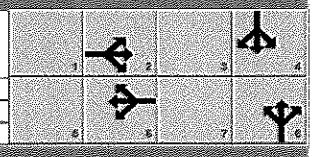
General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jul 1, 2021	Area Type	Other
Jurisdiction		Time Period	AM	PHF	0.86
Urban Street	Aiken Road	Analysis Year	2025 Build	Analysis Period	1> 7:15
Intersection	Johnson Road	File Name	Johnson AM 25 B.xus		
Project Description	Aiken North				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	48	238	32	112	763	4	211	17	49	10	50	143

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	46.7	19.3	0.0	0.0	0.0	0.0	
Yellow	4.0	4.0	0.0	0.0	0.0	0.0	
Red	3.0	3.0	0.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		5.0		6.0		5.0		7.0
Phase Duration, s		53.7		53.7		26.3		26.3
Change Period, ($Y+R_c$), s		7.0		7.0		7.0		7.0
Max Allow Headway (*MAH*), s		0.0		0.0		4.2		4.2
Queue Clearance Time (g_s), s						18.3		9.1
Green Extension Time (g_e), s		0.0		0.0		1.0		1.8
Phase Call Probability						1.00		1.00
Max Out Probability						0.84		0.04

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	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	56	277	37	130	892		245	20	57		70	166
Adjusted Saturation Flow Rate (*s*), veh/h/ln	614	1885	1598	1102	1883		1356	1900	1598		1827	1598
Queue Service Time (g_s), s	6.3	5.7	0.8	5.2	29.9		13.9	0.6	2.2		0.0	7.1
Cycle Queue Clearance Time (g_c), s	36.3	5.7	0.8	11.0	29.9		16.3	0.6	2.2		2.3	7.1
Green Ratio (*g/C*)	0.58	0.58	0.58	0.58	0.58		0.24	0.24	0.24		0.24	0.24
Capacity (*c*), veh/h	219	1101	933	655	1100		377	458	385		493	385
Volume-to-Capacity Ratio (*X*)	0.255	0.251	0.040	0.199	0.811		0.650	0.043	0.148		0.142	0.432
Back of Queue (*Q*), ft/ln (95 th percentile)	47.8	90.9	10.7	54.8	433.9		204.3	12.6	37.8		46.1	119.6
Back of Queue (*Q*), veh/ln (95 th percentile)	1.9	3.6	0.4	2.2	17.2		8.1	0.5	1.5		1.8	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (d_1), s/veh	27.5	8.1	7.1	10.8	13.1		30.3	23.3	23.9		23.9	25.7
Incremental Delay (d_2), s/veh	2.8	0.5	0.1	0.7	6.5		2.7	0.0	0.2		0.1	0.8
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.3	8.7	7.2	11.5	19.6		33.0	23.3	24.1		24.1	26.5
Level of Service (LOS)	C	A	A	B	B		C	C	C		C	C
Approach Delay, s/veh / LOS	11.8	B		18.6	B		30.8	C		25.8	C	
Intersection Delay, s/veh / LOS	20.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.07	B	1.88	B	1.92	B	2.11	B
Bicycle LOS Score / LOS	1.10	A	2.17	B	1.02	A	0.88	A

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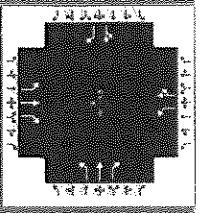
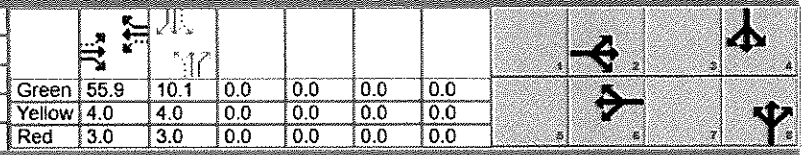
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jul 1, 2021	Area Type	Other
Jurisdiction		Time Period	PM	PHF	0.94
Urban Street	Aiken Road	Analysis Year	2025 Build	Analysis Period	1> 4:45
Intersection	Johnson Road	File Name	Johnson PM 25 B.xus		
Project Description	Aiken North				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	156	811	191	81	461	11	88	55	118	7	33	91

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



	EB		WB			
Green	55.9	10.1	0.0	0.0	0.0	0.0
Yellow	4.0	4.0	0.0	0.0	0.0	0.0
Red	3.0	3.0	0.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		5.0		6.0		5.0		7.0
Phase Duration, s		62.9		62.9		17.1		17.1
Change Period, (*Y+R c*), s		7.0		7.0		7.0		7.0
Max Allow Headway (*MAH*), s		0.0		0.0		4.2		4.2
Queue Clearance Time (*g s*), s						8.8		6.5
Green Extension Time (*g e*), s		0.0		0.0		1.3		1.4
Phase Call Probability						1.00		1.00
Max Out Probability						0.01		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	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	166	863	203	86	502		94	59	126		43	97
Adjusted Saturation Flow Rate (*s*), veh/h/ln	911	1900	1610	651	1892		1395	1900	1610		1849	1610
Queue Service Time (*g s*), s	7.3	20.0	3.5	6.7	8.7		5.1	2.2	5.9		0.0	4.5
Cycle Queue Clearance Time (*g c*), s	16.0	20.0	3.5	26.7	8.7		6.8	2.2	5.9		1.6	4.5
Green Ratio (*g/C*)	0.70	0.70	0.70	0.70	0.70		0.13	0.13	0.13		0.13	0.13
Capacity (*c*), veh/h	628	1329	1126	383	1323		237	239	202		285	202
Volume-to-Capacity Ratio (*X*)	0.264	0.649	0.180	0.225	0.379		0.395	0.245	0.621		0.149	0.479
Back of Queue (*Q*), ft/ln (95 th percentile)	58.7	245.4	37.5	45.3	109.8		78.9	45.9	107.8		32.8	80.1
Back of Queue (*Q*), veh/ln (95 th percentile)	2.3	9.8	1.5	1.8	4.4		3.2	1.8	4.3		1.3	3.2
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (*d 1*), s/veh	8.2	6.6	4.1	14.0	4.9		34.3	31.6	33.2		31.3	32.5
Incremental Delay (*d 2*), s/veh	1.0	2.5	0.4	1.4	0.8		1.1	0.5	3.1		0.2	1.8
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	9.2	9.1	4.5	15.3	5.8		35.4	32.1	36.3		31.5	34.3
Level of Service (LOS)	A	A	A	B	A		D	C	D		C	C
Approach Delay, s/veh / LOS	8.3	A		7.2	A		35.1	D		33.4	C	
Intersection Delay, s/veh / LOS	12.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.04	B	1.85	B	1.93	B	2.13	B
Bicycle LOS Score / LOS	2.52	C	1.46	A	0.95	A	0.72	A

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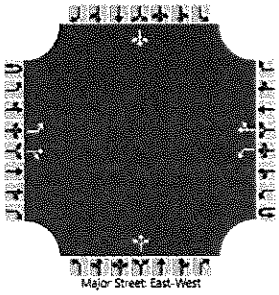
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Shelbyville at Johnson
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	7/1/21	East/West Street	Shelbyville Rd
Analysis Year	2025	North/South Street	Johnson Rd
Time Analyzed	AM Peak Build	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		56	521	1		3	1132	42		13	10	5		45	18	225
Percent Heavy Vehicles (%)		0				66				10	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.76				7.20	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.79				3.59	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		61				3					30				313	
Capacity, c (veh/h)		551				753									168	
v/c Ratio		0.11				0.00									1.87	
95% Queue Length, Q_{95} (veh)		0.4				0.0									23.2	
Control Delay (s/veh)		12.3				9.8									459.2	
Level of Service (LOS)		B				A									F	
Approach Delay (s/veh)		1.2				0.0								459.2		
Approach LOS														F		

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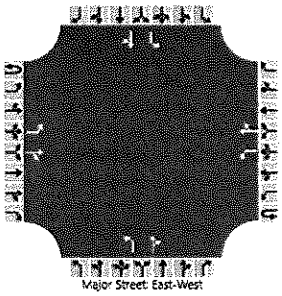
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Shelbyville at Johnson
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	7/1/21	East/West Street	Shelbyville Rd
Analysis Year	2025	North/South Street	Johnson Rd
Time Analyzed	AM Peak Build Improved	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	0	0	1	1	0		1	1	0		1	1	0
Configuration		L		TR		L		TR		L		TR		L		TR
Volume (veh/h)		56	521	1		3	1132	42		13	10	5		45	18	225
Percent Heavy Vehicles (%)		0				66				10	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.76				7.20	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.79				3.59	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		61				3				14		16		49		264
Capacity, c (veh/h)		551				753						80		130		177
v/c Ratio		0.11				0.00						0.20		0.38		1.49
95% Queue Length, Q_{95} (veh)		0.4				0.0						0.7		1.6		16.8
Control Delay (s/veh)		12.3				9.8						61.4		48.5		297.2
Level of Service (LOS)		B				A						F		E		F
Approach Delay (s/veh)		1.2				0.0								258.4		
Approach LOS														F		

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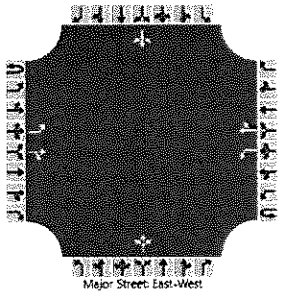
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Diane Zimmerman	Intersection	Shelbyville at Johnson
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	7/1/21	East/West Street	Shelbyville Rd
Analysis Year	2025	North/South Street	Johnson Rd
Time Analyzed	PM Peak Build	Peak Hour Factor	0.93
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		239	1228	0		4	861	63		8	7	5		40	8	152
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		257				4					22				215	
Capacity, c (veh/h)		704				530					26				49	
v/c Ratio		0.36				0.01					0.81				4.43	
95% Queue Length, Q_{95} (veh)		1.7				0.0					2.5				24.2	
Control Delay (s/veh)		13.0				11.8					326.6				1713.8	
Level of Service (LOS)		B				B					F				F	
Approach Delay (s/veh)		2.1				0.1				326.6				1713.8		
Approach LOS										F				F		

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HCS7 Two-Way Stop-Control Report

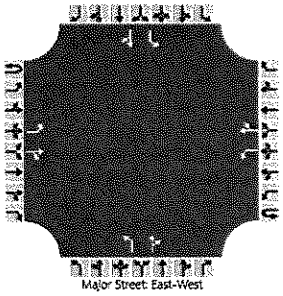
General Information

Analyst	Diane Zimmerman
Agency/Co.	Diane B Zimmerman Traffic Engineering
Date Performed	7/1/21
Analysis Year	2025
Time Analyzed	PM Peak Build
Intersection Orientation	East-West
Project Description	Aiken North

Site Information

Intersection	Shelbyville at Johnson
Jurisdiction	
East/West Street	Shelbyville Rd
North/South Street	Johnson Rd
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes



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	1	1	0	0	1	1	0		1	1	0		1	1	0
Configuration		L		TR		L		TR		L		TR		L		TR
Volume (veh/h)		239	1228	0		4	861	63		8	7	5		40	8	152
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		257				4				9		13		43		172
Capacity, c (veh/h)		704				530				78		18		14		137
v/c Ratio		0.36				0.01				0.11		0.70		3.18		1.25
95% Queue Length, Q_{95} (veh)		1.7				0.0				0.4		1.9		6.3		10.5
Control Delay (s/veh)		13.0				11.8				56.8		392.7		1548.2		223.0
Level of Service (LOS)		B				B				F		F		F		F
Approach Delay (s/veh)		2.1				0.1				258.3				488.0		
Approach LOS										F				F		

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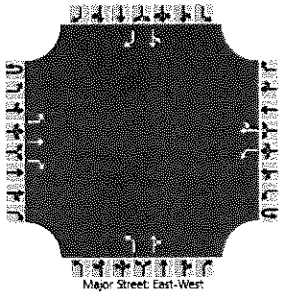
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Aiken at Beckley Station
Agency/Co.	DBZ	Jurisdiction	
Date Performed	7/1/21	East/West Street	Aiken Road
Analysis Year	2025	North/South Street	Beckley Station/Entrance
Time Analyzed	AM Peak Build	Peak Hour Factor	0.83
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	1	0	1	1	0		1	1	0		0	1	1
Configuration		L	T	R		L		TR		L		TR		LT		R
Volume (veh/h)		23	286	92		121	1164	6		93	2	76		19	7	68
Percent Heavy Vehicles (%)		1				1				1	3	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No												No		
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.11				4.11				7.11	6.53	6.21		7.11	6.51	6.21
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.51	4.03	3.31		3.51	4.01	3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28				146				112		94		31		82
Capacity, c (veh/h)		487				1110				10		500		59		171
v/c Ratio		0.06				0.13				11.27		0.19		0.53		0.48
95% Queue Length, Q_{95} (veh)		0.2				0.5				15.5		0.7		2.1		2.3
Control Delay (s/veh)		12.8				8.7				5359.2		13.9		120.8		43.9
Level of Service (LOS)		B				A				F		B		F		E
Approach Delay (s/veh)		0.7				0.8				2921.0				65.2		
Approach LOS										F				F		

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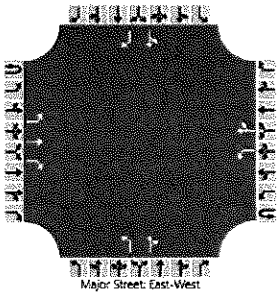
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Aiken at Beckley Station
Agency/Co.	Diane B Zimmerman Traffic	Jurisdiction	
Date Performed	7/1/21	East/West Street	Aiken Road
Analysis Year	2025	North/South Street	Beckley Station/Entrance
Time Analyzed	PM Peak Build	Peak Hour Factor	0.96
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	1	0	1	1	0		1	1	0		0	1	1
Configuration		L	T	R		L		TR		L		TR		LT		R
Volume (veh/h)		74	1183	117		37	657	20		30	8	43		12	5	43
Percent Heavy Vehicles (%)		1				1				1	3	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No												No		
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.11				4.11				7.11	6.53	6.21		7.11	6.51	6.21
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.51	4.03	3.31		3.51	4.01	3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		77				39				31		53		18		45
Capacity, c (veh/h)		897				511				91		127		41		444
v/c Ratio		0.09				0.08				0.34		0.42		0.43		0.10
95% Queue Length, Q_{95} (veh)		0.3				0.2				1.3		1.8		1.5		0.3
Control Delay (s/veh)		9.4				12.6				64.2		52.4		148.6		14.0
Level of Service (LOS)		A				B				F		F		F		B
Approach Delay (s/veh)		0.5				0.7				56.7				52.2		
Approach LOS										F				F		

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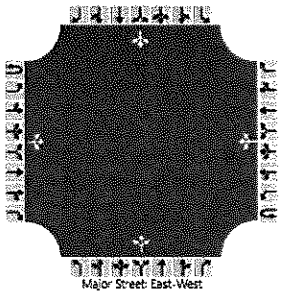
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Aiken at Arnold Palmer
Agency/Co.	Diane B. Zimmerman Traffi	Jurisdiction	
Date Performed	7/1/21	East/West Street	Aiken Road
Analysis Year	2025	North/South Street	Arnold Palmer Boulevard
Time Analyzed	AM Peak Build	Peak Hour Factor	0.91
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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 (veh/h)		11	366	17		22	1196	20		49	25	10		27	52	30
Percent Heavy Vehicles (%)		1				1				1	1	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.11				4.11				7.11	6.51	6.21		7.11	6.51	6.21
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.51	4.01	3.31		3.51	4.01	3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		12				24					92				120	
Capacity, c (veh/h)		519				1143					21				67	
v/c Ratio		0.02				0.02					4.34				1.79	
95% Queue Length, Q_{95} (veh)		0.1				0.1					11.8				10.8	
Control Delay (s/veh)		12.1				8.2					1871.4				511.8	
Level of Service (LOS)		B				A					F				F	
Approach Delay (s/veh)	0.7				0.8				1871.4				511.8			
Approach LOS									F				F			

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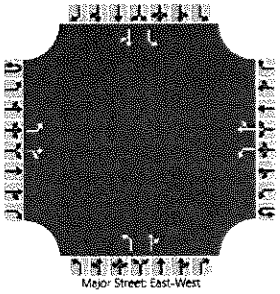
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Aiken at Arnold Palmer
Agency/Co.	Diane B. Zimmerman Traffi	Jurisdiction	
Date Performed	7/1/21	East/West Street	Aiken Road
Analysis Year	2025	North/South Street	Arnold Palmer Boulevard
Time Analyzed	AM Peak Build Improved	Peak Hour Factor	0.91
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Aiken North		

Lanes



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	1	1	0	0	1	1	0		1	1	0		1	1	0
Configuration		L		TR		L		TR		L		TR		L		TR
Volume (veh/h)		11	366	17		22	1196	20		49	25	10		27	52	30
Percent Heavy Vehicles (%)		1				1				1	1	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.11				4.11				7.11	6.51	6.21		7.11	6.51	6.21
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.51	4.01	3.31		3.51	4.01	3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		12				24				54		38		30		90
Capacity, c (veh/h)		519				1143				19		32		122		107
v/c Ratio		0.02				0.02				2.90		1.20		0.24		0.84
95% Queue Length, Q_{95} (veh)		0.1				0.1				7.2		4.2		0.9		4.9
Control Delay (s/veh)		12.1				8.2				1285.2		415.3		43.9		121.8
Level of Service (LOS)		B				A				F		F		E		F
Approach Delay (s/veh)		0.3				0.1				922.8				102.5		
Approach LOS										F				F		

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HCS7 Two-Way Stop-Control Report

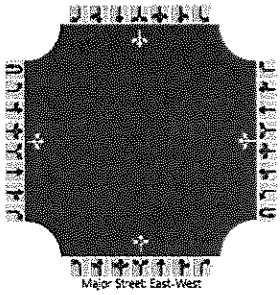
General Information

Analyst	DBZ
Agency/Co.	DBZ
Date Performed	7/1/21
Analysis Year	2025
Time Analyzed	PM Peak Build
Intersection Orientation	East-West
Project Description	Aiken North

Site Information

Intersection	Aiken at Arnold Palmer
Jurisdiction	
East/West Street	Aiken Road
North/South Street	Arnold Palmer Boulevard
Peak Hour Factor	0.96
Analysis Time Period (hrs)	0.25

Lanes



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 (veh/h)		44	1327	48		4	725	11		30	21	12		32	37	24
Percent Heavy Vehicles (%)		1				1				1	1	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.11				4.11				7.11	6.51	6.21		7.11	6.51	6.21
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.51	4.01	3.31		3.51	4.01	3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		46				4					66				97	
Capacity, c (veh/h)		851				477									17	
v/c Ratio		0.05				0.01									5.54	
95% Queue Length, Q_{95} (veh)		0.2				0.0									12.8	
Control Delay (s/veh)		9.5				12.6									2477.8	
Level of Service (LOS)		A				B									F	
Approach Delay (s/veh)		2.8				0.3								2477.8		
Approach LOS														F		

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HCS7 Two-Way Stop-Control Report

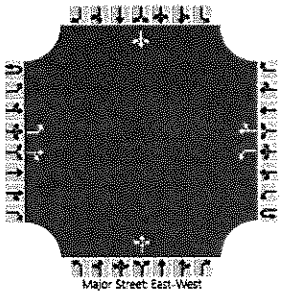
General Information

Analyst	DBZ
Agency/Co.	DBZ
Date Performed	7/1/21
Analysis Year	2025
Time Analyzed	PM Peak Build Improved
Intersection Orientation	East-West
Project Description	Aiken North

Site Information

Intersection	Aiken at Arnold Palmer
Jurisdiction	
East/West Street	Aiken Road
North/South Street	Arnold Palmer Boulevard
Peak Hour Factor	0.96
Analysis Time Period (hrs)	0.25

Lanes



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	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		44	1327	48		4	725	11		30	21	12		32	37	24
Percent Heavy Vehicles (%)		1				1				1	1	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.11				4.11				7.11	6.51	6.21		7.11	6.51	6.21
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.51	4.01	3.31		3.51	4.01	3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		46				4					66				97	
Capacity, c (veh/h)		851				477									52	
v/c Ratio		0.05				0.01									1.87	
95% Queue Length, Q_{95} (veh)		0.2				0.0									9.5	
Control Delay (s/veh)		9.5				12.6									580.0	
Level of Service (LOS)		A				B									F	
Approach Delay (s/veh)	0.3				0.1								580.0			
Approach LOS													F			

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HCS7 Two-Way Stop-Control Report

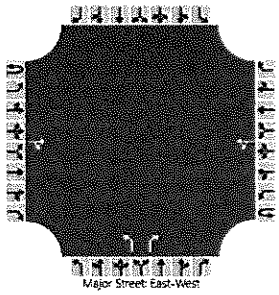
General Information

Analyst	DBZ
Agency/Co.	Diane B. Zimmerman Traffi
Date Performed	7/1/21
Analysis Year	2025
Time Analyzed	AM Peak Build
Intersection Orientation	East-West
Project Description	Aiken North

Site Information

Intersection	Aiken at Bush Farm
Jurisdiction	
East/West Street	Aiken Road/Bush Farm Road
North/South Street	Aiken Road
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



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		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			334	76		88	1236			108		20				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						99				121		22				
Capacity, c (veh/h)						1105				40		637				
v/c Ratio						0.09				3.03		0.04				
95% Queue Length, Q_{95} (veh)						0.3				13.5		0.1				
Control Delay (s/veh)						8.6				1127.4		10.9				
Level of Service (LOS)						A				F		B				
Approach Delay (s/veh)					3.7				953.0							
Approach LOS									F							

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HCS7 Two-Way Stop-Control Report

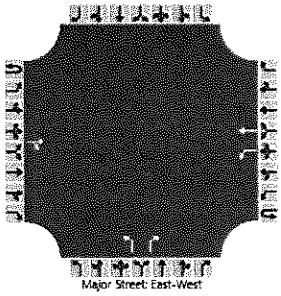
General Information

Analyst	DBZ
Agency/Co.	Diane B. Zimmerman Traffi
Date Performed	7/1/21
Analysis Year	2025
Time Analyzed	AM Peak Build Improved
Intersection Orientation	East-West
Project Description	Aiken North

Site Information

Intersection	Aiken at Bush Farm
Jurisdiction	
East/West Street	Aiken Road/Bush Farm Road
North/South Street	Aiken Road
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



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	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			334	76		88	1236			108		20				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage			Left Only							1						

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						99				121		22				
Capacity, c (veh/h)						1105				139		637				
v/c Ratio						0.09				0.87		0.04				
95% Queue Length, Q_{95} (veh)						0.3				5.7		0.1				
Control Delay (s/veh)						8.6				106.8		10.9				
Level of Service (LOS)						A				F		B				
Approach Delay (s/veh)						0.6				91.8						
Approach LOS										F						

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HCS7 Two-Way Stop-Control Report

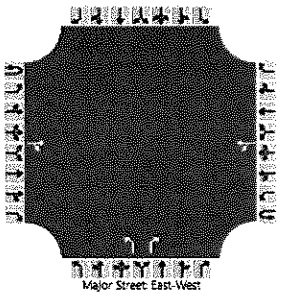
General Information

Analyst	DBZ
Agency/Co.	Diane B. Zimmerman Traffi
Date Performed	7/1/21
Analysis Year	2025
Time Analyzed	PM Peak Build
Intersection Orientation	East-West
Project Description	Aiken North

Site Information

Intersection	Aiken at Bush Farm
Jurisdiction	
East/West Street	Aiken Road/Bush Farm Road
North/South Street	Aiken Road
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes



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		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			1150	152		57	643			115		264				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						61				124		284				
Capacity, c (veh/h)						491				44		193				
v/c Ratio						0.12				2.84		1.47				
95% Queue Length, Q_{95} (veh)						0.4				13.5		17.4				
Control Delay (s/veh)						13.4				1025.6		282.7				
Level of Service (LOS)						B				F		F				
Approach Delay (s/veh)					3.6				508.1							
Approach LOS									F							

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HCS7 Two-Way Stop-Control Report

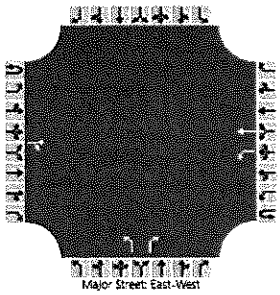
General Information

Analyst	DBZ
Agency/Co.	Diane B. Zimmerman Traffi
Date Performed	7/1/21
Analysis Year	2025
Time Analyzed	PM Peak Build Improved
Intersection Orientation	East-West
Project Description	Aiken North

Site Information

Intersection	Aiken at Bush Farm
Jurisdiction	
East/West Street	Aiken Road/Bush Farm Road
North/South Street	Aiken Road
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes



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	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			1150	152		57	643			115		264				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage																
	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						61				124		284				
Capacity, c (veh/h)						491				159		193				
v/c Ratio						0.12				0.78		1.47				
95% Queue Length, Q_{95} (veh)						0.4				4.9		17.4				
Control Delay (s/veh)						13.4				79.5		282.7				
Level of Service (LOS)						B				F		F				
Approach Delay (s/veh)					1.1				221.1							
Approach LOS									F							

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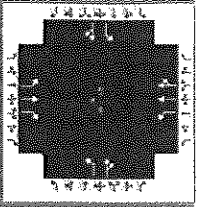
HCS7 Signalized Intersection Results Summary

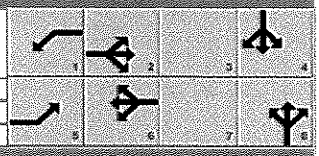
General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jul 1, 2021	Area Type	Other
Jurisdiction		Time Period	AM Peak	PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2025 Build	Analysis Period	1> 7:15
Intersection	Bush Farm Road	File Name	Old Henry AM 2025 B.xus		
Project Description	Aiken North				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	67	144	339	171	540	51	1047	110	131	8	149	131

Signal Information			
Cycle, s	139.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB		WB			
Green	5.8	1.4	34.8	75.0	0.0	0.0
Yellow	4.0	4.0	3.6	4.3	0.0	0.0
Red	1.3	1.3	3.0	1.3	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		6.0		6.0
Phase Duration, s	11.1	41.4	17.7	48.1		80.6		80.6
Change Period, (*Y+Rc*), s	5.3	6.6	5.3	6.6		5.6		5.6
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2		3.7		3.7
Queue Clearance Time (*gs*), s	6.1	32.4	12.4	22.4		77.0		15.6
Green Extension Time (*ge*), s	0.1	2.4	0.1	2.4		0.0		8.4
Phase Call Probability	0.94	1.00	1.00	1.00		1.00		1.00
Max Out Probability	0.00	0.00	1.00	0.00		1.00		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	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	72	154	362	186	326	317	1138	262		9	304	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1900	1610	1810	1900	1842	1092	1731		1135	1752	
Queue Service Time (*gs*), s	4.1	9.2	30.4	10.4	20.3	20.4	61.4	11.6		0.6	13.6	
Cycle Queue Clearance Time (*gc*), s	4.1	9.2	30.4	10.4	20.3	20.4	75.0	11.6		12.1	13.6	
Green Ratio (*g/C*)	0.29	0.25	0.25	0.35	0.30	0.30	0.54	0.54		0.54	0.54	
Capacity (*c*), veh/h	235	474	401	442	564	547	531	929		567	940	
Volume-to-Capacity Ratio (*X*)	0.304	0.325	0.902	0.421	0.577	0.579	2.143	0.282		0.015	0.324	
Back of Queue (*Q*), ft/ln (90 th percentile)	82.5	171.3	420.6	183.1	338	330.2	3821.7	183.9		7.2	212.5	
Back of Queue (*Q*), veh/ln (90 th percentile)	3.3	6.9	16.8	7.3	13.5	13.2	152.9	7.4		0.3	8.5	
Queue Storage Ratio (*RQ*) (90 th percentile)	0.41	0.29	0.72	1.22	0.23	0.22	7.64	0.37		0.01	0.38	
Uniform Delay (*d1*), s/veh	37.6	42.9	50.8	33.2	41.7	41.7	42.2	17.7		21.0	18.2	
Incremental Delay (*d2*), s/veh	0.2	0.1	4.0	0.2	0.3	0.4	520.6	0.1		0.0	0.1	
Initial Queue Delay (*d3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	37.8	43.0	54.8	33.4	42.0	42.1	562.7	17.7		21.0	18.2	
Level of Service (LOS)	D	D	D	C	D	D	F	B		C	B	
Approach Delay, s/veh / LOS	49.7	D		40.1	D		460.8	F		18.3	B	
Intersection Delay, s/veh / LOS	228.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.94	B	2.10	B	2.27	B
Bicycle LOS Score / LOS	1.47	A	1.17	A	2.80	C	1.00	A

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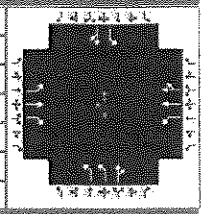
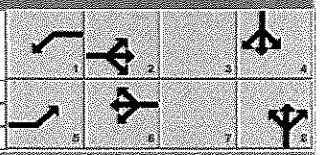
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jul 1, 2021	Area Type	Other
Jurisdiction		Time Period	AM Peak	PHF	0.92
Urban Street	Old Henry Road	Analysis Year	2025 Build Imp	Analysis Period	1> 7:15
Intersection	Bush Farm Road	File Name	Old Henry AM 2025 B IMP.xus		
Project Description	Aiken North				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	67	144	339	171	540	51	1047	110	131	8	149	131

Signal Information					EB			WB			NB			SB		
Cycle, s	172.6	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	6.9	2.8		42.3	32.2	59.9	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0		3.6	4.3	4.3	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.3	1.3		3.0	1.3	1.3	0.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		10.0		10.0
Phase Duration, s	12.2	48.9	20.3	57.0		65.5		37.8
Change Period, ($Y+R_c$), s	5.3	6.6	5.3	6.6		5.6		5.6
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2		3.1		3.2
Queue Clearance Time (g_s), s	7.1	39.8	15.0	27.4		56.0		31.5
Green Extension Time (g_e), s	0.0	2.3	0.0	2.4		3.8		0.6
Phase Call Probability	0.97	1.00	1.00	1.00		1.00		1.00
Max Out Probability	0.00	0.01	1.00	0.00		0.02		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	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	72	154	362	186	326	317	1138	262		9	304	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1900	1610	1810	1900	1842	1757	1731		1810	1762	
Queue Service Time (g_s), s	5.1	11.5	37.8	13.0	25.3	25.4	54.0	20.1		0.7	29.5	
Cycle Queue Clearance Time (g_c), s	5.1	11.5	37.8	13.0	25.3	25.4	54.0	20.1		0.7	29.5	
Green Ratio (*g/C*)	0.29	0.25	0.25	0.34	0.29	0.29	0.35	0.35		0.19	0.19	
Capacity (*c*), veh/h	221	466	395	423	554	538	1221	601		338	328	
Volume-to-Capacity Ratio (*X*)	0.324	0.330	0.917	0.439	0.587	0.589	0.932	0.436		0.026	0.929	
Back of Queue (*Q*), ft/ln (90 th percentile)	103.7	208.8	539.6	225.4	416.9	407.4	790.8	313.4		14.2	460.5	
Back of Queue (*Q*), veh/ln (90 th percentile)	4.1	8.4	21.6	9.0	16.7	16.3	31.6	12.5		0.6	18.4	
Queue Storage Ratio (*RQ*) (90 th percentile)	0.52	0.36	0.92	1.50	0.28	0.27	1.58	0.63		0.03	0.82	
Uniform Delay (d_1), s/veh	47.2	53.6	63.5	42.1	52.3	52.4	54.4	43.4		57.4	69.1	
Incremental Delay (d_2), s/veh	0.3	0.1	11.6	0.3	0.4	0.4	8.5	0.2		0.0	5.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	47.4	53.7	75.1	42.4	52.7	52.7	62.9	43.6		57.4	74.1	
Level of Service (LOS)	D	D	E	D	D	D	E	D		E	E	
Approach Delay, s/veh / LOS	66.1	E		50.4	D		59.3	E		73.7	E	
Intersection Delay, s/veh / LOS	59.6						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	1.95	B	2.17	B	2.30	B
Bicycle LOS Score / LOS	1.47	A	1.17	A	2.80	C	1.00	A

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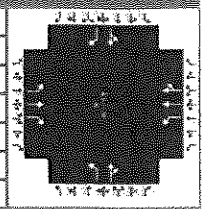
HCS7 Signalized Intersection Results Summary

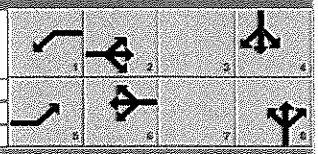
General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jul 1, 2021	Area Type	Other
Jurisdiction		Time Period	PM Peak	PHF	0.93
Urban Street	Old Henry Road	Analysis Year	2025 Build	Analysis Period	1> 5:00
Intersection	Bush Farm Road	File Name	Old Henry PM 2025 B.xus		
Project Description	Aiken North				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	141	581	1004	217	278	138	640	244	148	90	203	111

Signal Information			
Cycle, s	127.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	0.0	42.0	23.0	30.0	0.0						
Yellow	4.0	4.0	4.0	4.0	4.0	0.0						
Red	1.0	1.0	1.0	1.0	1.0	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		10.0		11.0
Phase Duration, s	12.0	47.0	17.0	52.0		35.0		28.0
Change Period, (*Y+R c*), s	5.0	5.0	5.0	5.0		5.0		5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2		3.1		3.1
Queue Clearance Time (*g s*), s	7.1	44.0	12.5	13.6		32.0		23.1
Green Extension Time (*g e*), s	0.1	0.0	0.0	4.4		0.0		0.0
Phase Call Probability	0.98	1.00	1.00	1.00		1.00		1.00
Max Out Probability	0.10	1.00	1.00	0.02		1.00		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	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	111	456	787	233	233	214	688	422			315	119
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1900	1610	1810	1900	1689	1810	1779			1871	1610
Queue Service Time (*g s*), s	5.1	26.8	42.0	10.5	11.2	11.6	30.0	30.0			21.1	8.3
Cycle Queue Clearance Time (*g c*), s	5.1	26.8	42.0	10.5	11.2	11.6	30.0	30.0			21.1	8.3
Green Ratio (*g/C*)	0.39	0.33	0.33	0.44	0.37	0.37	0.24	0.24			0.18	0.18
Capacity (*c*), veh/h	408	628	532	341	703	625	427	420			339	292
Volume-to-Capacity Ratio (*X*)	0.271	0.725	1.479	0.684	0.332	0.343	1.610	1.003			0.930	0.409
Back of Queue (*Q*), ft/ln (90 th percentile)	91.9	406.1	1736.7	192.4	199.7	187	1728.5	596			430.6	142.3
Back of Queue (*Q*), veh/ln (90 th percentile)	3.7	16.2	69.5	7.7	8.0	7.5	69.1	23.8			17.2	5.7
Queue Storage Ratio (*RQ*) (90 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00
Uniform Delay (*d 1*), s/veh	25.8	37.4	42.5	27.1	28.7	28.9	48.5	48.5			51.2	46.0
Incremental Delay (*d 2*), s/veh	0.1	2.3	221.6	4.6	0.1	0.1	285.2	44.6			30.9	0.3
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	25.9	39.7	264.1	31.7	28.8	29.0	333.7	93.1			82.1	46.3
Level of Service (LOS)	C	D	F	C	C	C	F	F			F	D
Approach Delay, s/veh / LOS	169.1	F		29.9	C		242.3	F		72.3	E	
Intersection Delay, s/veh / LOS	153.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	1.93	B	2.16	B	2.30	B
Bicycle LOS Score / LOS	3.55	D	1.05	A	2.32	B	1.20	A

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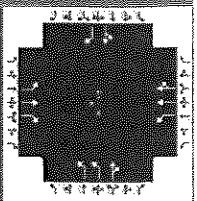
HCS7 Signalized Intersection Results Summary

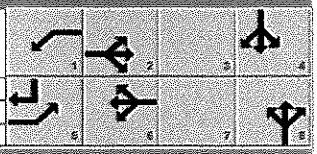
General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jul 1, 2021	Area Type	Other
Jurisdiction		Time Period	PM Peak	PHF	0.93
Urban Street	Old Henry Road	Analysis Year	2025 Build Improved	Analysis Period	1> 5:00
Intersection	Bush Farm Road	File Name	Old Henry PM 2025 B IMP.xus		
Project Description	Aiken North				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	141	581	1004	217	278	138	640	244	148	90	203	111

Signal Information			
Cycle, s	127.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

	EB			WB			NB			SB		
Green	6.7	0.3		42.0	23.0		30.0	0.0				
Yellow	4.0	4.0		4.0	4.0		4.0	0.0				
Red	1.0	1.0		1.0	1.0		1.0	0.0				



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		10.0		11.0
Phase Duration, s	11.7	47.0	17.0	52.3		35.0		28.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0		5.0		5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2		3.1		3.1
Queue Clearance Time (g_s), s	6.8	44.0	12.5	13.6		32.0		23.1
Green Extension Time (g_e), s	0.1	0.0	0.0	3.4		0.0		0.0
Phase Call Probability	0.98	1.00	1.00	1.00		1.00		1.00
Max Out Probability	0.07	1.00	1.00	0.01		1.00		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	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	105	432	591	233	233	214	688	422			315	119
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1900	1610	1810	1900	1689	1757	1779			1871	1610
Queue Service Time (g_s), s	4.8	25.0	42.0	10.5	11.1	11.6	23.6	30.0			21.1	7.8
Cycle Queue Clearance Time (g_c), s	4.8	25.0	42.0	10.5	11.1	11.6	23.6	30.0			21.1	7.8
Green Ratio (*g/C*)	0.38	0.33	0.33	0.44	0.37	0.37	0.24	0.24			0.18	0.23
Capacity (*c*), veh/h	407	628	532	357	708	629	830	420			339	377
Volume-to-Capacity Ratio (*X*)	0.258	0.688	1.109	0.653	0.329	0.340	0.829	1.003			0.930	0.317
Back of Queue (*Q*), ft/ln (90 th percentile)	88	379.1	830.6	189.2	199	186.6	379.8	596			430.6	133.8
Back of Queue (*Q*), veh/ln (90 th percentile)	3.5	15.2	33.2	7.6	8.0	7.5	15.2	23.8			17.2	5.4
Queue Storage Ratio (*RQ*) (90 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	25.9	36.8	42.5	26.6	28.5	28.6	46.1	48.5			51.2	40.2
Incremental Delay (d_2), s/veh	0.1	1.6	64.9	3.3	0.1	0.1	6.6	44.6			30.9	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	26.0	38.4	107.4	29.9	28.6	28.8	52.7	93.1			82.1	40.4
Level of Service (LOS)	C	D	F	C	C	C	D	F			F	D
Approach Delay, s/veh / LOS	73.4	E		29.1	C		68.1	E		70.7	E	
Intersection Delay, s/veh / LOS	62.3						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	1.93	B	2.16	B	2.60	C
Bicycle LOS Score / LOS	3.18	C	1.05	A	2.32	B	1.20	A

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