

June 1, 2020
Revised November 20, 2020

Traffic Impact Study

*Star Hill and S. Watterson Trail Subdivision
Hurstbourne Parkway (KY 1747)
Louisville, KY*

Prepared for

Louisville Metro Planning Commission
Kentucky Transportation Cabinet



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INTRODUCTION

The site plan for the proposed Star Hill development shows a mix of retail space, apartments, and senior living facilities along Hurstbourne Parkway (KY 1747) west of S. Watterson Trail in Louisville, KY. South of Star Hill a residential community is proposed with 240 apartments and 67 lots. **Figure 1** displays a map of the site. Access to the sites will be from three entrances on Hurstbourne Parkway and two entrances on S. Watterson Trail. 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 Hurstbourne Parkway with Vassel Road, Watterson Trail, and Bardstown Road; the intersection of Watterson Trail with Fair Lane; and the proposed entrances.

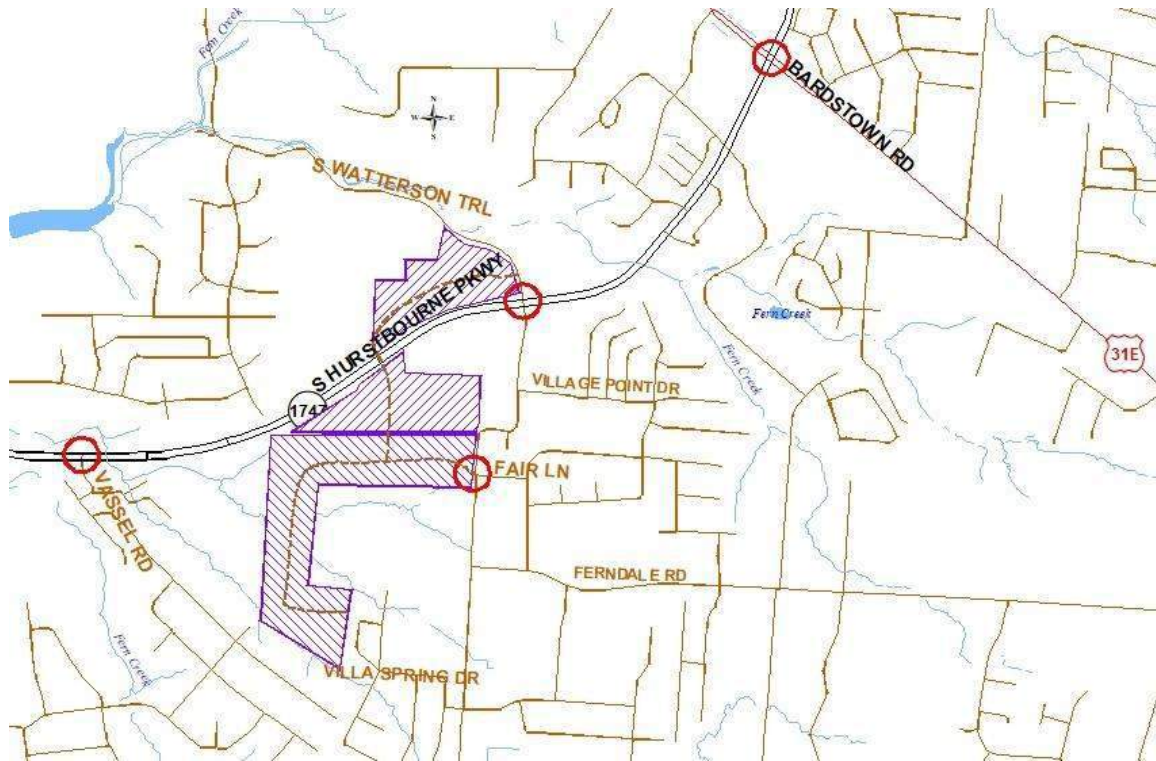


Figure 1. Site Map

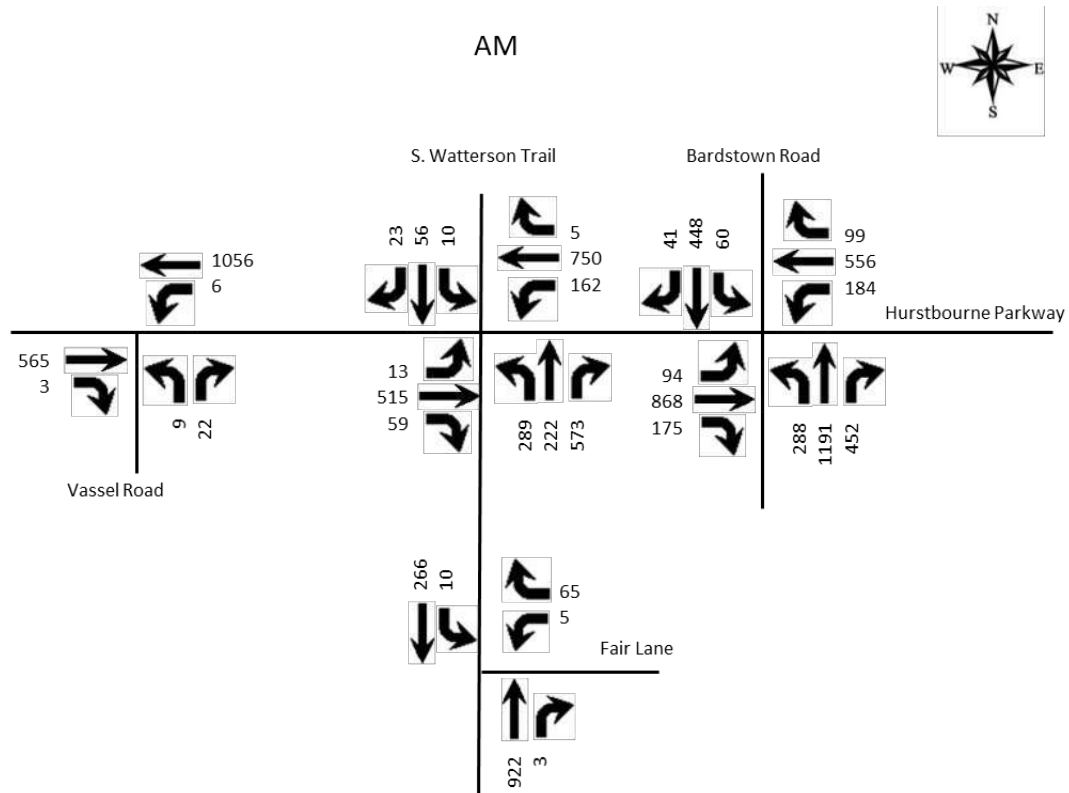
EXISTING CONDITIONS

Hurstbourne Parkway, is a state-maintained road (KY 1747) with an estimated 2020 ADT of 21,600 vehicles per day between Vassel Road and Watterson Trail, as estimated from the turning movement count. The road is a four-lane highway with twelve-foot lanes, curb and gutter, and a thirty-five-foot raised non-mountable median through the study area. The speed limit is 45 mph. There are no sidewalks. The intersection with Watterson Trail has dedicated left and right turn lanes on both approaches study area.

S Watterson Trail is maintained by Louisville Metro with an estimated 2020 Average Annual Daily Traffic (AADT) volume of 9,600 vehicles per day between Fair Lane and Ferndale Road, as estimated from the turning movement count. The road has two lanes of nine feet and three-foot shoulders through study area. The speed limit is 35 mph. There are no sidewalks. The intersection with Fair Lane is controlled with a stop sign on Fair Lane.

Star Hill
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Peak hour traffic count for the intersections was obtained on Wednesday, January 22, 2020. The a.m. peak hour occurred between 7:15 and 8:15 and the p.m. peak hour occurred between 4:45 and 5:45. **Figure 2** illustrates the existing a.m. and p.m. peak hour traffic volumes. The Appendix contains the full count data.



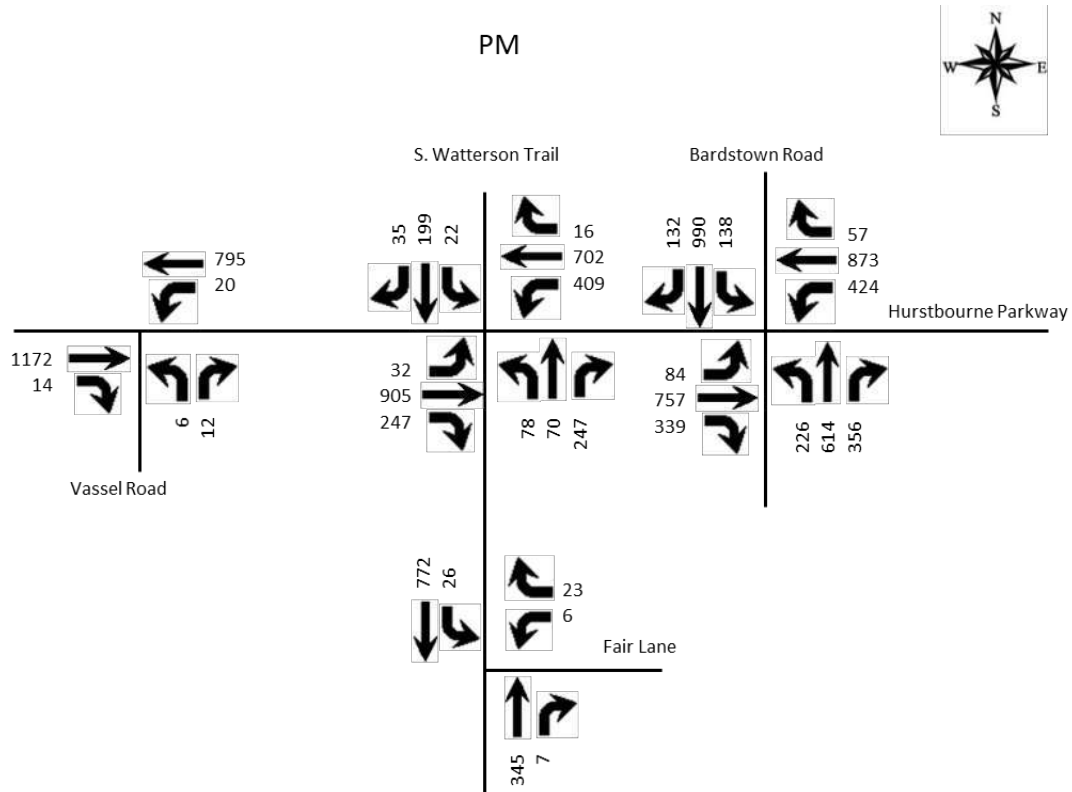


Figure 2. Existing Peak Hour Volumes

FUTURE CONDITIONS

The project completion date is 2024. An annual growth rate of 1 percent was applied to the 2020 volumes. This was determined by the historical growth at KYTC stations Q03 and 307. **Figure 3** displays the 2024 No Build peak hour volumes.

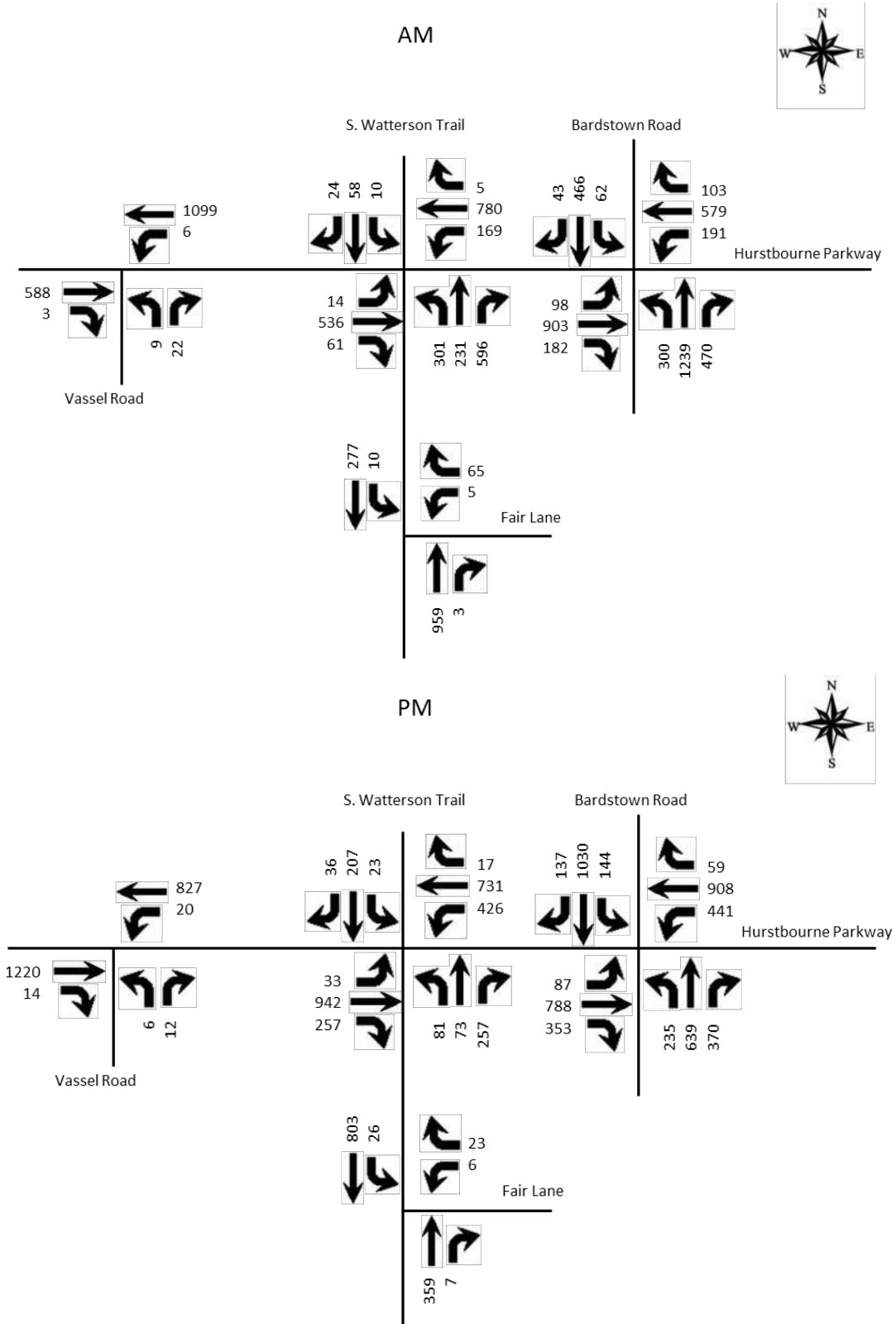


Figure 3. 2024 No Build Peak Hour Volumes

TRIP GENERATION

The Institute of Transportation Engineers Trip Generation Manual, 10th Edition contains trip generation rates for a wide range of developments. The trip generation results are listed in **Table 1**. The trips were assigned to the highway network with the percentages shown in **Figure 4**. **Figure 5** shows the trips generated by this development and distributed throughout the road network during the peak hours. **Figure 6** displays the individual turning movements for the peak hours when the development is completed.

Table 1. Peak Hour Trips Generated by Site North

AM Peak Hour																				
Land use	ITE Code	Intensity	Rate/EQ	% IN	% Out	Total Trips			Internal Trips				External Trips			Pass-by Trips		New Trips		
						In	Out	Total	In	Out	Total	%	In	Out	Total	%	Volume	In	Out	Total
Shopping Center	820	13,000 sf	$T = 0.50(X) + 151.78$	0.62	0.38	98	60	158	3	8	11	7.0%	95	52	147	0%	0	95	52	147
Bank	912	6,800 sf	$T = 9.50(X)$	0.58	0.42	38	27	65	0	0	0	0.0%	38	27	65	29%	19	27	19	46
Fast Food w drive	934	1,000 sf	$T = 40.19(X)$	0.51	0.49	20	20	40	12	4	16	40.0%	8	16	24	49%	12	4	8	12
Convenience w gas	853	8 pump	$T = 20.76(X)$	0.5	0.5	83	83	166	0	0	0	0.0%	83	83	166	63%	105	31	31	61
Multi-Family (3-10)	221	152 units	$\text{Ln}(T) = 0.98\text{Ln}(X) - 0.98$	0.26	0.74	14	38	52	1	4	5	9.6%	13	34	47	0%	0	13	34	47
Total						253	228	481	16	16	32	6.7%	237	212	449	30.1%	135	170	144	314

PM Peak Hour																				
Land use	ITE Code	Intensity	Rate/EQ	% IN	% Out	Total Trips			Internal Trips				External Trips			Pass-by Trips		New Trips		
						In	Out	Total	In	Out	Total	%	In	Out	Total	%	Volume	In	Out	Total
Shopping Center	820	13,000 sf	$\text{Ln}(T) = 0.74\text{Ln}(X) + 2.89$	0.48	0.52	58	62	120	13	21	34	28.3%	45	41	86	34%	29	30	27	57
Bank	912	6,800 sf	$T = 20.45(X)$	0.5	0.5	70	69	139	0	0	0	0.0%	70	69	139	26%	36	52	51	103
Fast Food w drive	934	1,000 sf	$T = 32.67(X)$	0.52	0.48	17	16	33	7	10	17	51.5%	10	6	16	50%	8	5	3	8
Convenience w gas	853	8 pump	$T = 23.04(X)$	0.5	0.5	92	92	184	0	0	0	0.0%	92	92	184	66%	121	31	31	63
Multi-Family (3-10)	221	152 units	$\text{Ln}(T) = 0.96\text{Ln}(X) - 0.63$	0.61	0.39	40	26	66	19	8	27	40.9%	21	18	39	0%	0	21	18	39
Total						277	265	542	39	39	78	14.4%	238	226	464	42.0%	195	139	130	269

Table 2. Peak Hour Trips Generated by Site South

AM Peak Hour																				
Land use	ITE Code	Intensity	Rate/EQ	% IN	% Out	Total Trips			Internal Trips				External Trips			Pass-by Trips		New Trips		
						In	Out	Total	In	Out	Total	%	In	Out	Total	%	Volume	In	Out	Total
Shopping Center	820	18,000 sf	$T = 0.50(X) + 151.78$	0.62	0.38	100	61	161	1	1	2	1.2%	99	60	159	0%	0	99	60	159
Bank	912	3,600 sf	$T = 9.50(X)$	0.58	0.42	20	14	34	0	0	0	0.0%	20	14	34	29%	10	14	10	24
Single Family	210	67 units	$T = 0.71(X) + 4.80$	0.25	0.75	13	39	52	0	0	0	0.0%	13	39	52	0%	0	13	39	52
Sr Adult Attached	252	124 units	$T = 0.20(X) - 0.18$	0.35	0.65	9	16	25	1	1	2	8.1%	8	15	23	0%	0	8	15	23
Multi-Family (3-10)	221	240 units	$\text{Ln}(T) = 0.98\text{Ln}(X) - 0.98$	0.26	0.74	21	60	81	0	0	0	0.0%	21	60	81	0%	0	21	60	81
Total						163	190	353	2	2	4	1.1%	161	188	349	2.8%	10	155	184	339

PM Peak Hour																				
Land use	ITE Code	Intensity	Rate/EQ	% IN	% Out	Total Trips			Internal Trips				External Trips			Pass-by Trips		New Trips		
						In	Out	Total	In	Out	Total	%	In	Out	Total	%	Volume	In	Out	Total
Shopping Center	820	18,000 sf	$\text{Ln}(T) = 0.74\text{Ln}(X) + 2.89$	0.48	0.52	73	80	153	11	30	41	26.8%	62	50	112	34%	38	41	33	74
Bank	912	3,600 sf	$T = 20.45(X)$	0.5	0.5	37	37	74	0	0	0	0.0%	37	37	74	26%	19	27	27	55
Single Family	210	67 units	$\text{Ln}(T) = 0.96\text{Ln}(X) + 0.20$	0.63	0.37	44	25	69	0	0	0	0.0%	44	25	69	0%	0	44	25	69
Sr Adult Attached	252	124 units	$T = 0.24(X) + 2.26$	0.55	0.45	18	14	32	0	0	0	0.0%	18	14	32	0%	0	18	14	32
Multi-Family (3-10)	221	240 units	$\text{Ln}(T) = 0.96\text{Ln}(X) - 0.63$	0.61	0.39	63	40	103	30	11	41	39.8%	33	29	62	0%	0	33	29	62
Total						235	196	431	41	41	82	19.0%	194	155	349	16.4%	57	163	129	292

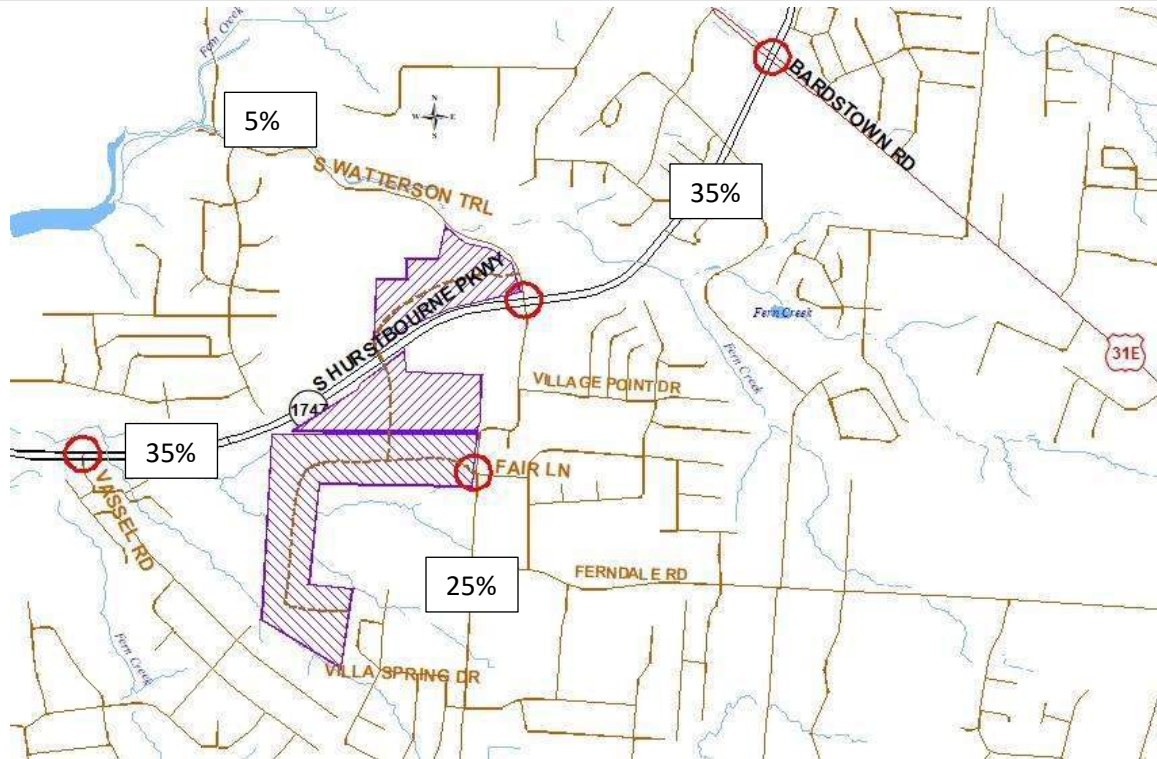
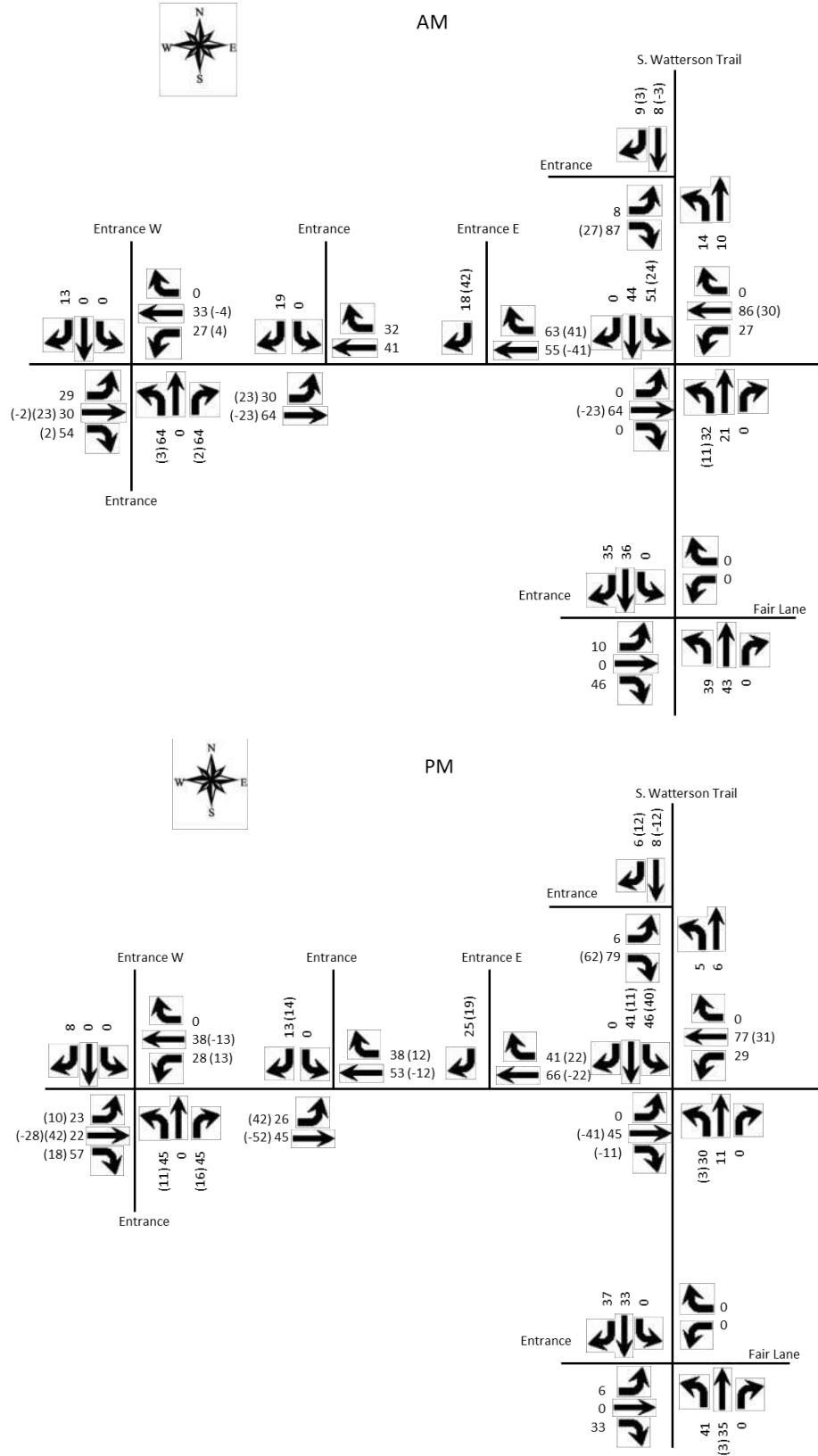
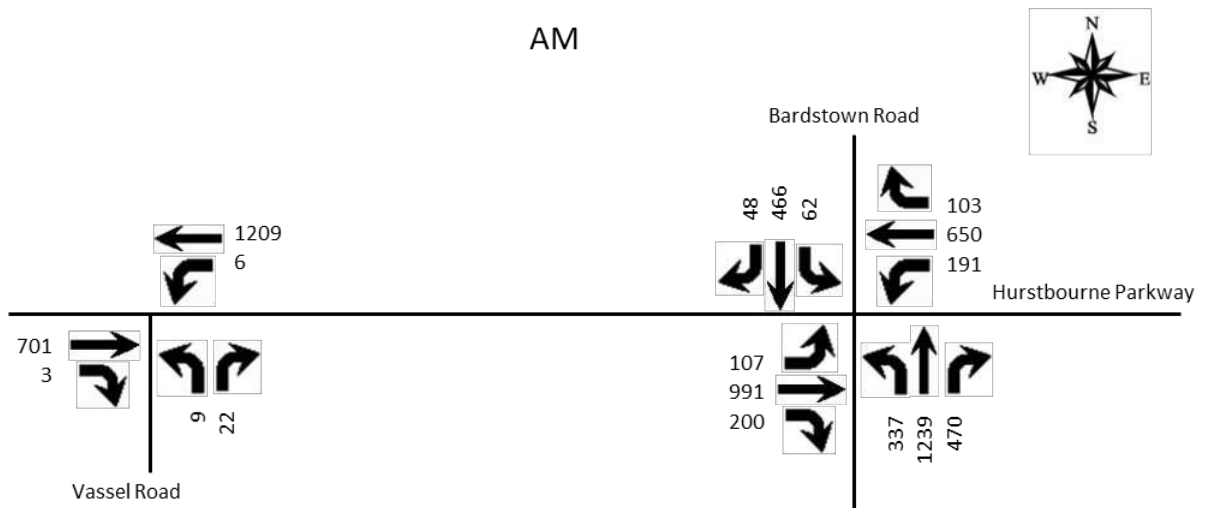
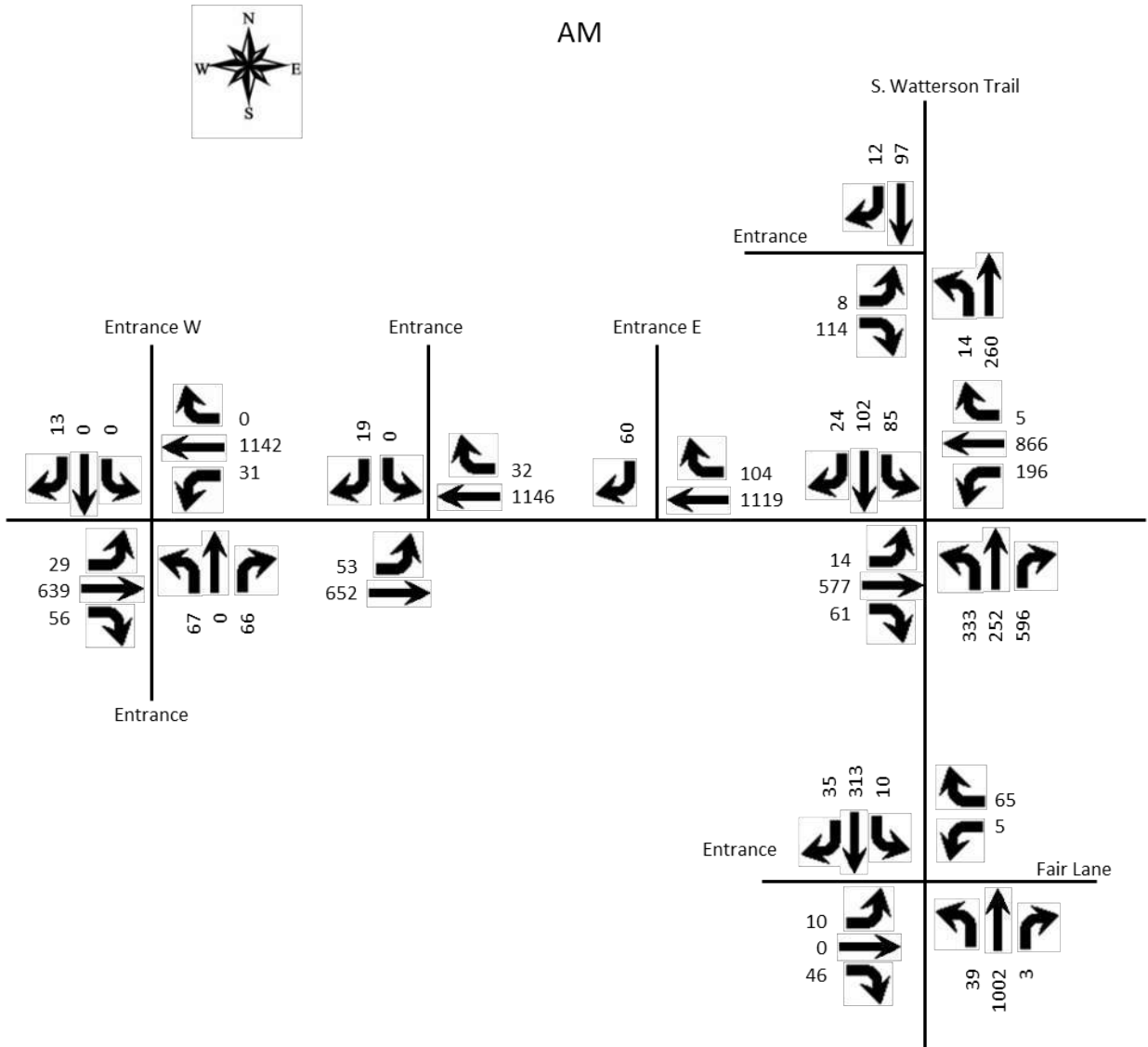


Figure 4. Trip Distribution Percentages





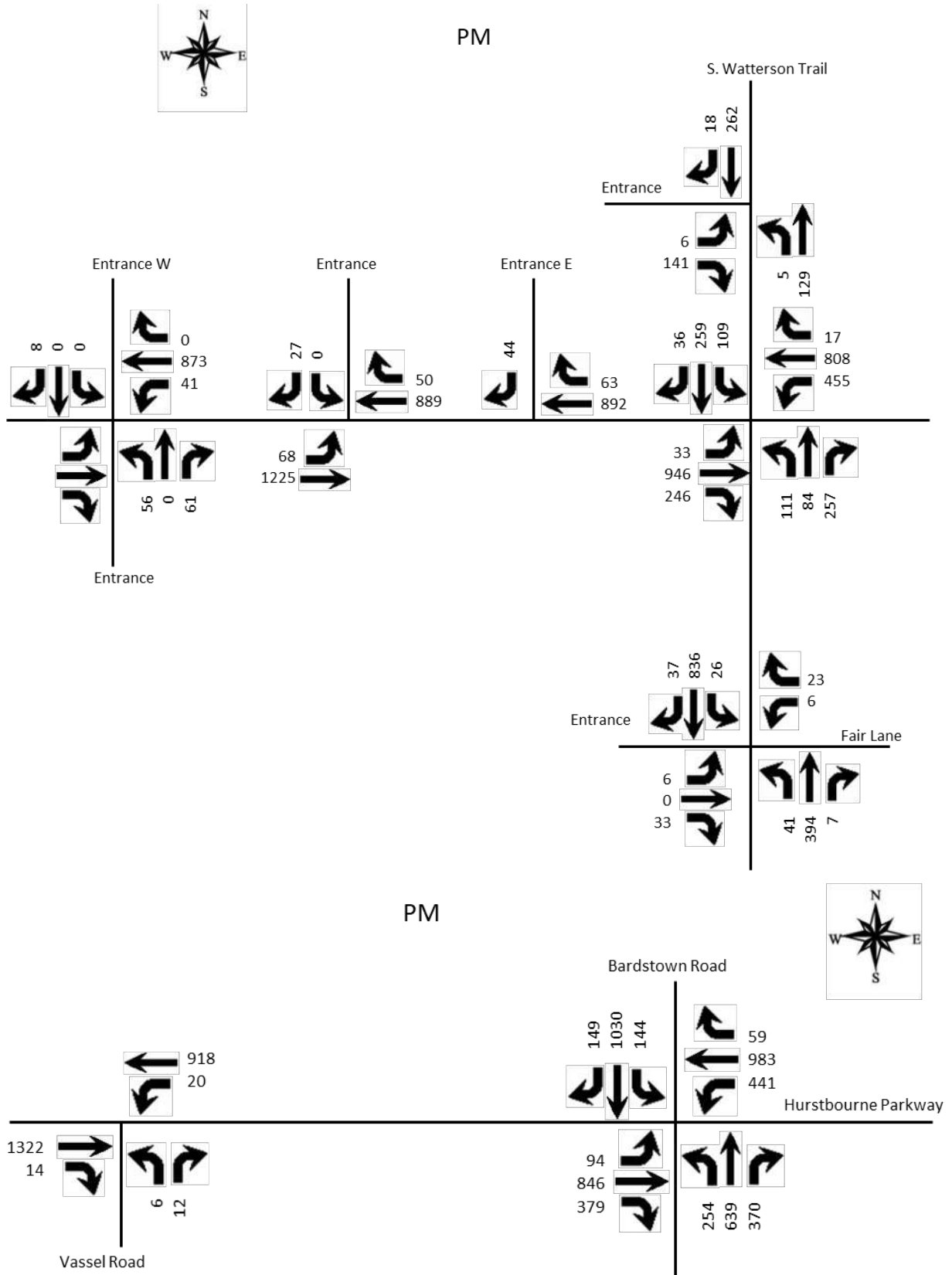


Figure 6. 2024 Build Peak Hour Volumes

ANALYSIS

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

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**. Hurstbourne Parkway at S. Watterson Trail is recommended to operate with side street split phasing in 2024 No Build.

Table 3. Peak Hour Level of Service

Approach	A.M.			P.M.		
	2020 Existing	2024 No Build	2024 Build	2020 Existing	2024 No Build	2024 Build
Hurstbourne Parkway at Vassel Road						
Hurstbourne Parkway Westbound (left)	A 8.9	A 8.9	A 9.4	B 11.7	B 12.0	B 12.7
Vassel Road Northbound	B 12.8	B 13.0	B 14.1	C 17.8	C 18.5	C 20.2
Hurstbourne Parkway at Entrance W						
Hurstbourne Parkway Eastbound			B 12.0			B 10.0
Hurstbourne Parkway Westbound			A 9.4			B 12.7
Entrance Northbound			C 23.6			E 38.6
Entrance Southbound			B 13.8			B 11.6
Hurstbourne Parkway at Entrance						
Hurstbourne Parkway Eastbound			B 12.6			B 10.7
Entrance Southbound			B 14.3			B 12.3
Hurstbourne Parkway at S Watterson Trail						
Hurstbourne Parkway Eastbound	D 47.3	D 42.5	D 45.1	D 38.2	D 40.6	E 56.1
Hurstbourne Parkway Westbound	C 34.5	C 34.6	D 37.8	D 44.0	D 49.5	E 55.6
S Watterson Trail Northbound	C 34.3	C 34.7	D 36.2	C 30.4	C 31.1	E 58.0
S Watterson Trail Northbound	E 65.5	D 51.6	D 52.5	C 34.0	C 33.2	D 40.3

Approach	A.M.			P.M.		
	2020 Existing	2024 No Build	2024 Build	2020 Existing	2024 No Build	2024 Build
S Watterson Trail Southbound	D 42.6	E 63.2	E 71.2	D 52.9	D 52.5	E 69.5
Hurstbourne Parkway at Bardstown Road	E 56.9	E 58.8	E 61.6	D 53.7	D 57.3	E 61.1
Hurstbourne Parkway Eastbound	E 60.6	E 60.8	E 61.8	E 56.2	E 58.9	E 64.1
Hurstbourne Parkway Westbound	E 76.5	E 75.9	E 75.0	E 58.7	E 58.5	E 57.7
Bardstown Road Northbound	D 47.1	D 51.1	D 55.4	D 39.9	D 41.3	D 42.9
Bardstown Road Southbound	D 53.2	E 55.7	E 60.8	E 59.2	E 69.9	E 79.4
S. Watterson Trail at Entrance						
Entrance Eastbound			A 9.6			B 10.9
S. Watterson Trail Northbound (left)			A 7.5			A 7.8
S. Watterson Trail at Fair Lane						
Entrance Eastbound			C 21.5			C 19.1
Fair Lane Westbound	D 31.1	D 34.0	E 36.5	B 14.2	B 14.6	B 14.9
S. Watterson Trail Northbound (left)			A 8.3			B 10.3
S. Watterson Trail Southbound (left)	B 11.3	B 11.6	B 11.9	A 8.1	A 8.1	A 8.3

Key: Level of Service, Delay in seconds per vehicle

The entrances were evaluated for turn lanes using the Kentucky Transportation Cabinet [Highway Design Guidance Manual](#) dated September, 2020. The Kentucky Transportation Cabinet policy requires analysis of 2034, or ten years beyond completion. An annual growth rate of 1.0 percent was applied to the 2024 No Build for the 2034 No Build volumes shown in **Figure 7**. The site volumes were added for the 2034 Build volumes in **Figure 8**. The resulting delays and Level of Service are summarized in **Table 4**. Using the volumes in Figure 8, a northbound left-turn lane will be required at the entrance on South Watterson Trail opposite Fair Lane, a right turn lane will be required eastbound on Hurstbourne Parkway at Entrance W and westbound at the right-in/right-out. Additionally, a southbound left-turn lane will be provided on S. Watterson Trail at the north entrance.

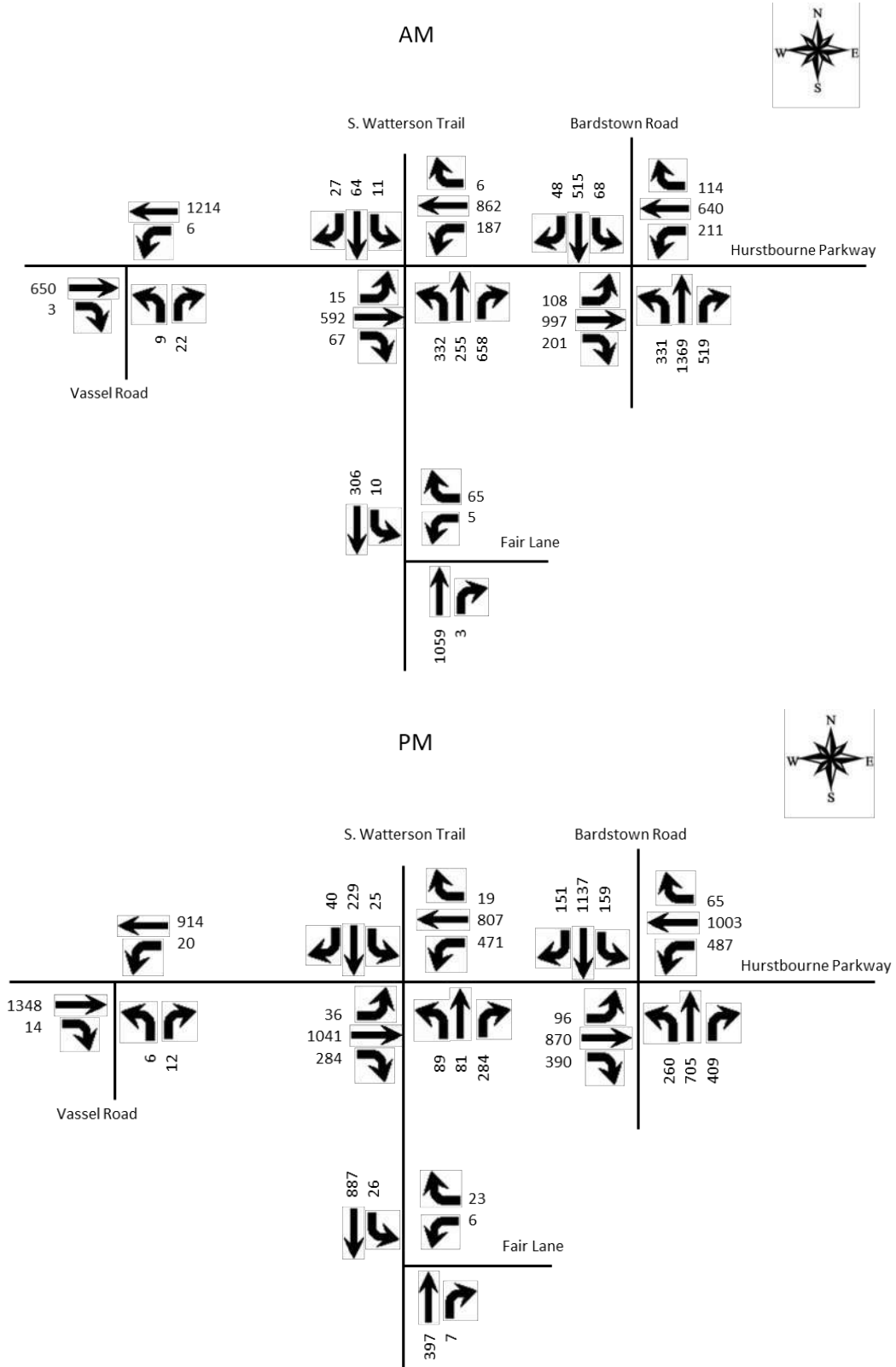
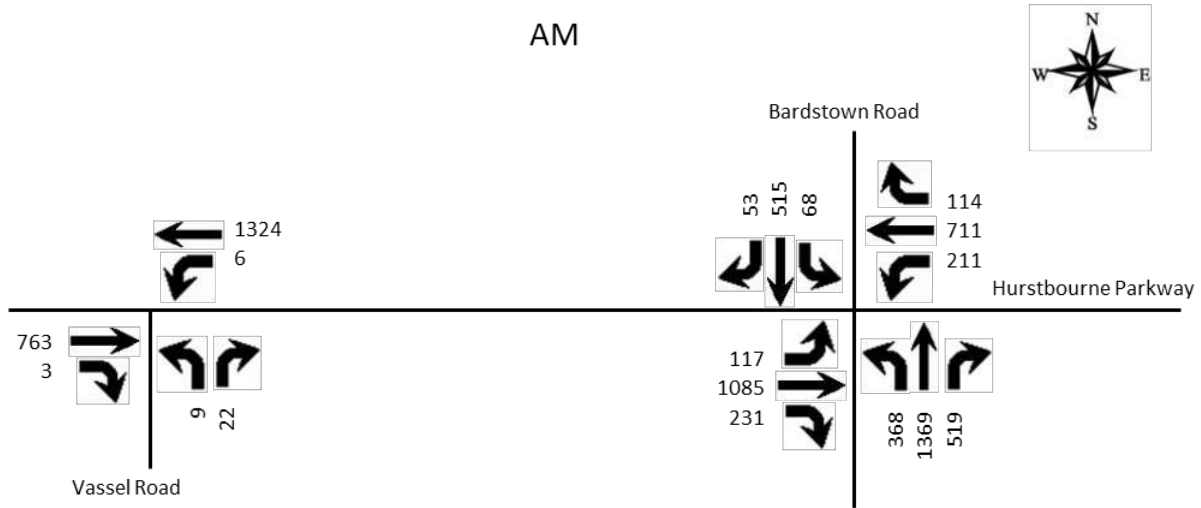
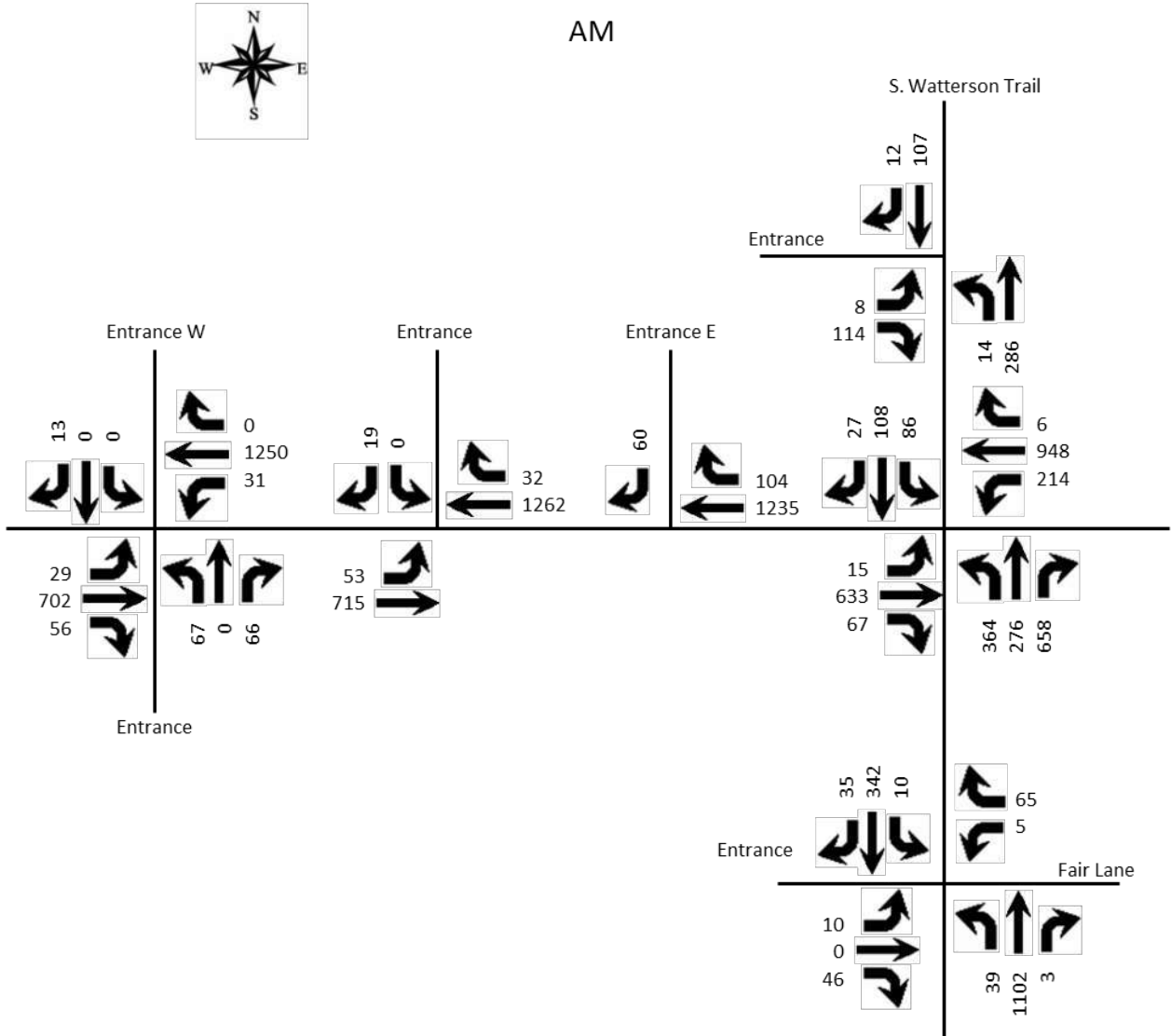


Figure 7. 2034 No Build Peak Hour Volumes



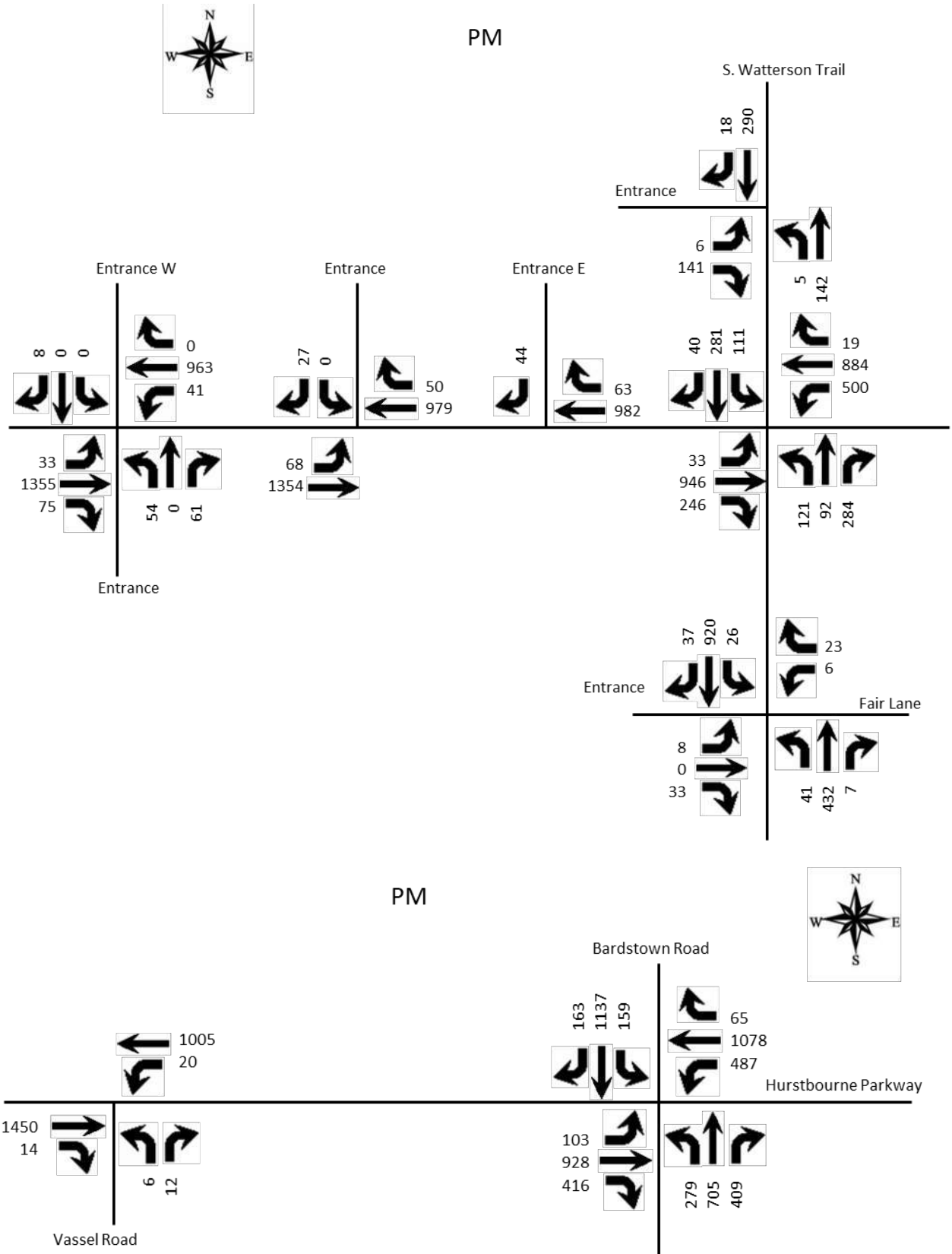


Figure 8. 2034 Build Peak Hour Volumes

Table 4. 2034 Peak Hour Level of Service

Approach	A.M.			P.M.		
	2020 Existing	2034 No Build	2034 Build	2020 Existing	2034 No Build	2034 Build
Hurstbourne Parkway at Vassel Road						
Hurstbourne Parkway Westbound (left)	A 8.9	A 9.2	A 9.7	B 11.7	B 12.9	B 13.7
Vassel Road Northbound	B 12.8	B 13.7	B 15.0	C 17.8	C 20.6	C 22.5
Hurstbourne Parkway at Entrance W						
Hurstbourne Parkway Eastbound			B 12.8			B 10.5
Hurstbourne Parkway Westbound			A 9.7			B 13.8
Entrance Northbound			D 27.3			E 49.2
Entrance Southbound			B 14.7			B 12.1
Hurstbourne Parkway at Entrance 2						
Hurstbourne Parkway Eastbound			B 13.7			B 10.7
Entrance Southbound			C 15.4			B 12.8
Hurstbourne Parkway at S Watterson Trail						
Hurstbourne Parkway Eastbound	D 47.3	D 48.9	D 50.1	D 38.2	E 58.7	E 56.7
Hurstbourne Parkway Westbound	C 34.5	D 37.2	D 50.4	D 44.0	E 70.6	D 53.9
S Watterson Trail Northbound	C 34.3	D 35.9	D 43.1	C 30.4	D 52.7	E 61.0
S Watterson Trail Southbound	E 65.5	E 65.0	D 53.9	C 34.0	D 38.8	D 47.4
S Watterson Trail Southbound	D 42.6	E 64.2	E 63.8	D 52.9	E 60.1	E 62.1
Hurstbourne Parkway at Bardstown Road						
Hurstbourne Parkway Eastbound	E 56.9	E 68.4	E 73.4	D 53.7	E 62.6	E 67.0
Hurstbourne Parkway Westbound	E 60.6	E 64.7	E 74.1	E 56.2	E 66.4	E 77.7
Bardstown Road Northbound	E 76.5	E 75.3	E 74.7	E 58.7	E 62.7	E 62.1
Bardstown Road Southbound	D 47.1	E 69.3	E 74.5	D 39.9	E 58.1	E 65.9
Bardstown Road Southbound	D 53.2	E 62.3	E 66.1	E 59.2	E 63.4	E 63.0
S. Watterson Trail at Entrance						
Entrance Eastbound			A 9.7			B 11.2

Approach	A.M.			P.M.		
	2020 Existing	2034 No Build	2034 Build	2020 Existing	2034 No Build	2034 Build
S. Watterson Trail Northbound (left)			A 7.5			A 7.9
S. Watterson Trail at Fair Lane						
Entrance Eastbound			D 27.7			C 22.0
Fair Lane Westbound	D 31.1	E 44.3	E 47.4	B 14.2	C 16.1	C 16.2
S. Watterson Trail Northbound (left)			A 8.5			B 10.8
S. Watterson Trail Southbound (left)	B 11.3	B 12.4	B 12.7	A 8.1	A 8.3	A 8.4

CONCLUSIONS

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2034, there will be an impact to the existing highway network. A left-turn lane will be required at the entrances on Hurstbourne Parkway and the entrance on S. Watterson Trail opposite Fair Lane. Right turn lanes will be required eastbound on Hurstbourne Parkway and westbound at the right-in/right-out. A southbound left turn lane will be constructed on S. Watterson Trail at the northbound entrance. The traffic signal at Hurstbourne Parkway at S. Watterson Trail is recommended to be converted to side street split phasing.

APPENDIX

Star Hill
Traffic Impact Study

Traffic Counts

Jefferson County, KY
Classified Turn Movement Count

Site 2 of 4
S Watterson Trail (North)
KY-1747 S Hurstbourne Pkwy (East)
S Watterson Trail (South)
KY-1747 S Hurstbourne Pkwy (West)



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

Lat/Long
38.162783°, -85.612956°

Weather
Cloudy
31°F

1 (800) 615-3765

Date
Wednesday, January 22, 2020

TIME	Southbound						Westbound						Northbound						Eastbound						Int Total
	S Watterson Trail (North)						KY-1747 S Hurstbourne Pkwy (East)						S Watterson Trail (South)						KY-1747 S Hurstbourne Pkwy (West)						
	U-Turn 2.1	Left 2.2	Thru 2.3	Right 2.4	Peds 2a	App Total	U-Turn 2.5	Left 2.6	Thru 2.7	Right 2.8	Peds 2b	App Total	U-Turn 2.9	Left 2.10	Thru 2.11	Right 2.12	Peds 2c	App Total	U-Turn 2.13	Left 2.14	Thru 2.15	Right 2.16	Peds 2d	App Total	
0700 - 0715	0	4	7	8	0	19	0	29	168	1	0	198	0	52	36	94	0	182	0	1	116	4	0	121	520
0715 - 0730	0	4	9	5	0	18	0	33	161	1	0	195	0	68	48	132	0	248	0	3	121	21	0	145	606
0730 - 0745	0	0	16	7	0	23	0	47	213	2	0	262	0	82	70	153	0	305	0	5	147	14	0	166	756
0745 - 0800	0	4	21	6	0	31	0	56	211	1	0	268	0	78	59	165	0	302	0	3	137	10	0	150	751
0800 - 0815	0	2	10	5	0	17	0	26	165	1	0	192	0	61	45	123	0	229	0	2	110	14	0	126	564
0815 - 0830	0	4	17	8	0	29	0	18	144	0	0	162	0	43	26	104	0	173	0	2	109	8	0	119	483
0830 - 0845	0	5	14	7	0	26	0	27	142	2	0	171	0	32	24	96	0	152	0	1	127	15	0	143	492
0845 - 0900	0	0	11	3	0	14	0	27	124	2	0	153	0	25	31	75	0	131	0	3	113	7	0	123	421
1600 - 1615	0	3	34	7	0	44	0	61	121	4	0	186	0	19	23	46	0	88	0	6	180	33	0	219	537
1615 - 1630	0	1	49	3	0	53	0	82	165	4	0	251	0	8	26	60	0	94	0	6	189	34	0	229	627
1630 - 1645	0	2	48	13	0	63	0	113	162	2	0	277	0	6	21	55	0	82	0	7	162	47	0	216	638
1645 - 1700	0	8	54	9	0	71	0	92	157	3	0	252	0	19	20	58	0	97	0	11	219	53	0	283	703
1700 - 1715	0	8	61	7	0	76	0	95	182	4	0	281	0	16	18	59	0	93	0	4	244	55	0	303	753
1715 - 1730	0	2	45	11	0	58	0	110	197	3	0	310	0	20	18	67	0	105	0	9	218	82	0	309	782
1730 - 1745	0	4	39	8	0	51	0	112	166	6	0	284	0	23	14	63	0	100	0	8	224	57	0	289	724
1745 - 1800	0	4	44	6	0	54	0	89	192	4	0	285	0	20	28	64	0	112	1	4	175	44	0	224	675

0715 - 0730	0	4	9	5	0	18	0	33	161	1	0	195	0	68	48	132	0	248	0	3	121	21	0	145	606
0730 - 0745	0	0	16	7	0	23	0	47	213	2	0	262	0	82	70	153	0	305	0	5	147	14	0	166	756
0745 - 0800	0	4	21	6	0	31	0	56	211	1	0	268	0	78	59	165	0	302	0	3	137	10	0	150	751
0800 - 0815	0	2	10	5	0	17	0	26	165	1	0	192	0	61	45	123	0	229	0	2	110	14	0	126	564
AM PEAK	0	10	56	23	0	89	0	162	750	5	0	917	0	289	222	573	0	1084	0	13	515	59	0	587	2677
1645 - 1700	0	8	54	9	0	71	0	92	157	3	0	252	0	19	20	58	0	97	0	11	219	53	0	283	703
1700 - 1715	0	8	61	7	0	76	0	95	182	4	0	281	0	16	18	59	0	93	0	4	244	55	0	303	753
1715 - 1730	0	2	45	11	0	58	0	110	197	3	0	310	0	20	18	67	0	105	0	9	218	82	0	309	782
1730 - 1745	0	4	39	8	0	51	0	112	166	6	0	284	0	23	14	63	0	100	0	8	224	57	0	289	724
PM PEAK	0	22	199	35	0	256	0	409	702	16	0	1127	0	78	70	247	0	395	0	32	905	247	0	1184	2962

Star Hill

Traffic Impact Study

Jefferson County, KY
Classified Turn Movement Count



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

Site 1 of 4
KY-1747 S Hurstbourne Pkwy (North)
US-150 Bardstown Rd (East)
KY-1747 S Hurstbourne Pkwy (South)
US-150 Bardstown Rd (West)

hello@marrtraffic.com
www.marrtraffic.com

Lat/Long Date
38.168936°, -85.605162° Wednesday, January 22, 2020

1 (800) 615-3765

	Southbound						Westbound						Northbound						Eastbound						Int
	KY-1747 S Hurstbourne Pkwy (North)						US-150 Bardstown Rd (East)						KY-1747 S Hurstbourne Pkwy (South)						US-150 Bardstown Rd (West)						
	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	U-Turn	Left	Thru	Right	Peds	App	
0700 - 0715	0	39	106	18	0	163	0	49	287	108	0	444	0	15	169	41	0	225	0	19	89	4	0	112	944
0715 - 0730	0	49	112	25	0	186	0	82	332	113	0	527	0	27	204	51	0	282	0	10	109	6	0	125	1120
0730 - 0745	0	56	189	25	1	271	0	77	291	127	1	496	0	29	229	51	1	310	0	11	105	14	1	131	1208
0745 - 0800	0	26	138	24	0	188	0	77	277	101	0	455	0	22	263	46	0	331	0	21	118	18	0	157	1131
0800 - 0815	0	53	117	25	0	195	0	52	291	111	0	454	0	16	172	27	0	215	0	18	116	3	0	137	1001
0815 - 0830	0	44	111	21	0	176	0	41	237	132	0	410	0	24	189	42	0	255	0	15	84	5	0	104	945
0830 - 0845	0	41	100	13	0	154	0	38	236	99	0	373	0	31	201	41	0	273	0	14	108	8	1	131	931
0845 - 0900	0	57	95	24	0	176	1	38	252	134	0	425	0	23	167	29	0	219	1	12	125	7	0	145	965
1600 - 1615	0	118	166	16	0	300	1	44	139	89	0	273	0	11	142	67	0	220	0	14	198	29	0	241	1034
1615 - 1630	0	103	192	11	0	306	0	54	147	72	0	273	1	13	156	65	0	235	0	29	222	19	0	270	1084
1630 - 1645	0	101	196	11	0	308	0	51	176	84	0	311	0	17	142	85	0	244	0	30	239	28	0	297	1160
1645 - 1700	2	137	234	19	0	392	0	56	132	63	0	251	2	6	165	79	0	252	0	29	248	32	0	309	1204
1700 - 1715	0	108	218	11	0	337	0	50	142	68	0	260	0	18	209	99	0	326	0	37	273	35	0	345	1268
1715 - 1730	0	100	211	10	0	321	0	59	177	110	0	346	0	18	181	69	0	268	0	29	296	35	1	361	1296
1730 - 1745	0	101	217	17	0	335	0	63	147	97	0	307	0	22	172	91	0	285	0	39	212	28	0	279	1206
1745 - 1800	0	115	227	19	0	361	0	54	148	81	0	283	0	26	195	80	0	301	0	33	209	34	0	276	1221

0715 - 0730	0	49	112	25	0	186	0	82	332	113	0	527	0	27	204	51	0	282	0	10	109	6	0	125	1120
0730 - 0745	0	56	189	25	1	271	0	77	291	127	1	496	0	29	229	51	1	310	0	11	105	14	1	131	1208
0745 - 0800	0	26	138	24	0	188	0	77	277	101	0	455	0	22	263	46	0	331	0	21	118	18	0	157	1131
0800 - 0815	0	53	117	25	0	195	0	52	291	111	0	454	0	16	172	27	0	215	0	18	116	3	0	137	1001
AM PEAK	0	184	556	99	1	840	0	288	1191	452	1	1932	0	94	868	175	1	1138	0	60	448	41	1	550	4460
1700 - 1715	0	108	218	11	0	337	0	50	142	68	0	260	0	18	209	99	0	326	0	37	273	35	0	345	1268
1715 - 1730	0	100	211	10	0	321	0	59	177	110	0	346	0	18	181	69	0	268	0	29	296	35	1	361	1296
1730 - 1745	0	101	217	17	0	335	0	63	147	97	0	307	0	22	172	91	0	285	0	39	212	28	0	279	1206
1745 - 1800	0	115	227	19	0	361	0	54	148	81	0	283	0	26	195	80	0	301	0	33	209	34	0	276	1221
PM PEAK	0	424	873	57	0	1354	0	226	614	356	0	1196	0	84	757	339	0	1180	0	138	990	132	1	1261	4991

Star Hill
Traffic Impact Study

Jefferson County, KY
Classified Turn Movement Count

Site 3 of 4
S Watterson Trail (North)
Fair Ln
S Watterson Trail (South)



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

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Lat/Long
38.158524°, -85.614507°

1 (800) 615-3765

Date
Wednesday, January 22, 2020

	Southbound				Westbound				Northbound				Int
	S Watterson Trail (North)				Fair Ln				S Watterson Trail (South)				
	Left	Thru	Peds	App	Left	Right	Peds	App	Thru	Right	Peds	App	
0700 - 0715	1	38	0	39	0	6	0	6	164	0	0	164	209
0715 - 0730	3	56	0	59	1	11	0	12	215	0	0	215	286
0730 - 0745	4	75	0	79	1	37	0	38	267	0	0	267	384
0745 - 0800	0	82	0	82	3	14	0	17	234	2	0	236	335
0800 - 0815	3	53	0	56	0	3	0	3	206	1	0	207	266
0815 - 0830	2	39	0	41	1	9	0	10	142	1	0	143	194
0830 - 0845	2	53	0	55	3	3	0	6	130	2	0	132	193
0845 - 0900	1	40	0	41	1	6	0	7	111	2	0	113	161
1600 - 1615	3	118	0	121	1	5	0	6	73	0	0	73	200
1615 - 1630	7	134	0	141	3	6	0	9	90	3	0	93	243
1630 - 1645	4	183	0	187	1	3	0	4	75	2	0	77	268
1645 - 1700	3	184	0	187	1	7	0	8	86	1	0	87	282
1700 - 1715	5	192	0	197	2	5	0	7	87	4	0	91	295
1715 - 1730	12	211	0	223	2	8	0	10	88	0	0	88	321
1730 - 1745	6	185	0	191	1	3	0	4	84	2	0	86	281
1745 - 1800	6	155	0	161	1	5	0	6	92	4	0	96	263

0715 - 0730	3	56	0	59	1	11	0	12	215	0	0	215	286
0730 - 0745	4	75	0	79	1	37	0	38	267	0	0	267	384
0745 - 0800	0	82	0	82	3	14	0	17	234	2	0	236	335
0800 - 0815	3	53	0	56	0	3	0	3	206	1	0	207	266
AM PEAK TOTAL	10	266	0	276	5	65	0	70	922	3	0	925	1271
1645 - 1700	3	184	0	187	1	7	0	8	86	1	0	87	282
1700 - 1715	5	192	0	197	2	5	0	7	87	4	0	91	295
1715 - 1730	12	211	0	223	2	8	0	10	88	0	0	88	321
1730 - 1745	6	185	0	191	1	3	0	4	84	2	0	86	281
PM PEAK TOTAL	26	772	0	798	6	23	0	29	345	7	0	352	1179

Study Name Hurstbourne Pkwy & Vassel Rd
Start Date Thursday, March 28, 2019 7:00 AM
End Date Thursday, March 28, 2019 6:00 PM
Site Code

Report Summary

Time Period	Class.	Westbound					Northbound					Eastbound					Total
		T	L	U	I	O	R	L	U	I	O	R	T	U	I	O	
Peak 1	Lights	849	6	0	855	563	22	9	0	31	9	3	541	0	544	858	1430
Specified Period	%	98%	100%	0%	99%	96%	100%	100%	0%	100%	100%	100%	96%	0%	96%	99%	97%
7:00 AM - 9:15 AM	Other Vehicle:	13	0	0	13	25	0	0	0	0	0	25	0	25	13	38	
One Hour Peak	%	3%	0%	0%	3%	4%	0%	0%	0%	0%	0%	4%	0%	4%	3%	3%	
7:00 AM - 8:00 AM	Total	862	6	0	868	588	22	9	0	31	9	3	566	0	569	871	1468
	PHF	0.86	0.75	0	0.86	0.88	0.69	0.75	0	0.78	0.56	0.38	0.88	0	0.88	0.86	0.9
	Approach %				59%	80%				2%	1%				88%	59%	
Peak 2	Lights	774	20	1	795	1169	11	5	0	16	34	14	1157	0	1171	779	1982
Specified Period	%	98%	100%	100%	98%	99%	92%	83%	0%	89%	100%	100%	99%	0%	99%	98%	99%
4:00 PM - 6:15 PM	Other Vehicle:	14	0	0	14	10	1	1	0	2	0	0	9	0	9	15	25
One Hour Peak	%	3%	0%	0%	3%	3%	8%	17%	0%	11%	0%	0%	3%	0%	3%	3%	3%
4:45 PM - 5:45 PM	Total	788	20	1	809	1179	12	6	0	18	34	14	1166	0	1180	794	2007
	PHF	0.95	0.56	0.25	0.96	0.94	0.75	0.75	0	0.75	0.77	0.5	0.94	0	0.93	0.95	0.97
	Approach %				40%	59%				1%	2%				59%	40%	

HCS Reports

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	5/21/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2020							North/South Street	Vassel Road							
Time Analyzed	AM Peak							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume (veh/h)			565	3	0	6	1056			9		22				
Percent Heavy Vehicles (%)					3	3				3		3				
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						7						34				
Capacity, c (veh/h)						941						499				
v/c Ratio						0.01						0.07				
95% Queue Length, Q ₉₅ (veh)						0.0						0.2				
Control Delay (s/veh)						8.9						12.8				
Level of Service (LOS)						A						B				
Approach Delay (s/veh)						0.1						12.8				
Approach LOS												B				

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	5/21/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2024							North/South Street	Vassel Road							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Number of Lanes	0	0	2	0	0	1	2	0	0	1	0		0	0	0	
Configuration			T	TR		L	T				LR					
Volume (veh/h)			588	3	0	6	1099		9		22					
Percent Heavy Vehicles (%)					3	3			3		3					
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				7.5				6.9	
Critical Headway (sec)							4.16				6.86				6.96	
Base Follow-Up Headway (sec)							2.2				3.5				3.3	
Follow-Up Headway (sec)							2.23				3.53				3.33	
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)							7				34					
Capacity, c (veh/h)							920				484					
v/c Ratio							0.01				0.07					
95% Queue Length, Q ₉₅ (veh)							0.0				0.2					
Control Delay (s/veh)							8.9				13.0					
Level of Service (LOS)							A				B					
Approach Delay (s/veh)					0.0				13.0							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2024							North/South Street	Vassel Road							
Time Analyzed	AM Peak Build							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0	0	1	0		0	0	0	
Configuration			T	TR		L	T				LR					
Volume (veh/h)			701	3	0	6	1209			9		22				
Percent Heavy Vehicles (%)					3	3				3		3				
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						7						34				
Capacity, c (veh/h)						825						428				
v/c Ratio						0.01						0.08				
95% Queue Length, Q ₉₅ (veh)						0.0						0.3				
Control Delay (s/veh)						9.4						14.1				
Level of Service (LOS)						A						B				
Approach Delay (s/veh)						0.0						14.1				
Approach LOS												B				

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	5/21/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2034							North/South Street	Vassel Road							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9	10	11	12		
Number of Lanes	0	0	2	0	0	1	2	0	0	1	0	0	0	0		
Configuration			T	TR		L	T			LR						
Volume (veh/h)			650	3	0	6	1214		9		22					
Percent Heavy Vehicles (%)					3	3			3		3					
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						7						34				
Capacity, c (veh/h)						867						447				
v/c Ratio						0.01						0.08				
95% Queue Length, Q ₉₅ (veh)						0.0						0.2				
Control Delay (s/veh)						9.2						13.7				
Level of Service (LOS)						A						B				
Approach Delay (s/veh)					0.0							13.7				
Approach LOS												B				

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2034							North/South Street	Vassel Road							
Time Analyzed	AM Peak Build							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0	0	1	0		0	0	0	
Configuration			T	TR		L	T				LR					
Volume (veh/h)			763	3	0	6	1324			9		22				
Percent Heavy Vehicles (%)					3	3				3		3				
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						7						34				
Capacity, c (veh/h)						777						396				
v/c Ratio						0.01						0.09				
95% Queue Length, Q ₉₅ (veh)						0.0						0.3				
Control Delay (s/veh)						9.7						15.0				
Level of Service (LOS)						A						B				
Approach Delay (s/veh)						0.0						15.0				
Approach LOS												B				

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	5/21/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2020							North/South Street	Vassel Road							
Time Analyzed	PM Peak							Peak Hour Factor	0.97							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Number of Lanes	0	0	2	0	0	1	2	0	0	1	0		0	0	0	
Configuration			T	TR		L	T				LR					
Volume (veh/h)			1172	14	0	20	795		6		12					
Percent Heavy Vehicles (%)					3	3			3		3					
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						21				19						
Capacity, c (veh/h)						560				300						
v/c Ratio						0.04				0.06						
95% Queue Length, Q ₉₅ (veh)						0.1				0.2						
Control Delay (s/veh)						11.7				17.8						
Level of Service (LOS)						B				C						
Approach Delay (s/veh)					0.3				17.8							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	5/21/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2024							North/South Street	Vassel Road							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.97							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume (veh/h)			1220	14	0	20	827			6		12				
Percent Heavy Vehicles (%)					3	3				3		3				
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						21					19					
Capacity, c (veh/h)						536					286					
v/c Ratio						0.04					0.06					
95% Queue Length, Q ₉₅ (veh)						0.1					0.2					
Control Delay (s/veh)						12.0					18.5					
Level of Service (LOS)						B					C					
Approach Delay (s/veh)						0.3					18.5					
Approach LOS											C					

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2024							North/South Street	Vassel Road							
Time Analyzed	PM Peak Build							Peak Hour Factor	0.97							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume (veh/h)			1322	14	0	20	918			6		12				
Percent Heavy Vehicles (%)					3	3				3		3				
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						21						19				
Capacity, c (veh/h)						489						256				
v/c Ratio						0.04						0.07				
95% Queue Length, Q ₉₅ (veh)						0.1						0.2				
Control Delay (s/veh)						12.7						20.2				
Level of Service (LOS)						B						C				
Approach Delay (s/veh)						0.3						20.2				
Approach LOS												C				

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	5/21/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2034							North/South Street	Vassel Road							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.97							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume (veh/h)			1348	14	0	20	914			6		12				
Percent Heavy Vehicles (%)					3	3				3		3				
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				7.5		6.9				
Critical Headway (sec)						4.16				6.86		6.96				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						21						19				
Capacity, c (veh/h)						477						250				
v/c Ratio						0.04						0.07				
95% Queue Length, Q ₉₅ (veh)						0.1						0.2				
Control Delay (s/veh)						12.9						20.6				
Level of Service (LOS)						B						C				
Approach Delay (s/veh)						0.3						20.6				
Approach LOS												C				

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Vassel							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2034							North/South Street	Vassel Road							
Time Analyzed	PM Peak Build							Peak Hour Factor	0.97							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume (veh/h)			1450	14	0	20	1005			6		12				
Percent Heavy Vehicles (%)					3	3				3		3				
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					7.5		6.9			
Critical Headway (sec)						4.16					6.86		6.96			
Base Follow-Up Headway (sec)						2.2					3.5		3.3			
Follow-Up Headway (sec)						2.23					3.53		3.33			
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						21					19					
Capacity, c (veh/h)						434					224					
v/c Ratio						0.05					0.08					
95% Queue Length, Q ₉₅ (veh)						0.1					0.3					
Control Delay (s/veh)						13.7					22.5					
Level of Service (LOS)						B					C					
Approach Delay (s/veh)					0.3				22.5							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Entrance W							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2024							North/South Street	Entrance 1							
Time Analyzed	AM Peak							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	1	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	R		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	29	639	56	0	31	1142	0		67	0	66		0	0	13
Percent Heavy Vehicles (%)	3	1			3	1				1	3	1		1	3	1
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No															
Median Type Storage					Left + Thru								1			
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.12				4.12				7.52	6.56	6.92		7.52	6.56	6.92
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	4.03	3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		32				34				74		73		0		14
Capacity, c (veh/h)		549				845				190		644		121		424
v/c Ratio		0.06				0.04				0.39		0.11		0.00		0.03
95% Queue Length, Q ₉₅ (veh)		0.2				0.1				1.7		0.4		0.0		0.1
Control Delay (s/veh)		12.0				9.4				35.7		11.3		34.8		13.8
Level of Service (LOS)		B				A				E		B		D		B
Approach Delay (s/veh)	0.5				0.2				23.6				13.8			
Approach LOS									C				B			

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Entrance W							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2034							North/South Street	Entrance 1							
Time Analyzed	AM Peak							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	1	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	R		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	29	702	56	0	31	1250	0		67	0	66		0	0	13
Percent Heavy Vehicles (%)	3	1			3	1				1	3	1		1	3	1
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No															
Median Type Storage					Left + Thru								1			
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.12				4.12				7.52	6.56	6.92		7.52	6.56	6.92
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	4.03	3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		32				34				74		73		0		14
Capacity, c (veh/h)		494				796				167		612		102		387
v/c Ratio		0.07				0.04				0.44		0.12		0.00		0.04
95% Queue Length, Q ₉₅ (veh)		0.2				0.1				2.0		0.4		0.0		0.1
Control Delay (s/veh)		12.8				9.7				42.7		11.7		40.3		14.7
Level of Service (LOS)		B				A				E		B		E		B
Approach Delay (s/veh)	0.5				0.2				27.3				14.7			
Approach LOS									D				B			

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Entrance W							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/18/2020							East/West Street	Hurstbourne Parkway							
Analysis Year	2024							North/South Street	Entrance 1							
Time Analyzed	PM Peak							Peak Hour Factor	0.96							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Number of Lanes	0	1	2	1	0	1	2	0	1	1	0		1	1	0	
Configuration		L	T	R		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	33	1226	75	0	41	873	0	56	0	61		0	0	8	
Percent Heavy Vehicles (%)	3	1			3	1			1	3	1		1	3	1	
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No															
Median Type Storage					Left + Thru								1			
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.12				4.12				7.52	6.56	6.92		7.52	6.56	6.92
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	4.03	3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		34				43				58		64		0		8
Capacity, c (veh/h)		751				509				116		421		139		555
v/c Ratio		0.05				0.08				0.50		0.15		0.00		0.02
95% Queue Length, Q ₉₅ (veh)		0.1				0.3				2.3		0.5		0.0		0.0
Control Delay (s/veh)		10.0				12.7				64.3		15.1		30.9		11.6
Level of Service (LOS)		B				B				F		C		D		B
Approach Delay (s/veh)	0.2				0.6				38.6				11.6			
Approach LOS									E				B			

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Entrance W							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/17/20							East/West Street	Hurstbourne Parkway							
Analysis Year	2034							North/South Street	Entrance 1							
Time Analyzed	PM Peak							Peak Hour Factor	0.96							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9	10	11	12		
Number of Lanes	0	1	2	1	0	1	2	0	1	1	0	1	1	0		
Configuration		L	T	R		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	33	1355	75	0	41	963	0	54	0	61	0	0	8		
Percent Heavy Vehicles (%)	3	1			3	1			1	3	1	1	3	1		
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No															
Median Type Storage					Left + Thru								1			
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.12				4.12				7.52	6.56	6.92		7.52	6.56	6.92
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	4.03	3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		34				43				56		64		0		8
Capacity, c (veh/h)		692				452				96		381		118		518
v/c Ratio		0.05				0.09				0.59		0.17		0.00		0.02
95% Queue Length, Q ₉₅ (veh)		0.2				0.3				2.8		0.6		0.0		0.0
Control Delay (s/veh)		10.5				13.8				86.2		16.3		35.5		12.1
Level of Service (LOS)		B				B				F		C		E		B
Approach Delay (s/veh)	0.2				0.6				49.2				12.1			
Approach LOS									E				B			

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Hurstbourne at Entrance								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	11/19/2020							East/West Street	Hurstbourne								
Analysis Year	2024							North/South Street	Entrance 2								
Time Analyzed	AM Peak							Peak Hour Factor	0.90								
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25								
Project Description	Star Hill																
Lanes																	
<p>Major Street: East-West</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority	1U	1	2	3	4U	4	5	6			7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0			0	0	0		1	0	1
Configuration		L	T				T	TR							L		R
Volume (veh/h)	0	53	652				1146	32							0		19
Percent Heavy Vehicles (%)	3	1													1		3
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													7.5		6.9
Critical Headway (sec)		4.12													6.82		6.96
Base Follow-Up Headway (sec)		2.2													3.5		3.3
Follow-Up Headway (sec)		2.21													3.51		3.33
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)		59													0		21
Capacity, c (veh/h)		530													168		407
v/c Ratio		0.11													0.00		0.05
95% Queue Length, Q ₉₅ (veh)		0.4													0.0		0.2
Control Delay (s/veh)		12.6													26.5		14.3
Level of Service (LOS)		B													D		B
Approach Delay (s/veh)		1.0													14.3		
Approach LOS															B		

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Hurstbourne at Entrance							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Hurstbourne							
Analysis Year	2034							North/South Street	Entrance 2							
Time Analyzed	AM Peak							Peak Hour Factor	0.90							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9	10	11	12		
Number of Lanes	0	1	2	0	0	0	2	0	0	0	0	1	0	1		
Configuration		L	T				T	TR					L		R	
Volume (veh/h)	0	53	715				1262	32					0		19	
Percent Heavy Vehicles (%)	3	1											1		3	
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											7.5		6.9	
Critical Headway (sec)		4.12											6.82		6.96	
Base Follow-Up Headway (sec)		2.2											3.5		3.3	
Follow-Up Headway (sec)		2.21											3.51		3.33	
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		59											0		21	
Capacity, c (veh/h)		473											144		369	
v/c Ratio		0.12											0.00		0.06	
95% Queue Length, Q ₉₅ (veh)		0.4											0.0		0.2	
Control Delay (s/veh)		13.7											30.1		15.4	
Level of Service (LOS)		B											D		C	
Approach Delay (s/veh)		0.9											15.4			
Approach LOS													C			

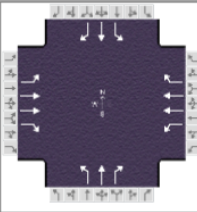
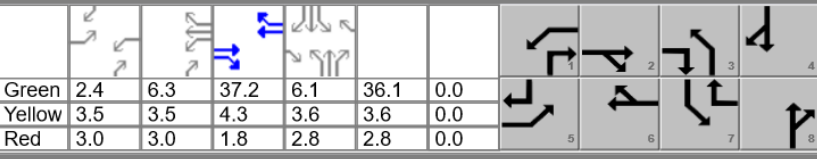
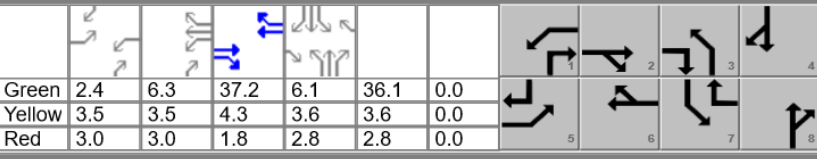
HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Hurstbourne at Entrance								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	11/19/2020							East/West Street	Hurstbourne								
Analysis Year	2024							North/South Street	Entrance 2								
Time Analyzed	PM Peak							Peak Hour Factor	0.95								
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25								
Project Description	Star Hill																
Lanes																	
<p>Major Street: East-West</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1	
Configuration		L	T				T	TR						L		R	
Volume (veh/h)	0	68	1225				889	50						0		27	
Percent Heavy Vehicles (%)	3	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												7.5		6.9	
Critical Headway (sec)		4.12												6.82		6.92	
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)		72												0		28	
Capacity, c (veh/h)		701												192		523	
v/c Ratio		0.10												0.00		0.05	
95% Queue Length, Q ₉₅ (veh)		0.3												0.0		0.2	
Control Delay (s/veh)		10.7												23.8		12.3	
Level of Service (LOS)		B												C		B	
Approach Delay (s/veh)		0.6												12.3			
Approach LOS		B												B			

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Hurstbourne at Entrance 2								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	11/19/2020							East/West Street	Hurstbourne								
Analysis Year	2034							North/South Street	Entrance 2								
Time Analyzed	PM Peak							Peak Hour Factor	0.95								
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25								
Project Description	Star Hill																
Lanes																	
<p>Major Street: East-West</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority	1U	1	2	3	4U	4	5	6			7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0			0	0	0		1	0	1
Configuration		L	T				T	TR						L		R	
Volume (veh/h)	0	68	1354				979	50						0		27	
Percent Heavy Vehicles (%)	3	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												7.5		6.9	
Critical Headway (sec)		4.12												6.82		6.92	
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)		72												0		28	
Capacity, c (veh/h)		646												169		488	
v/c Ratio		0.11												0.00		0.06	
95% Queue Length, Q ₉₅ (veh)		0.4												0.0		0.2	
Control Delay (s/veh)		11.3												26.3		12.8	
Level of Service (LOS)		B												D		B	
Approach Delay (s/veh)	0.5												12.8				
Approach LOS													B				

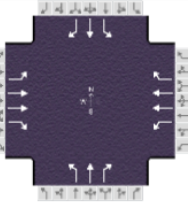
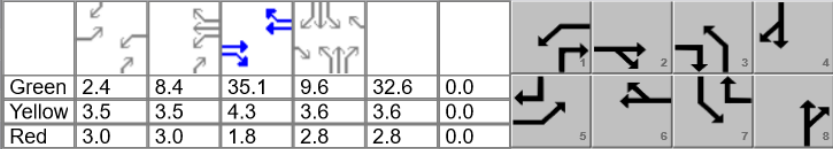
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information															
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250														
Analyst	DBZ	Analysis Date	5/19/2020	Area Type	Other														
Jurisdiction		Time Period	AM Peak	PHF	0.89														
Urban Street	Hurstbourne Parkway	Analysis Year	2020	Analysis Period	1> 7:15														
Intersection	S Watterson Trail	File Name	S Watterson AM 20.xus																
Project Description	Star Hill																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				13	515	59	162	750	5	289	222	573	10	56	23				
Signal Information																			
Cycle, s	120.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	2.3	5.9	37.7	1.9	10.1	23.6									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	3.5	4.3	3.5	3.5	3.6									
				Red	3.0	3.0	1.8	3.0	3.0	2.8									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase				5	2	1	6	3	8	7	4								
Case Number				2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0								
Phase Duration, s				8.8	43.8	21.2	56.2	25.0	46.6	8.4	30.0								
Change Period, (Y+R _c), s				6.5	6.1	6.5	6.1	6.5	6.4	6.5	6.4								
Max Allow Headway (MAH), s				4.0	0.0	5.0	0.0	5.1	5.3	5.1	5.3								
Queue Clearance Time (g _s), s				3.0		14.0		21.5	42.2	3.0	5.4								
Green Extension Time (g _e), s				0.0	0.0	0.7	0.0	0.0	0.0	0.0	6.3								
Phase Call Probability				0.39		1.00		1.00	1.00	0.31	1.00								
Max Out Probability				0.00		0.00		1.00	1.00	0.54	0.24								
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				15	579	66	182	843	6	325	249	644	11	63	26				
Adjusted Saturation Flow Rate (s), veh/h/ln				1697	1752	1547	1781	1781	1610	1795	1856	1585	1386	1841	1560				
Queue Service Time (g _s), s				1.0	16.3	2.9	12.0	21.7	0.2	19.5	12.4	40.2	1.0	3.4	1.6				
Cycle Queue Clearance Time (g _c), s				1.0	16.3	2.9	12.0	21.7	0.2	19.5	12.4	40.2	1.0	3.4	1.6				
Green Ratio (g/C)				0.02	0.31	0.47	0.12	0.42	0.43	0.16	0.34	0.46	0.02	0.20	0.22				
Capacity (c), veh/h				33	1102	725	218	1487	697	292	622	725	33	362	337				
Volume-to-Capacity Ratio (X)				0.447	0.525	0.091	0.836	0.567	0.008	1.113	0.401	0.888	0.338	0.174	0.077				
Back of Queue (Q), ft/ln (50 th percentile)				13.6	179.6	26.7	149.5	230.6	2.3	394.5	143.1	479.4	12.7	40.7	15.9				
Back of Queue (Q), veh/ln (50 th percentile)				0.5	7.0	1.0	5.9	9.1	0.1	15.7	5.6	18.9	0.4	1.6	0.6				
Queue Storage Ratio (RQ) (50 th percentile)				0.00	0.00	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				58.2	33.8	17.7	51.5	26.7	19.4	50.3	30.6	29.7	57.6	40.1	37.5				
Incremental Delay (d ₂), s/veh				9.2	1.8	0.2	11.2	1.6	0.0	86.5	0.6	13.2	8.3	0.3	0.1				
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	0.0	0.0				
Control Delay (d), s/veh				67.5	35.6	18.0	62.7	28.2	19.4	136.8	31.2	42.9	65.9	40.4	37.6				
Level of Service (LOS)				E	D	B	E	C	B	F	C	D	E	D	D				
Approach Delay, s/veh / LOS				34.5	C	34.3	C	65.6	E	42.6	D								
Intersection Delay, s/veh / LOS				47.3						D									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.12	B	2.11	B	2.44	B	2.46	B								
Bicycle LOS Score / LOS				1.03	A	1.34	A	2.50	B	0.65	A								

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250										
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other										
Jurisdiction		Time Period	AM Peak	PHF	0.89										
Urban Street	Hurstbourne Parkway	Analysis Year	2024	Analysis Period	1> 7:15										
Intersection	S Watterson Trail	File Name	S Watterson AM 24 NB.xus												
Project Description	Star Hill														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				14	536	61	169	780	5	301	231	596	10	58	24
Signal Information															
Cycle, s	120.0	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	2.4	6.3	37.2	6.1	36.1	0.0					
				Yellow	3.5	3.5	4.3	3.6	3.6	0.0					
				Red	3.0	3.0	1.8	2.8	2.8	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6		8		4				
Case Number				2.0	3.0	2.0	3.0		9.0		9.0				
Phase Duration, s				8.9	43.3	21.7	56.1		42.5		12.5				
Change Period, (Y+R _c), s				6.5	6.1	6.5	6.1		6.4		6.4				
Max Allow Headway (MAH), s				4.0	0.0	5.0	0.0		5.2		5.1				
Queue Clearance Time (g _s), s				3.1		14.5			38.1		6.2				
Green Extension Time (g _e), s				0.0	0.0	0.7	0.0		0.0		0.1				
Phase Call Probability				0.41		1.00			1.00		0.97				
Max Out Probability				0.00		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				16	602	69	190	876	6	338	260	670	11	65	27
Adjusted Saturation Flow Rate (s), veh/h/ln				1697	1752	1547	1781	1781	1610	1795	1856	1585	1386	1841	1560
Queue Service Time (g _s), s				1.1	17.2	2.2	12.5	22.9	0.2	19.2	13.6	36.1	0.9	4.2	2.0
Cycle Queue Clearance Time (g _c), s				1.1	17.2	2.2	12.5	22.9	0.2	19.2	13.6	36.1	0.9	4.2	2.0
Green Ratio (g/C)				0.02	0.31	0.61	0.13	0.42	0.47	0.30	0.30	0.43	0.05	0.05	0.07
Capacity (c), veh/h				35	1086	945	226	1482	752	556	559	678	82	93	111
Volume-to-Capacity Ratio (X)				0.454	0.555	0.072	0.840	0.591	0.007	0.609	0.465	0.987	0.138	0.701	0.244
Back of Queue (Q), ft/ln (50 th percentile)				14.6	190.5	18.5	155.6	243.8	2.1	217.9	159.4	619.5	10.7	58.2	21
Back of Queue (Q), veh/ln (50 th percentile)				0.5	7.4	0.7	6.1	9.6	0.1	8.6	6.2	24.4	0.3	2.3	0.8
Queue Storage Ratio (RQ) (50 th percentile)				0.00	0.00	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				58.1	34.5	9.5	51.2	27.1	17.1	35.3	33.7	34.0	53.6	55.6	52.7
Incremental Delay (d ₂), s/veh				9.0	2.0	0.1	11.2	1.7	0.0	2.3	0.9	31.3	1.1	12.7	1.6
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	0.0	0.0
Control Delay (d), s/veh				67.1	36.6	9.7	62.4	28.9	17.1	37.5	34.6	65.3	54.7	68.3	54.3
Level of Service (LOS)				E	D	A	E	C	B	D	C	E	D	E	D
Approach Delay, s/veh / LOS				34.6		C	34.7		C	51.6		D	63.2		E
Intersection Delay, s/veh / LOS				42.5						D					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.12		B	2.11		B	2.48		B	2.45		B
Bicycle LOS Score / LOS				1.05		A	1.37		A	2.58		C	0.66		A

HCS7 Signalized Intersection Results Summary

General Information					Intersection Information																															
Agency	Diane B. Zimmerman Traffic Engineering				Duration, h	0.250																														
Analyst	DBZ	Analysis Date	Nov 19, 2020		Area Type	Other																														
Jurisdiction		Time Period	AM Peak		PHF	0.89																														
Urban Street	Hurstbourne Parkway	Analysis Year	2024 Build		Analysis Period	1> 7:15																														
Intersection	S Watterson Trail	File Name	S Watterson AM 24 B.xus																																	
Project Description	Star Hill																																			
Demand Information					EB			WB			NB			SB																						
Approach Movement	L			T			R			L			T			R																				
Demand (v), veh/h	14			577			61			196			866			5			333			252			596			85			102			24		
Signal Information																																				
Cycle, s	120.0	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	2.4	8.4	35.1	9.6	32.6	0.0																														
Yellow	3.5	3.5	4.3	3.6	3.6	0.0																														
Red	3.0	3.0	1.8	2.8	2.8	0.0																														
Timer Results					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT																								
Assigned Phase	5			2			1			6			8			4																				
Case Number	2.0			3.0			2.0			3.0			9.0			9.0																				
Phase Duration, s	8.9			41.2			23.8			56.1			39.0			16.0																				
Change Period, (Y+R c), s	6.5			6.1			6.5			6.1			6.4			6.4																				
Max Allow Headway (MAH), s	4.0			0.0			5.0			0.0			5.2			5.1																				
Queue Clearance Time (g s), s	3.1						16.5						35.6			10.1																				
Green Extension Time (g e), s	0.0			0.0			0.8			0.0			0.0			0.0																				
Phase Call Probability	0.41						1.00						1.00			1.00																				
Max Out Probability	0.00						0.03						1.00			1.00																				
Movement Group Results					EB			WB			NB			SB																						
Approach Movement	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	16			648			69			220			973			6			374			283			670			96			115			27		
Adjusted Saturation Flow Rate (s), veh/h/ln	1697			1752			1547			1781			1781			1610			1795			1856			1585			1386			1841			1560		
Queue Service Time (g s), s	1.1			19.3			2.4			14.5			26.3			0.2			22.7			15.7			33.6			8.1			7.3			1.9		
Cycle Queue Clearance Time (g c), s	1.1			19.3			2.4			14.5			26.3			0.2			22.7			15.7			33.6			8.1			7.3			1.9		
Green Ratio (g/C)	0.02			0.29			0.56			0.14			0.42			0.50			0.27			0.27			0.42			0.09			0.09			0.11		
Capacity (c), veh/h	35			1025			873			257			1482			799			503			504			686			122			163			157		
Volume-to-Capacity Ratio (X)	0.454			0.633			0.079			0.857			0.656			0.007			0.744			0.562			0.977			0.780			0.705			0.172		
Back of Queue (Q), ft/ln (90 th percentile)	26.3			312.2			38.8			267.5			390.9			3.5			376.8			276.1			762.2			193.3			168.3			35.7		
Back of Queue (Q), veh/ln (90 th percentile)	1.0			12.1			1.5			10.5			15.4			0.1			15.0			10.8			30.0			6.2			6.5			1.4		
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			0.00			0.00		
Uniform Delay (d 1), s/veh	58.1			36.9			11.9			50.1			28.1			15.3			39.3			37.2			33.5			53.6			53.2			49.4		
Incremental Delay (d 2), s/veh	9.0			3.0			0.2			11.9			2.3			0.0			6.4			1.8			28.6			28.2			14.1			0.7		
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			0.0			0.0		
Control Delay (d), s/veh	67.1			39.8			12.1			62.1			30.4			15.3			45.7			38.9			62.0			81.8			67.3			50.1		
Level of Service (LOS)	E			D			B			E			C			B			D			D			E			F			E			D		
Approach Delay, s/veh / LOS	37.8			D			36.2			D			52.5			D			71.2			E														
Intersection Delay, s/veh / LOS	45.1												D																							
Multimodal Results					EB			WB			NB			SB																						
Pedestrian LOS Score / LOS	2.12			B			2.11			B			2.48			B			2.45			B														
Bicycle LOS Score / LOS	1.09			A			1.48			A			2.68			C			0.88			A														

HCS7 Signalized Intersection Results Summary

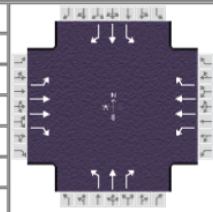
General Information				Intersection Information																							
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																						
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other																						
Jurisdiction		Time Period	AM Peak	PHF	0.89																						
Urban Street	Hurstbourne Parkway	Analysis Year	2034 No Build	Analysis Period	1> 7:15																						
Intersection	S Watterson Trail	File Name	S Watterson AM 34 NB.xus																								
Project Description	Star Hill																										
Demand Information				EB			WB			NB			SB														
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R												
Demand (v), veh/h				15	592	67	187	862	6	332	255	658	11	64	27												
Signal Information																											
Cycle, s	120.0	Reference Phase	2																								
Offset, s	0	Reference Point	End																								
Uncoordinated	No	Simult. Gap E/W	On	Green	2.6	7.5	35.8	6.5	35.7	0.0																	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	3.5	4.3	3.6	3.6	0.0																	
				Red	3.0	3.0	1.8	2.8	2.8	0.0																	
Timer Results				EBL			EBT			WBL			WBT			NBL			NBT			SBL			SBT		
Assigned Phase				5			2			1			6						8						4		
Case Number				2.0			3.0			2.0			3.0						9.0						9.0		
Phase Duration, s				9.1			41.9			23.1			55.9						42.1						12.9		
Change Period, (Y+R _c), s				6.5			6.1			6.5			6.1						6.4						6.4		
Max Allow Headway (MAH), s				4.0			0.0			5.0			0.0						5.2						5.1		
Queue Clearance Time (g _s), s				3.2						15.8									37.7						6.6		
Green Extension Time (g _e), s				0.0			0.0			0.8			0.0						0.0						0.1		
Phase Call Probability				0.43						1.00									1.00						0.98		
Max Out Probability				0.00						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				17	665	75	210	969	7	373	287	739	12	72	30												
Adjusted Saturation Flow Rate (s), veh/h/ln				1697	1752	1547	1781	1781	1610	1795	1856	1585	1386	1841	1560												
Queue Service Time (g _s), s				1.2	19.7	2.5	13.8	26.2	0.3	21.9	15.4	35.7	1.0	4.6	2.2												
Cycle Queue Clearance Time (g _c), s				1.2	19.7	2.5	13.8	26.2	0.3	21.9	15.4	35.7	1.0	4.6	2.2												
Green Ratio (g/C)				0.02	0.30	0.60	0.14	0.42	0.47	0.30	0.30	0.44	0.05	0.05	0.08												
Capacity (c), veh/h				36	1045	921	247	1479	756	548	551	690	87	100	119												
Volume-to-Capacity Ratio (X)				0.462	0.636	0.082	0.852	0.655	0.009	0.680	0.520	1.071	0.142	0.716	0.256												
Back of Queue (Q), ft/ln (50 th percentile)				15.5	221.3	21.5	171.4	280.8	2.5	252.4	180.9	754.7	11.7	65.6	23.4												
Back of Queue (Q), veh/ln (50 th percentile)				0.6	8.6	0.8	6.7	11.1	0.1	10.0	7.1	29.7	0.4	2.5	0.9												
Queue Storage Ratio (RQ) (50 th percentile)				0.00	0.00	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				58.0	36.5	10.3	50.5	28.2	16.9	36.5	34.7	33.9	53.2	55.3	52.2												
Incremental Delay (d ₂), s/veh				8.8	3.0	0.2	11.1	2.3	0.0	3.8	1.2	54.8	1.0	15.0	1.6												
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	0.0	0.0												
Control Delay (d), s/veh				66.9	39.4	10.5	61.6	30.5	17.0	40.3	35.9	88.7	54.2	70.3	53.8												
Level of Service (LOS)				E	D	B	E	C	B	D	D	F	D	E	D												
Approach Delay, s/veh / LOS				37.2			D			35.9			D			65.0			E			64.2			E		
Intersection Delay, s/veh / LOS				48.9									D														
Multimodal Results				EB			WB			NB			SB														
Pedestrian LOS Score / LOS				2.12	B	2.11	B	2.48	B	2.45	B																
Bicycle LOS Score / LOS				1.11	A	1.47	A	2.80	C	0.68	A																

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information												
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250											
Analyst	DBZ			Analysis Date	Nov 19, 2020								Area Type	Other		
Jurisdiction				Time Period	AM Peak								PHF	0.89		
Urban Street	Hurstbourne Parkway			Analysis Year	2034 No-Build								Analysis Period	1> 7:15		
Intersection	S Watterson Trail			File Name	S Watterson AM 34 B Split.xus											
Project Description	Star Hill															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				15	633	67	214	948	6	364	276	658	86	108	27	
Signal Information																
Cycle, s	120.0	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	2.6	9.6	28.7	10.5	36.7	0.0										
Yellow	3.5	3.5	4.3	3.6	3.6	0.0										
Red	3.0	3.0	1.8	2.8	2.8	0.0										
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase				5	2	1	6		8		4					
Case Number				2.0	3.0	2.0	3.0		9.0		9.0					
Phase Duration, s				9.1	34.8	25.2	50.9		43.1		16.9					
Change Period, (Y+R c), s				6.5	6.1	6.5	6.1		6.4		6.4					
Max Allow Headway (MAH), s				4.0	0.0	5.0	0.0		5.2		5.1					
Queue Clearance Time (g s), s				3.2		17.8			38.7		10.1					
Green Extension Time (g e), s				0.0	0.0	0.9	0.0		0.0		0.4					
Phase Call Probability				0.43		1.00			1.00		1.00					
Max Out Probability				0.00		0.07			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				17	711	75	240	1065	7	409	310	739	97	121	30	
Adjusted Saturation Flow Rate (s), veh/h/ln				1697	1752	1547	1781	1781	1610	1795	1856	1585	1386	1841	1560	
Queue Service Time (g s), s				1.2	23.2	2.8	15.8	32.1	0.3	24.3	16.7	36.7	8.1	7.7	2.1	
Cycle Queue Clearance Time (g c), s				1.2	23.2	2.8	15.8	32.1	0.3	24.3	16.7	36.7	8.1	7.7	2.1	
Green Ratio (g/C)				0.02	0.24	0.55	0.16	0.37	0.46	0.31	0.31	0.46	0.09	0.09	0.11	
Capacity (c), veh/h				36	839	843	277	1330	743	564	567	731	133	161	170	
Volume-to-Capacity Ratio (X)				0.462	0.848	0.089	0.867	0.801	0.009	0.725	0.547	1.011	0.726	0.752	0.178	
Back of Queue (Q), ft/ln (90 th percentile)				28	390.8	45.2	292.1	480.3	4.6	392	287.5	874.6	174.2	173.3	39.7	
Back of Queue (Q), veh/ln (90 th percentile)				1.1	15.1	1.7	11.5	18.9	0.2	15.6	11.2	34.4	5.6	6.7	1.5	
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	0.00	0.00	
Uniform Delay (d 1), s/veh				58.0	43.5	13.1	49.5	33.6	17.5	36.6	34.4	32.3	52.7	53.0	48.6	
Incremental Delay (d 2), s/veh				8.8	10.4	0.2	13.9	5.1	0.0	5.0	1.4	36.1	13.3	12.8	0.7	
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	0.0	0.0	
Control Delay (d), s/veh				66.9	53.9	13.3	63.3	38.7	17.5	41.6	35.8	68.4	66.0	65.8	49.3	
Level of Service (LOS)				E	D	B	E	D	B	D	D	F	E	E	D	
Approach Delay, s/veh / LOS				50.4		D	43.1		D	53.9		D	63.8		E	
Intersection Delay, s/veh / LOS				50.1						D						
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				2.13		B	2.12		B	2.48		B	2.45		B	
Bicycle LOS Score / LOS				1.15		A	1.57		B	2.89		C	0.90		A	

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	5/19/2020	Area Type	Other		
Jurisdiction		Time Period	PM Peak	PHF	0.95		
Urban Street	Hurstbourne Parkway	Analysis Year	2020	Analysis Period	1> 4:45		
Intersection	S Watterson Trail	File Name	S Watterson PM 20.xus				
Project Description	Star Hill						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	32	905	247	409	702	16	78	70	247	22	199	35

Signal Information				Signal Timing (s)										
Cycle, s	120.0	Reference Phase	2	Green	4.0	21.2	37.6	3.2	3.9	18.0	5	6	7	8
Offset, s	0	Reference Point	End	Yellow	3.5	3.5	4.3	3.5	0.0	3.6				
Uncoordinated	No	Simult. Gap E/W	On	Red	3.0	3.0	1.8	3.0	0.0	2.8				
Force Mode	Fixed	Simult. Gap N/S	On											

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	10.5	43.7	38.3	71.4	13.7	28.3	9.7	24.4
Change Period, (Y+R _c), s	6.5	6.1	6.5	6.1	6.5	6.4	6.5	6.4
Max Allow Headway (MAH), s	4.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2
Queue Clearance Time (g _s), s	4.2		29.5		7.4	14.8	3.5	14.6
Green Extension Time (g _e), s	0.1	0.0	2.2	0.0	0.2	3.5	0.0	3.3
Phase Call Probability	0.67		1.00		0.94	1.00	0.54	1.00
Max Out Probability	0.00		0.04		0.01	0.01	1.00	0.03

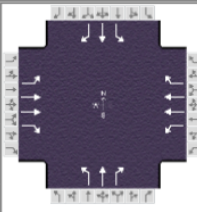
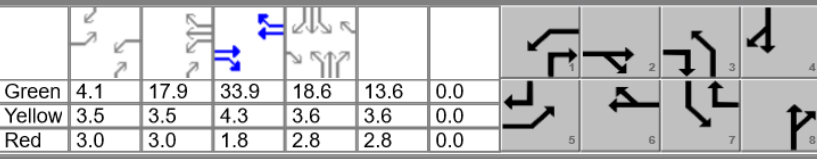
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	34	953	260	431	739	17	82	74	260	23	209	37
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1781	1598	1810	1781	1610	1767	1900	1610	1810	1900	1610
Queue Service Time (g _s), s	2.2	30.1	14.6	27.5	14.3	0.5	5.4	4.0	12.8	1.5	12.6	2.3
Cycle Queue Clearance Time (g _c), s	2.2	30.1	14.6	27.5	14.3	0.5	5.4	4.0	12.8	1.5	12.6	2.3
Green Ratio (g/C)	0.03	0.31	0.37	0.26	0.54	0.57	0.07	0.18	0.45	0.04	0.15	0.18
Capacity (c), veh/h	61	1116	596	479	1939	920	120	347	720	64	284	295
Volume-to-Capacity Ratio (X)	0.552	0.853	0.436	0.899	0.381	0.018	0.683	0.213	0.361	0.363	0.736	0.125
Back of Queue (Q), ft/ln (90 th percentile)	50	472.7	222.7	455.5	218.3	8.6	123.7	85.2	191.2	34.5	239.5	41.8
Back of Queue (Q), veh/ln (90 th percentile)	2.0	18.6	8.8	18.2	8.6	0.3	4.8	3.4	7.6	1.4	9.6	1.7
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	0.00	0.00
Uniform Delay (d ₁), s/veh	57.1	38.6	28.2	42.6	15.7	11.1	54.7	41.7	21.9	56.6	48.8	40.9
Incremental Delay (d ₂), s/veh	7.6	8.3	2.3	12.7	0.6	0.0	9.3	0.4	0.4	4.9	5.2	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	0.0	0.0
Control Delay (d), s/veh	64.6	46.9	30.5	55.3	16.3	11.2	64.0	42.1	22.3	61.4	54.0	41.2
Level of Service (LOS)	E	D	C	E	B	B	E	D	C	E	D	D
Approach Delay, s/veh / LOS	44.0	D		30.4	C		34.0	C		52.9	D	
Intersection Delay, s/veh / LOS	38.2						D					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS	2.12 / B	2.09 / B	2.46 / B	2.46 / B
Bicycle LOS Score / LOS	1.52 / B	1.47 / A	1.17 / A	0.93 / A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information																				
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																			
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other																			
Jurisdiction		Time Period	PM Peak	PHF	0.95																			
Urban Street	Hurstbourne Parkway	Analysis Year	2024 No Build	Analysis Period	1> 4:45																			
Intersection	S Watterson Trail	File Name	S Watterson PM 24 NB.xus																					
Project Description	Star Hill																							
Demand Information				EB			WB			NB			SB											
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R												
Demand (v), veh/h	33	942	257	426	731	17	81	73	257	23	207	36												
Signal Information																								
Cycle, s	120.0	Reference Phase	2	Green	4.1	22.3	35.6	3.3	4.1	18.6	Yellow	3.5	3.5	4.3	3.5	0.0	3.6	Red	3.0	3.0	1.8	3.0	0.0	2.8
Offset, s	0	Reference Point	End	Uncoordinated	No	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On													
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT													
Assigned Phase				5	2	1	6	3	8	7	4													
Case Number				2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0													
Phase Duration, s				10.6	41.7	39.4	70.5	13.9	29.1	9.8	25.0													
Change Period, (Y+R _c), s				6.5	6.1	6.5	6.1	6.5	6.4	6.5	6.4													
Max Allow Headway (MAH), s				4.0	0.0	5.0	0.0	5.1	5.2	5.1	5.2													
Queue Clearance Time (g _s), s				4.3		30.7		7.7	15.0	3.6	15.1													
Green Extension Time (g _e), s				0.1	0.0	2.2	0.0	0.2	3.6	0.0	3.4													
Phase Call Probability				0.69		1.00		0.94	1.00	0.55	1.00													
Max Out Probability				0.00		0.07		0.01	0.02	1.00	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	35	992	271	448	769	18	85	77	271	24	218	38												
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1781	1598	1810	1781	1610	1767	1900	1610	1810	1900	1610												
Queue Service Time (g _s), s	2.3	32.2	15.7	28.7	15.3	0.6	5.7	4.1	13.0	1.6	13.1	2.3												
Cycle Queue Clearance Time (g _c), s	2.3	32.2	15.7	28.7	15.3	0.6	5.7	4.1	13.0	1.6	13.1	2.3												
Green Ratio (g/C)	0.03	0.31	0.37	0.27	0.54	0.56	0.07	0.19	0.46	0.04	0.15	0.19												
Capacity (c), veh/h	62	1087	573	496	1911	909	124	359	745	65	294	304												
Volume-to-Capacity Ratio (X)	0.560	0.912	0.472	0.904	0.403	0.020	0.688	0.214	0.363	0.371	0.741	0.124												
Back of Queue (Q), ft/ln (90th percentile)	51.6	519.1	237.8	476.7	232.1	9.4	127	88.1	193.1	36.1	246.9	42.7												
Back of Queue (Q), veh/ln (90th percentile)	2.1	20.4	9.4	19.1	9.1	0.4	5.0	3.5	7.7	1.4	9.9	1.7												
Queue Storage Ratio (RQ) (90th percentile)	0.00	0.00	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	57.0	40.6	29.7	42.0	16.4	11.5	54.5	41.1	20.8	56.5	48.4	40.4												
Incremental Delay (d ₂), s/veh	7.7	13.0	2.8	13.9	0.6	0.0	9.2	0.4	0.4	4.9	5.2	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	0.0	0.0												
Control Delay (d), s/veh	64.7	53.6	32.5	56.0	17.1	11.6	63.8	41.6	21.2	61.4	53.6	40.7												
Level of Service (LOS)	E	D	C	E	B	B	E	D	C	E	D	D												
Approach Delay, s/veh / LOS	49.5		D	31.1		C	33.2		C	52.5		D												
Intersection Delay, s/veh / LOS	40.6						D																	
Multimodal Results				EB			WB			NB			SB											
Pedestrian LOS Score / LOS	2.12		B	2.09		B	2.46		B	2.46		B												
Bicycle LOS Score / LOS	1.56		B	1.51		B	1.20		A	0.95		A												

HCS7 Signalized Intersection Results Summary

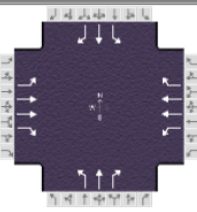
General Information				Intersection Information																							
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																						
Analyst	DBZ			Analysis Date	Nov 19, 2020																						
Jurisdiction				Time Period	PM Peak																						
Urban Street	Hurstbourne Parkway			Analysis Year	2024 Build																						
Intersection	S Watterson Trail			File Name	S Watterson PM 24 B.xus																						
Project Description	Star Hill																										
Demand Information				EB			WB			NB			SB														
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R												
Demand (v), veh/h				33	946	246	455	808	17	111	84	257	109	259	36												
Signal Information																											
Cycle, s	120.0	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	4.1	17.9	33.9	18.6	13.6	0.0																					
Yellow	3.5	3.5	4.3	3.6	3.6	0.0																					
Red	3.0	3.0	1.8	2.8	2.8	0.0																					
Timer Results				EBL			EBT			WBL			WBT			NBL			NBT			SBL			SBT		
Assigned Phase				5			2			1			6						8						4		
Case Number				2.0			3.0			2.0			3.0						9.0						9.0		
Phase Duration, s				10.6			40.0			35.0			64.4						20.0						25.0		
Change Period, (Y+R _c), s				6.5			6.1			6.5			6.1						6.4						6.4		
Max Allow Headway (MAH), s				4.0			0.0			5.0			0.0						5.2						5.1		
Queue Clearance Time (g _s), s				4.3						30.5									15.6						19.0		
Green Extension Time (g _e), s				0.0			0.0			0.0			0.0						0.0						0.0		
Phase Call Probability				0.69						1.00									1.00						1.00		
Max Out Probability				0.00						1.00									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				35	996	259	479	851	18	117	88	271	115	273	38												
Adjusted Saturation Flow Rate (s), veh/h/ln				1810	1781	1598	1810	1781	1610	1767	1900	1610	1810	1900	1610												
Queue Service Time (g _s), s				2.3	33.0	14.0	28.5	19.4	0.5	7.5	5.2	13.6	6.8	17.0	2.3												
Cycle Queue Clearance Time (g _c), s				2.3	33.0	14.0	28.5	19.4	0.5	7.5	5.2	13.6	6.8	17.0	2.3												
Green Ratio (g/C)				0.03	0.29	0.40	0.24	0.49	0.64	0.11	0.11	0.35	0.15	0.15	0.19												
Capacity (c), veh/h				62	1036	632	430	1730	1032	215	215	565	296	295	305												
Volume-to-Capacity Ratio (X)				0.560	0.961	0.409	1.114	0.492	0.017	0.543	0.411	0.479	0.388	0.926	0.124												
Back of Queue (Q), ft/ln (90 th percentile)				51.6	559.3	213.1	734.6	289.7	7.2	150.5	115.1	233.4	134.9	373.7	42.7												
Back of Queue (Q), veh/ln (90 th percentile)				2.1	22.0	8.5	29.4	11.4	0.3	5.9	4.6	9.3	5.4	14.9	1.7												
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	0.00	0.00												
Uniform Delay (d ₁), s/veh				57.1	42.4	26.1	45.8	20.8	7.8	49.6	49.0	30.4	44.8	49.5	40.4												
Incremental Delay (d ₂), s/veh				7.7	20.1	2.0	78.3	1.0	0.0	3.6	1.8	0.9	1.2	33.9	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	0.0	0.0												
Control Delay (d), s/veh				64.7	62.5	28.1	124.1	21.9	7.9	53.2	50.8	31.3	46.0	83.5	40.6												
Level of Service (LOS)				E	E	C	F	C	A	D	D	C	D	F	D												
Approach Delay, s/veh / LOS				55.6			E			58.0			E			40.3			D			69.5			E		
Intersection Delay, s/veh / LOS										56.1						E											
Multimodal Results				EB			WB			NB			SB														
Pedestrian LOS Score / LOS				2.13			B			2.10			B			2.48			B								
Bicycle LOS Score / LOS				1.55			B			1.60			B			1.27			A								

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250										
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other										
Jurisdiction		Time Period	PM Peak	PHF	0.95										
Urban Street	Hurstbourne Parkway	Analysis Year	2034 No Build	Analysis Period	1> 4:45										
Intersection	S Watterson Trail	File Name	S Watterson PM 34 NB.xus												
Project Description	Star Hill														
Demand Information				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h	36	1041	284	471	807	19	89	81	284	25	229	40			
Signal Information															
Cycle, s	120.0	Reference Phase	2	Green	4.3	18.7	34.4	17.3	13.4	0.0					
Offset, s	0	Reference Point	End	Yellow	3.5	3.5	4.3	3.6	3.6	0.0					
Uncoordinated	No	Simult. Gap E/W	On	Red	3.0	3.0	1.8	2.8	2.8	0.0					
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6		8		4				
Case Number				2.0	3.0	2.0	3.0		9.0		9.0				
Phase Duration, s				10.8	40.5	36.0	65.7		19.8		23.7				
Change Period, (Y+R _c), s				6.5	6.1	6.5	6.1		6.4		6.4				
Max Allow Headway (MAH), s				4.0	0.0	5.0	0.0		5.3		5.1				
Queue Clearance Time (g _s), s				4.5		32.5			15.4		16.8				
Green Extension Time (g _e), s				0.0	0.0	0.0	0.0		0.0		0.5				
Phase Call Probability				0.72		1.00			1.00		1.00				
Max Out Probability				0.99		1.00			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	38	1096	299	496	849	20	94	85	299	26	241	42			
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1781	1598	1810	1781	1610	1767	1900	1610	1810	1900	1610			
Queue Service Time (g _s), s	2.5	35.4	16.6	30.5	18.9	0.5	5.9	5.0	13.4	1.5	14.8	2.6			
Cycle Queue Clearance Time (g _c), s	2.5	35.4	16.6	30.5	18.9	0.5	5.9	5.0	13.4	1.5	14.8	2.6			
Green Ratio (g/C)	0.04	0.29	0.41	0.25	0.50	0.64	0.11	0.11	0.36	0.15	0.15	0.19			
Capacity (c), veh/h	65	1050	636	460	1769	1032	212	212	576	276	290	290			
Volume-to-Capacity Ratio (X)	0.584	1.043	0.470	1.078	0.480	0.019	0.441	0.401	0.519	0.095	0.833	0.145			
Back of Queue (Q), ft/ln (90 th percentile)	56.3	690.7	246	713.2	282.8	8.1	123.4	111	256.4	31	296.9	48.3			
Back of Queue (Q), veh/ln (90 th percentile)	2.3	27.2	9.8	28.5	11.1	0.3	4.8	4.4	10.3	1.2	11.9	1.9			
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	0.00	0.00			
Uniform Delay (d ₁), s/veh	57.0	42.3	26.7	44.7	20.0	7.8	49.1	49.1	30.4	43.7	49.4	41.4			
Incremental Delay (d ₂), s/veh	8.1	39.8	2.5	64.4	0.9	0.0	2.0	1.7	1.1	0.2	15.7	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	0.0	0.0			
Control Delay (d), s/veh	65.0	82.1	29.2	109.1	20.9	7.9	51.1	50.8	31.5	44.0	65.1	41.8			
Level of Service (LOS)	E	F	C	F	C	A	D	D	C	D	E	D			
Approach Delay, s/veh / LOS	70.6 / E			52.7 / D			38.8 / D			60.1 / E					
Intersection Delay, s/veh / LOS	58.7						E								
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.13 / B			2.10 / B			2.48 / B			2.46 / B					
Bicycle LOS Score / LOS	1.67 / B			1.61 / B			1.28 / A			1.00 / A					

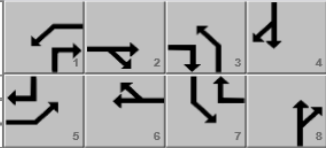
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other		
Jurisdiction		Time Period	PM Peak	PHF	0.95		
Urban Street	Hurstbourne Parkway	Analysis Year	2034 Build	Analysis Period	1> 4:45		
Intersection	S Watterson Trail	File Name	S Watterson PM 34 B.xus				
Project Description	Star Hill						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	33	946	246	500	884	19	121	92	284	111	281	40

Signal Information				Signal Timing (s)									
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	4.1	18.9	34.4	20.1	10.6	0.0			
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.5	3.5	4.3	3.6	3.6	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	3.0	3.0	1.8	2.8	2.8	0.0			

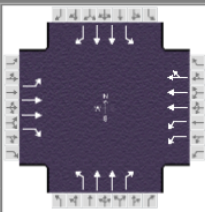


Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	3.0	2.0	3.0		9.0		9.0
Phase Duration, s	10.6	40.5	36.0	65.9		17.0		26.5
Change Period, (Y+Rc), s	6.5	6.1	6.5	6.1		6.4		6.4
Max Allow Headway (MAH), s	4.0	0.0	5.0	0.0		5.2		5.1
Queue Clearance Time (gs), s	4.3		32.5			12.6		20.2
Green Extension Time (ge), s	0.0	0.0	0.0	0.0		0.0		0.0
Phase Call Probability	0.69		1.00			1.00		1.00
Max Out Probability	0.74		1.00			1.00		1.00

Movement Group Results	EB			WB			NB			SB		
	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	35	996	259	526	931	20	127	97	299	117	296	42
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1781	1598	1810	1781	1610	1767	1900	1610	1810	1900	1610
Queue Service Time (gs), s	2.3	32.8	14.5	30.5	21.3	0.5	8.4	5.9	10.6	6.8	18.2	2.6
Cycle Queue Clearance Time (gc), s	2.3	32.8	14.5	30.5	21.3	0.5	8.4	5.9	10.6	6.8	18.2	2.6
Green Ratio (g/C)	0.03	0.30	0.38	0.25	0.50	0.67	0.09	0.09	0.33	0.18	0.18	0.21
Capacity (c), veh/h	62	1051	599	460	1774	1072	171	168	538	318	334	325
Volume-to-Capacity Ratio (X)	0.560	0.948	0.432	1.144	0.524	0.019	0.746	0.577	0.556	0.367	0.885	0.130
Back of Queue (Q), ft/ln (90 th percentile)	51.6	547.6	221.1	828.9	312.9	7.3	185.7	132.3	267.1	134.9	373.6	46.7
Back of Queue (Q), veh/ln (90 th percentile)	2.1	21.6	8.8	33.2	12.3	0.3	7.3	5.3	10.7	5.4	14.9	1.9
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	0.00	0.00
Uniform Delay (d1), s/veh	57.1	41.9	28.0	44.8	20.5	6.8	52.8	52.1	32.7	43.6	48.3	39.3
Incremental Delay (d2), s/veh	7.7	17.7	2.3	87.9	1.1	0.0	17.4	5.9	1.6	1.0	23.9	0.3
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	0.0	0.0
Control Delay (d), s/veh	64.7	59.6	30.2	132.6	21.6	6.8	70.1	58.0	34.3	44.6	72.2	39.5
Level of Service (LOS)	E	E	C	F	C	A	E	E	C	D	E	D
Approach Delay, s/veh / LOS	53.9	D		61.0	E		47.4	D		62.1	E	
Intersection Delay, s/veh / LOS	56.7						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.13	B	2.10	B	2.48	B	2.47	B
Bicycle LOS Score / LOS	1.55	B	1.71	B	1.35	A	1.24	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information															
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		Area Type	Other											
Analyst	DBZ	Analysis Date	5/21/2020		PHF	0.92													
Jurisdiction		Time Period	AM Peak		Analysis Period	1> 7:15													
Urban Street	Hurstbourne Pkwy		Analysis Year	2020															
Intersection	Bardstown Rd		File Name	Bardstown AM 20.xus															
Project Description	Star Hill																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				94	868	175	184	556	99	288	1191	452	60	448	41				
Signal Information																			
Cycle, s	180.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	34.1	38.7	10.6	12.5	10.8	37.3									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0									
				Red	2.0	2.0	2.0	2.0	2.0	2.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase				7	4		3		8		5		2		1		6		
Case Number				2.0	3.0		1.2		4.0		2.0		3.0		2.0		3.0		
Phase Duration, s				43.3	60.1		18.5		35.3		40.1		84.8		16.6		61.3		
Change Period, (Y+R c), s				6.0	6.0		6.0		6.0		6.0		6.0		6.0		6.0		
Max Allow Headway (MAH), s				5.0	5.0		5.0		5.0		5.0		0.0		5.0		0.0		
Queue Clearance Time (g s), s				10.8	47.4		11.6		24.9		32.6				9.0				
Green Extension Time (g e), s				9.6	6.7		0.9		4.4		1.5		0.0		2.0		0.0		
Phase Call Probability				0.99	1.00		1.00		1.00		1.00				0.96				
Max Out Probability				0.06	0.39		0.00		0.02		0.01				0.61				
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16				
Adjusted Flow Rate (v), veh/h				102	943	190	200	484	228	313	1295	491	65	487	45				
Adjusted Saturation Flow Rate (s), veh/h/ln				1767	1781	1547	1716	1870	1724	1795	1795	1585	1640	1738	1485				
Queue Service Time (g s), s				8.8	45.4	12.9	9.6	22.4	22.9	30.6	57.1	39.9	7.0	20.3	2.7				
Cycle Queue Clearance Time (g c), s				8.8	45.4	12.9	9.6	22.4	22.9	30.6	57.1	39.9	7.0	20.3	2.7				
Green Ratio (g/C)				0.21	0.30	0.49	0.14	0.16	0.16	0.19	0.44	0.51	0.06	0.31	0.51				
Capacity (c), veh/h				366	1070	758	318	610	281	350	1571	804	97	1068	763				
Volume-to-Capacity Ratio (X)				0.279	0.882	0.251	0.628	0.794	0.811	0.894	0.824	0.611	0.673	0.456	0.058				
Back of Queue (Q), ft/ln (90 th percentile)				167	690.9	198	178.2	385.3	370.8	516.5	818.8	281.4	152.1	334.3	28.5				
Back of Queue (Q), veh/ln (90 th percentile)				6.5	27.2	7.6	7.0	15.2	14.8	20.5	32.5	11.1	5.6	12.9	1.1				
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	0.00	0.00				
Uniform Delay (d 1), s/veh				60.1	59.9	26.7	71.0	72.4	72.6	70.6	44.5	12.1	83.0	50.2	10.5				
Incremental Delay (d 2), s/veh				0.6	7.5	0.2	2.9	3.4	7.7	15.9	5.1	3.5	11.0	1.4	0.1				
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	0.0	0.0				
Control Delay (d), s/veh				60.7	67.4	26.9	73.9	75.8	80.4	86.6	49.6	15.6	93.9	51.6	10.6				
Level of Service (LOS)				E	E	C	E	E	F	F	D	B	F	D	B				
Approach Delay, s/veh / LOS				60.6	E		76.5	E		47.1	D		53.2	D					
Intersection Delay, s/veh / LOS				56.9						E									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.46	B		2.47	B		2.63	C		2.60	C					
Bicycle LOS Score / LOS				1.51	B		0.99	A		2.22	B		0.98	A					

HCS7 Signalized Intersection Results Summary

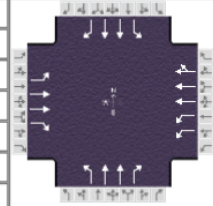
General Information				Intersection Information												
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250											
Analyst	DBZ	Analysis Date	5/21/2020	Area Type	Other											
Jurisdiction		Time Period	AM Peak	PHF	0.92											
Urban Street	Hurstbourne Pkwy	Analysis Year	2024 No Build	Analysis Period	1> 7:15											
Intersection	Bardstown Rd	File Name	Bardstown AM 24 NV.xus													
Project Description	Star Hill															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				98	903	182	191	579	103	300	1239	470	62	466	43	
Signal Information																
Cycle, s	180.0	Reference Phase	2	Green	35.3	35.4	10.9	12.9	11.5	38.0						
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	4.0	4.0	4.0						
Uncoordinated	No	Simult. Gap E/W	On	Red	2.0	2.0	2.0	2.0	2.0	2.0						
Force Mode	Fixed	Simult. Gap N/S	On													
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase				7	4	3	8	5	2	1	6					
Case Number				2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0					
Phase Duration, s				44.0	61.5	18.9	36.4	41.3	82.7	16.9	58.3					
Change Period, (Y+R c), s				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0					
Max Allow Headway (MAH), s				5.0	5.0	5.0	5.0	5.0	0.0	5.0	0.0					
Queue Clearance Time (g s), s				11.1	49.4	11.9	25.8	33.9		9.2						
Green Extension Time (g e), s				10.0	6.2	1.0	4.6	1.4	0.0	2.1	0.0					
Phase Call Probability				1.00	1.00	1.00	1.00	1.00		0.97						
Max Out Probability				0.08	0.53	0.00	0.03	0.05		0.66						
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16	
Adjusted Flow Rate (v), veh/h				107	982	198	208	504	237	326	1347	511	67	507	47	
Adjusted Saturation Flow Rate (s), veh/h/ln				1767	1781	1547	1716	1870	1724	1795	1795	1585	1640	1738	1485	
Queue Service Time (g s), s				9.1	47.4	13.1	9.9	23.3	23.8	31.9	62.0	43.0	7.2	21.8	2.9	
Cycle Queue Clearance Time (g c), s				9.1	47.4	13.1	9.9	23.3	23.8	31.9	62.0	43.0	7.2	21.8	2.9	
Green Ratio (g/C)				0.21	0.31	0.50	0.15	0.17	0.17	0.20	0.43	0.50	0.06	0.29	0.50	
Capacity (c), veh/h				373	1099	781	325	632	291	362	1529	788	100	1010	745	
Volume-to-Capacity Ratio (X)				0.286	0.893	0.253	0.639	0.799	0.814	0.901	0.881	0.648	0.676	0.501	0.063	
Back of Queue (Q), ft/ln (90 th percentile)				172.3	720.8	199.7	183	398.6	383.3	540.9	897.2	303.2	155.9	356	31.3	
Back of Queue (Q), veh/ln (90 th percentile)				6.7	28.4	7.7	7.2	15.7	15.3	21.5	35.6	11.9	5.7	13.7	1.2	
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	0.00	0.00	
Uniform Delay (d 1), s/veh				59.6	59.4	25.3	70.3	71.9	72.1	70.1	47.5	12.6	82.8	53.0	10.5	
Incremental Delay (d 2), s/veh				0.6	8.6	0.2	3.0	3.4	7.8	18.1	7.6	4.1	10.8	1.8	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	0.0	0.0	
Control Delay (d), s/veh				60.2	68.0	25.6	73.2	75.2	79.8	88.2	55.1	16.7	93.6	54.8	10.7	
Level of Service (LOS)				E	E	C	E	E	E	F	E	B	F	D	B	
Approach Delay, s/veh / LOS				60.8	E	75.9	E	51.1	D	55.7	E					
Intersection Delay, s/veh / LOS				58.8						E						
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				2.46	B	2.47	B	2.63	C	2.60	C					
Bicycle LOS Score / LOS				1.55	B	1.01	A	2.29	B	1.00	A					

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information																				
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																			
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other																			
Jurisdiction		Time Period	AM Peak	PHF	0.92																			
Urban Street	Hurstbourne Pkwy	Analysis Year	2024 Build	Analysis Period	1> 7:15																			
Intersection	Bardstown Rd	File Name	Bardstown AM 24 B.xus																					
Project Description	Star Hill																							
Demand Information				EB			WB			NB			SB											
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R									
Demand (v), veh/h				107	991	200	191	650	103	337	1239	470	62	466	48									
Signal Information																								
Cycle, s	180.0	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	38.9	28.5	11.0	12.7	14.4	38.6	Yellow	4.0	4.0	4.0	4.0	4.0	4.0	Red	2.0	2.0	2.0	2.0	2.0	2.0
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT													
Assigned Phase				7	4	3	8	5	2	1	6													
Case Number				2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0													
Phase Duration, s				44.6	65.0	18.7	39.1	44.9	79.4	17.0	51.5													
Change Period, (Y+R c), s				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0													
Max Allow Headway (MAH), s				5.0	5.0	5.0	5.0	5.0	0.0	5.0	0.0													
Queue Clearance Time (g s), s				12.0	54.5	11.7	28.1	37.9		9.2														
Green Extension Time (g e), s				10.9	4.5	1.0	4.9	1.0	0.0	2.1	0.0													
Phase Call Probability				1.00	1.00	1.00	1.00	1.00		0.97														
Max Out Probability				0.16	0.86	0.00	0.06	0.85		0.66														
Movement Group Results				EB			WB			NB			SB											
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R									
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16									
Adjusted Flow Rate (v), veh/h				116	1077	217	208	556	262	366	1347	511	67	507	52									
Adjusted Saturation Flow Rate (s), veh/h/ln				1767	1781	1547	1716	1870	1737	1795	1795	1585	1640	1738	1485									
Queue Service Time (g s), s				10.0	52.5	13.4	9.7	25.7	26.1	35.9	63.4	44.7	7.2	22.9	3.5									
Cycle Queue Clearance Time (g c), s				10.0	52.5	13.4	9.7	25.7	26.1	35.9	63.4	44.7	7.2	22.9	3.5									
Green Ratio (g/C)				0.21	0.33	0.54	0.16	0.18	0.18	0.22	0.41	0.48	0.06	0.25	0.47									
Capacity (c), veh/h				379	1167	841	322	687	319	398	1484	758	100	878	693									
Volume-to-Capacity Ratio (X)				0.307	0.923	0.258	0.645	0.810	0.822	0.921	0.908	0.674	0.675	0.577	0.075									
Back of Queue (Q), ft/ln (90 th percentile)				185.2	800.5	201.9	180.5	434.2	419.4	617.4	926.8	308.4	155.9	376.5	39.7									
Back of Queue (Q), veh/ln (90 th percentile)				7.2	31.5	7.8	7.0	17.1	16.8	24.5	36.8	12.1	5.7	14.5	1.5									
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	0.00	0.00									
Uniform Delay (d 1), s/veh				59.5	58.3	21.8	68.1	70.5	70.6	68.5	50.0	12.8	82.8	58.8	10.6									
Incremental Delay (d 2), s/veh				0.6	11.7	0.2	3.1	4.0	8.9	24.0	9.7	4.8	10.8	2.8	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	0.0										
Control Delay (d), s/veh				60.1	70.1	22.0	71.2	74.4	79.6	92.5	59.7	17.5	93.5	61.6	10.8									
Level of Service (LOS)				E	E	C	E	E	E	F	E	B	F	E	B									
Approach Delay, s/veh / LOS				61.8		E	75.1		E	55.4		E	60.8		E									
Intersection Delay, s/veh / LOS				61.6						E														
Multimodal Results				EB			WB			NB			SB											
Pedestrian LOS Score / LOS				2.46		B	2.47		B	2.63		C	2.61		C									
Bicycle LOS Score / LOS				1.65		B	1.05		A	2.32		B	1.00		A									

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	5/21/2020	Area Type	Other		
Jurisdiction		Time Period	AM Peak	PHF	0.92		
Urban Street	Hurstbourne Pkwy	Analysis Year	2034 No Build	Analysis Period	1> 7:15		
Intersection	Bardstown Rd	File Name	Bardstown AM 34 NB.xus				
Project Description	Star Hill						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	108	997	201	211	640	114	331	1369	519	68	515	48

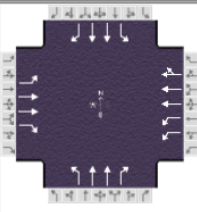
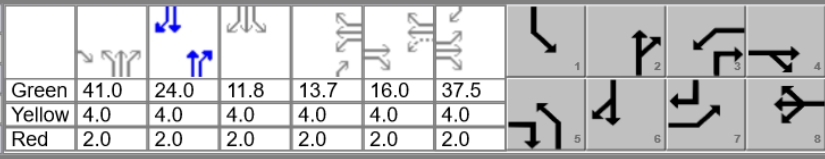
Signal Information				Signal Timing (s)														
Cycle, s	180.0	Reference Phase	2	Green	38.2	28.1	11.8	13.8	13.3	38.9	Yellow	4.0	4.0	4.0	4.0	4.0	4.0	
Offset, s	0	Reference Point	End	Red	2.0	2.0	2.0	2.0	2.0	2.0	Uncoordinated	No	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0
Phase Duration, s	44.9	64.2	19.8	39.1	44.2	78.2	17.8	51.8
Change Period, (Y+R c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	5.0	5.0	5.0	5.0	5.0	0.0	5.0	0.0
Queue Clearance Time (g s), s	12.0	55.3	12.8	28.2	37.3		9.9	
Green Extension Time (g e), s	10.9	2.9	1.0	4.9	0.9	0.0	2.1	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00		0.98	
Max Out Probability	0.17	1.00	0.01	0.07	1.00		0.80	

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	117	1084	218	229	558	261	360	1488	564	74	560	52
Adjusted Saturation Flow Rate (s), veh/h/ln	1767	1781	1547	1716	1870	1723	1795	1795	1585	1640	1738	1485
Queue Service Time (g s), s	10.0	53.3	13.8	10.8	25.8	26.2	35.3	73.2	51.9	7.9	25.8	3.5
Cycle Queue Clearance Time (g c), s	10.0	53.3	13.8	10.8	25.8	26.2	35.3	73.2	51.9	7.9	25.8	3.5
Green Ratio (g/C)	0.22	0.32	0.54	0.16	0.18	0.18	0.22	0.41	0.48	0.07	0.25	0.47
Capacity (c), veh/h	382	1151	828	344	688	317	391	1460	758	107	885	699
Volume-to-Capacity Ratio (X)	0.307	0.941	0.264	0.667	0.811	0.824	0.921	1.019	0.745	0.689	0.632	0.075
Back of Queue (Q), ft/ln (90 th percentile)	186.3	823.7	206.4	196.6	436	419.6	610	1170.2	369.5	167.7	416.7	39.1
Back of Queue (Q), veh/ln (90 th percentile)	7.3	32.4	7.9	7.7	17.2	16.8	24.2	46.4	14.5	6.1	16.0	1.4
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	0.00	0.00
Uniform Delay (d 1), s/veh	59.2	59.2	22.6	68.4	70.4	70.6	68.9	53.4	14.1	82.3	59.6	10.6
Incremental Delay (d 2), s/veh	0.6	14.5	0.2	3.2	4.1	9.4	24.6	28.5	6.6	10.9	3.4	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	0.0	0.0
Control Delay (d), s/veh	59.9	73.7	22.9	71.6	74.6	80.1	93.5	81.9	20.7	93.3	63.0	10.8
Level of Service (LOS)	E	E	C	E	E	F	F	F	C	F	E	B
Approach Delay, s/veh / LOS	64.7 E			75.3 E			69.3 E			62.3 E		
Intersection Delay, s/veh / LOS	68.4						E					

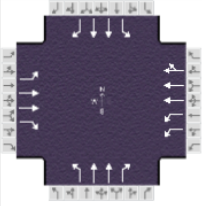
Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS	2.46 B	2.47 B	2.63 C	2.61 C
Bicycle LOS Score / LOS	1.66 B	1.06 A	2.48 B	1.05 A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information																		
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																	
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other																	
Jurisdiction		Time Period	AM Peak	PHF	0.92																	
Urban Street	Hurstbourne Pkwy	Analysis Year	2034 Build	Analysis Period	1> 7:15																	
Intersection	Bardstown Rd	File Name	Bardstown AM 34 B.xus																			
Project Description	Star Hill																					
Demand Information				EB			WB			NB			SB									
Approach Movement		L	T	R	L	T	R	L	T	R	L	T	R									
Demand (v), veh/h		117	1085	231	211	711	114	368	1369	519	68	515	53									
Signal Information																						
Cycle, s	180.0	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	41.0	24.0	11.8	13.7	16.0	37.5	Yellow	4.0	4.0	4.0	4.0	4.0	Red	2.0	2.0	2.0	2.0	2.0
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT											
Assigned Phase				7	4	3	8	5	2	1	6											
Case Number				2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0											
Phase Duration, s				43.5	65.6	19.7	41.7	47.0	77.0	17.8	47.8											
Change Period, (Y+R _c), s				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0											
Max Allow Headway (MAH), s				5.0	5.0	5.0	5.0	5.0	0.0	5.0	0.0											
Queue Clearance Time (g _s), s				13.0	61.5	12.6	30.5	41.5		9.9												
Green Extension Time (g _e), s				11.5	0.0	1.0	5.2	0.0	0.0	2.2	0.0											
Phase Call Probability				1.00	1.00	1.00	1.00	1.00		0.98												
Max Out Probability				0.30	1.00	0.01	0.13	1.00		0.80												
Movement Group Results				EB			WB			NB			SB									
Approach Movement		L	T	R	L	T	R	L	T	R	L	T	R									
Assigned Movement		7	4	14	3	8	18	5	2	12	1	6	16									
Adjusted Flow Rate (v), veh/h		127	1179	251	229	610	286	400	1488	564	74	560	58									
Adjusted Saturation Flow Rate (s), veh/h/ln		1767	1781	1547	1716	1870	1735	1795	1795	1585	1640	1738	1485									
Queue Service Time (g _s), s		11.0	59.5	15.4	10.6	28.1	28.5	39.5	72.0	52.7	7.9	26.5	4.1									
Cycle Queue Clearance Time (g _c), s		11.0	59.5	15.4	10.6	28.1	28.5	39.5	72.0	52.7	7.9	26.5	4.1									
Green Ratio (g/C)		0.21	0.33	0.56	0.18	0.20	0.20	0.23	0.40	0.48	0.07	0.23	0.44									
Capacity (c), veh/h		368	1178	865	340	741	344	419	1436	746	107	806	654									
Volume-to-Capacity Ratio (X)		0.345	1.001	0.290	0.674	0.823	0.832	0.954	1.036	0.757	0.688	0.694	0.088									
Back of Queue (Q), ft/ln (90 th percentile)		201.7	959.5	224.4	193.8	472	456.3	695.9	1197.4	374.5	167.6	432.3	47.8									
Back of Queue (Q), veh/ln (90 th percentile)		7.9	37.8	8.6	7.6	18.6	18.3	27.6	47.5	14.7	6.1	16.6	1.8									
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	0.00	0.00									
Uniform Delay (d ₁), s/veh		60.8	60.2	20.9	66.4	69.1	69.3	68.0	54.0	14.2	82.3	63.3	10.6									
Incremental Delay (d ₂), s/veh		0.8	26.5	0.3	3.3	4.9	10.7	32.3	33.7	7.1	10.9	4.9	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	0.0	0.0									
Control Delay (d), s/veh		61.6	86.7	21.2	69.7	74.0	79.9	100.4	87.7	21.3	93.2	68.2	10.9									
Level of Service (LOS)		E	F	C	E	E	E	F	F	C	F	E	B									
Approach Delay, s/veh / LOS		74.1		E	74.7		E	74.5		E	66.1		E									
Intersection Delay, s/veh / LOS		73.4						E														
Multimodal Results				EB			WB			NB			SB									
Pedestrian LOS Score / LOS		2.46		B	2.47		B	2.63		C	2.61		C									
Bicycle LOS Score / LOS		1.77		B	1.11		A	2.51		C	1.06		A									

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	5/21/2020	Area Type	Other		
Jurisdiction		Time Period	PM Peak	PHF	0.96		
Urban Street	Hurstbourne Pkwy	Analysis Year	2020	Analysis Period	1> 5:00		
Intersection	Bardstown Rd	File Name	Bardstown PM 20.xus				
Project Description	Star Hill						



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	84	757	339	424	873	57	226	614	356	138	990	132

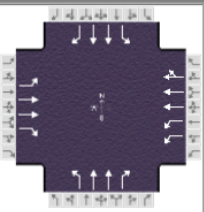
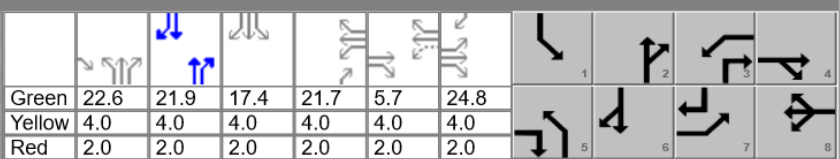
Signal Information				Signal Timing (s)									
Cycle, s	150.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	21.9	23.6	17.0	21.1	5.2	25.1			
Uncoordinated	No	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	2.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0
Phase Duration, s	31.1	42.4	27.1	38.3	27.9	57.5	23.0	52.6
Change Period, (Y+R c), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Allow Headway (MAH), s	5.0	5.0	5.0	4.9	5.0	0.0	5.0	0.0
Queue Clearance Time (g s), s	8.3	33.7	19.4	26.5	21.5		13.5	
Green Extension Time (g e), s	7.5	2.6	1.7	5.8	0.4	0.0	3.6	0.0
Phase Call Probability	0.97	1.00	1.00	1.00	1.00		1.00	
Max Out Probability	0.28	1.00	0.31	0.12	1.00		0.96	

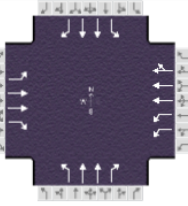
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	88	789	353	442	652	317	235	640	371	144	1031	138
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1795	1598	1743	1885	1824	1767	1795	1610	1795	1795	1610
Queue Service Time (g s), s	6.3	31.7	26.0	17.4	24.4	24.5	19.5	21.4	23.2	11.5	41.7	7.3
Cycle Queue Clearance Time (g c), s	6.3	31.7	26.0	17.4	24.4	24.5	19.5	21.4	23.2	11.5	41.7	7.3
Green Ratio (g/C)	0.17	0.25	0.40	0.20	0.22	0.22	0.15	0.34	0.48	0.12	0.31	0.48
Capacity (c), veh/h	303	894	621	610	837	405	270	1233	780	216	1115	770
Volume-to-Capacity Ratio (X)	0.289	0.882	0.569	0.725	0.779	0.782	0.871	0.519	0.476	0.667	0.925	0.179
Back of Queue (Q), ft/ln (90 th percentile)	127.8	510.5	359.4	285.4	405.2	402	367	339.5	174.6	217.2	659.1	90.6
Back of Queue (Q), veh/ln (90 th percentile)	5.1	20.3	14.3	11.3	16.1	16.1	14.3	13.5	7.0	8.6	26.2	3.6
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	0.00	0.00
Uniform Delay (d 1), s/veh	54.6	54.7	36.0	54.9	55.3	54.9	62.1	39.3	8.3	63.1	50.0	10.8
Incremental Delay (d 2), s/veh	0.7	10.0	1.5	3.1	2.8	5.8	21.6	1.6	2.1	7.1	14.0	0.5
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	0.0	0.0
Control Delay (d), s/veh	55.3	64.7	37.4	58.0	58.1	60.7	83.7	40.9	10.4	70.2	64.0	11.3
Level of Service (LOS)	E	E	D	E	E	E	F	D	B	E	E	B
Approach Delay, s/veh / LOS	56.2	E		58.7	E		39.9	D		59.2	E	
Intersection Delay, s/veh / LOS	53.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.47	B	2.61	C	2.59	C
Bicycle LOS Score / LOS	1.50	B	1.26	A	1.52	B	1.57	B

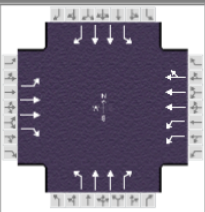
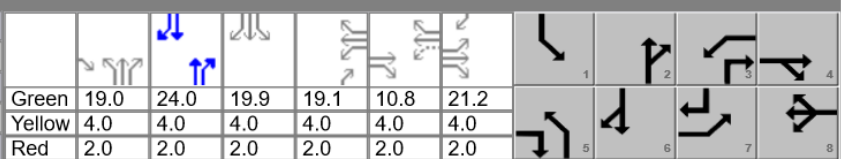
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250										
Analyst	DBZ	Analysis Date	5/21/2020	Area Type	Other										
Jurisdiction		Time Period	PM Peak	PHF	0.96										
Urban Street	Hurstbourne Pkwy	Analysis Year	2024 No Build	Analysis Period	1> 5:00										
Intersection	Bardstown Rd	File Name	Bardstown PM 24 NB.xus												
Project Description	Star Hill														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				87	788	353	441	908	59	235	639	370	144	1030	137
Signal Information															
Cycle, s	150.0	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	22.6	21.9	17.4	21.7	5.7	24.8									
Yellow	4.0	4.0	4.0	4.0	4.0	4.0									
Red	2.0	2.0	2.0	2.0	2.0	2.0									
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				7	4	3	8	5	2	1	6				
Case Number				2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0				
Phase Duration, s				30.8	42.5	27.7	39.4	28.6	56.5	23.4	51.2				
Change Period, (Y+R c), s				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Allow Headway (MAH), s				5.0	5.0	5.0	4.9	5.0	0.0	5.0	0.0				
Queue Clearance Time (g s), s				8.6	35.4	20.0	27.5	22.3		14.0					
Green Extension Time (g e), s				7.5	1.1	1.7	5.9	0.3	0.0	3.4	0.0				
Phase Call Probability				0.98	1.00	1.00	1.00	1.00		1.00					
Max Out Probability				0.35	1.00	0.43	0.16	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				7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h				91	821	368	459	678	329	245	666	385	150	1073	143
Adjusted Saturation Flow Rate (s), veh/h/ln				1810	1795	1598	1743	1885	1824	1767	1795	1610	1795	1795	1610
Queue Service Time (g s), s				6.6	33.4	27.2	18.0	25.4	25.5	20.3	22.7	24.5	12.0	44.7	7.8
Cycle Queue Clearance Time (g c), s				6.6	33.4	27.2	18.0	25.4	25.5	20.3	22.7	24.5	12.0	44.7	7.8
Green Ratio (g/C)				0.17	0.25	0.40	0.21	0.23	0.23	0.16	0.34	0.48	0.12	0.30	0.47
Capacity (c), veh/h				299	897	629	623	864	418	278	1208	774	220	1083	752
Volume-to-Capacity Ratio (X)				0.303	0.915	0.584	0.737	0.785	0.788	0.881	0.551	0.498	0.683	0.991	0.190
Back of Queue (Q), ft/ln (90 th percentile)				131.9	545.1	373.7	295.2	419.5	416.8	385.9	358.5	183.7	226.8	744	97.7
Back of Queue (Q), veh/ln (90 th percentile)				5.3	21.6	14.8	11.7	16.6	16.7	15.1	14.2	7.3	9.0	29.5	3.9
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	0.00	0.00
Uniform Delay (d 1), s/veh				55.0	55.2	35.8	54.3	54.8	54.4	61.8	40.5	8.4	63.0	52.2	10.8
Incremental Delay (d 2), s/veh				0.8	13.7	1.7	3.5	3.1	6.3	24.5	1.8	2.3	8.1	25.3	0.6
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	0.0	0.0
Control Delay (d), s/veh				55.8	68.9	37.5	57.8	57.9	60.7	86.4	42.4	10.7	71.1	77.5	11.4
Level of Service (LOS)				E	E	D	E	E	E	F	D	B	E	E	B
Approach Delay, s/veh / LOS				58.9	E	58.5	E	41.3	D	69.9	E				
Intersection Delay, s/veh / LOS				57.3						E					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.46	B	2.47	B	2.61	C	2.60	C				
Bicycle LOS Score / LOS				1.54	B	1.29	A	1.56	B	1.61	B				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information											
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250										
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other										
Jurisdiction		Time Period	PM Peak	PHF	0.96										
Urban Street	Hurstbourne Pkwy	Analysis Year	2024 Build	Analysis Period	1> 5:00										
Intersection	Bardstown Rd	File Name	Bardstown PM 24 B.xus												
Project Description	Star Hill														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				94	846	379	441	983	59	254	639	370	144	1030	149
Signal Information															
Cycle, s	150.0	Reference Phase	2												
Offset, s	0	Reference Point	End	Green	24.0	20.0	17.4	21.4	8.0	23.2					
Uncoordinated	No	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	2.0	2.0	2.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				7	4	3	8	5	2	1	6				
Case Number				2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0				
Phase Duration, s				29.2	43.2	27.4	41.5	30.0	56.0	23.4	49.4				
Change Period, (Y+R c), s				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Allow Headway (MAH), s				5.0	5.0	5.0	4.9	5.0	0.0	5.0	0.0				
Queue Clearance Time (g s), s				9.3	38.4	19.7	29.4	24.0		14.0					
Green Extension Time (g e), s				7.3	0.0	1.7	6.1	0.0	0.0	3.4	0.0				
Phase Call Probability				0.98	1.00	1.00	1.00	1.00		1.00					
Max Out Probability				0.50	1.00	0.39	0.25	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				7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h				98	881	395	459	731	355	265	666	385	150	1073	155
Adjusted Saturation Flow Rate (s), veh/h/ln				1810	1795	1598	1743	1885	1828	1767	1795	1610	1795	1795	1610
Queue Service Time (g s), s				7.3	36.4	29.1	17.7	27.3	27.4	22.0	22.8	24.7	12.0	43.4	8.9
Cycle Queue Clearance Time (g c), s				7.3	36.4	29.1	17.7	27.3	27.4	22.0	22.8	24.7	12.0	43.4	8.9
Green Ratio (g/C)				0.15	0.25	0.41	0.22	0.24	0.24	0.17	0.33	0.48	0.12	0.29	0.44
Capacity (c), veh/h				280	915	652	617	916	444	295	1197	767	220	1038	714
Volume-to-Capacity Ratio (X)				0.350	0.964	0.605	0.745	0.797	0.799	0.898	0.556	0.503	0.682	1.034	0.217
Back of Queue (Q), ft/ln (90 th percentile)				142.7	612.7	396.4	290.7	447.6	446.5	421.3	360.1	186.4	226.7	789.8	114.1
Back of Queue (Q), veh/ln (90 th percentile)				5.7	24.3	15.7	11.5	17.8	17.9	16.5	14.3	7.5	9.0	31.3	4.6
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	0.00	0.00
Uniform Delay (d 1), s/veh				56.7	55.7	34.9	52.6	53.8	53.3	61.2	40.9	8.4	63.0	53.3	10.9
Incremental Delay (d 2), s/veh				1.1	21.4	1.9	3.7	3.6	7.2	28.5	1.9	2.4	8.0	37.0	0.7
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	0.0	0.0
Control Delay (d), s/veh				57.8	77.1	36.8	56.3	57.3	60.5	89.8	42.8	10.8	71.1	90.4	11.6
Level of Service (LOS)				E	E	D	E	E	E	F	D	B	E	F	B
Approach Delay, s/veh / LOS				64.1	E	57.7	E	42.9	D	79.4	E				
Intersection Delay, s/veh / LOS				61.1						E					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.46	B	2.47	B	2.61	C	2.60	C				
Bicycle LOS Score / LOS				1.62	B	1.34	A	1.57	B	1.62	B				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information																		
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																	
Analyst	DBZ	Analysis Date	5/21/2020			Area Type	Other															
Jurisdiction		Time Period	PM Peak			PHF	0.96															
Urban Street	Hurstbourne Pkwy		Analysis Year	2034 No Build		Analysis Period	1> 5:00															
Intersection	Bardstown Rd	File Name	Bardstown PM 34 NB.xus																			
Project Description	Star Hill																					
Demand Information				EB			WB			NB			SB									
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R							
Demand (v), veh/h				96	870	390	487	1003	65	260	705	409	159	1137	151							
Signal Information																						
Cycle, s	150.0	Reference Phase	2	Green	19.0	24.0	19.9	19.1	10.8	21.2	Yellow	4.0	4.0	4.0	4.0	4.0	Red	2.0	2.0	2.0	2.0	2.0
Offset, s	0	Reference Point	End	Uncoordinated	No	Simult. Gap E/W	On	Force Mode	Fixed	Simult. Gap N/S	On											
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT											
Assigned Phase				7	4	3	8	5	2	1	6											
Case Number				2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0											
Phase Duration, s				27.2	44.0	25.1	41.9	25.0	55.0	25.9	55.9											
Change Period, (Y+R _c), s				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0											
Max Allow Headway (MAH), s				5.0	5.0	5.0	4.9	5.0	0.0	5.0	0.0											
Queue Clearance Time (g _s), s				9.5	39.5	21.8	30.1	22.0		15.1												
Green Extension Time (g _e), s				6.6	0.0	0.0	5.8	0.0	0.0	4.8	0.0											
Phase Call Probability				0.98	1.00	1.00	1.00	1.00		1.00												
Max Out Probability				0.61	1.00	1.00	0.34	1.00		0.89												
Movement Group Results				EB			WB			NB			SB									
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R							
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16							
Adjusted Flow Rate (v), veh/h				100	906	406	507	749	363	271	734	426	166	1184	157							
Adjusted Saturation Flow Rate (s), veh/h/ln				1810	1795	1598	1743	1885	1824	1767	1795	1610	1795	1795	1610							
Queue Service Time (g _s), s				7.5	37.5	31.7	19.8	28.0	28.1	20.0	26.0	29.5	13.1	48.8	8.5							
Cycle Queue Clearance Time (g _c), s				7.5	37.5	31.7	19.8	28.0	28.1	20.0	26.0	29.5	13.1	48.8	8.5							
Green Ratio (g/C)				0.14	0.26	0.39	0.23	0.25	0.25	0.13	0.33	0.45	0.14	0.34	0.48							
Capacity (c), veh/h				256	933	607	564	928	449	235	1172	731	250	1218	763							
Volume-to-Capacity Ratio (X)				0.390	0.971	0.669	0.899	0.807	0.809	1.151	0.626	0.583	0.663	0.973	0.206							
Back of Queue (Q), ft/ln (90 th percentile)				147.6	632.6	434.1	350.6	460.2	459.7	567.3	406.2	248.4	240.3	779.1	107.7							
Back of Queue (Q), veh/ln (90 th percentile)				5.9	25.1	17.2	13.9	18.3	18.4	22.2	16.1	9.9	9.5	30.9	4.3							
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	0.00	0.00							
Uniform Delay (d ₁), s/veh				58.5	55.4	38.7	53.2	53.6	53.2	65.0	42.8	5.2	61.2	49.4	13.8							
Incremental Delay (d ₂), s/veh				1.4	22.6	3.2	17.7	4.1	8.2	105.6	2.5	3.4	6.1	20.0	0.6							
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	0.0	0.0							
Control Delay (d), s/veh				59.9	78.0	41.9	70.8	57.8	61.5	170.7	45.3	8.6	67.4	69.4	14.4							
Level of Service (LOS)				E	E	D	E	E	E	F	D	A	E	E	B							
Approach Delay, s/veh / LOS				66.4	E	62.7	E	58.1	E	63.4	E											
Intersection Delay, s/veh / LOS				62.6						E												
Multimodal Results				EB			WB			NB			SB									
Pedestrian LOS Score / LOS				2.46	B	2.47	B	2.61	C	2.59	C											
Bicycle LOS Score / LOS				1.65	B	1.38	A	1.67	B	1.73	B											

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information																				
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																			
Analyst	DBZ	Analysis Date	Nov 19, 2020	Area Type	Other																			
Jurisdiction		Time Period	PM Peak	PHF	0.96																			
Urban Street	Hurstbourne Pkwy	Analysis Year	2034 Build	Analysis Period	1> 5:00																			
Intersection	Bardstown Rd	File Name	Bardstown PM 34 B.xus																					
Project Description	Star Hill																							
Demand Information				EB			WB			NB			SB											
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R												
Demand (v), veh/h	103	928	416	487	1078	65	279	705	409	159	1137	163												
Signal Information																								
Cycle, s	150.0	Reference Phase	2	Green	19.0	24.0	19.9	19.1	12.7	19.4														
Offset, s	0	Reference Point	End	Yellow	4.0	4.0	4.0	4.0	4.0	4.0														
Uncoordinated	No	Simult. Gap E/W	On	Red	2.0	2.0	2.0	2.0	2.0	2.0														
Force Mode	Fixed	Simult. Gap N/S	On																					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT													
Assigned Phase				7	4	3	8	5	2	1	6													
Case Number				2.0	3.0	1.2	4.0	2.0	3.0	2.0	3.0													
Phase Duration, s				25.4	44.0	25.1	43.8	25.0	55.0	25.9	55.9													
Change Period, (Y+R c), s				6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0													
Max Allow Headway (MAH), s				5.0	5.0	5.0	4.9	5.0	0.0	5.0	0.0													
Queue Clearance Time (g s), s				10.2	41.0	21.4	32.1	22.0		15.1														
Green Extension Time (g e), s				5.9	0.0	0.0	5.7	0.0	0.0	4.8	0.0													
Phase Call Probability				0.99	1.00	1.00	1.00	1.00		1.00														
Max Out Probability				0.77	1.00	1.00	0.47	1.00		0.89														
Movement Group Results				EB			WB			NB			SB											
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R												
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16												
Adjusted Flow Rate (v), veh/h	107	967	433	507	802	389	291	734	426	166	1184	170												
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1795	1598	1743	1885	1828	1767	1795	1610	1795	1795	1610												
Queue Service Time (g s), s	8.2	39.0	34.6	19.4	30.0	30.1	20.0	26.0	29.5	13.1	48.8	9.5												
Cycle Queue Clearance Time (g c), s	8.2	39.0	34.6	19.4	30.0	30.1	20.0	26.0	29.5	13.1	48.8	9.5												
Green Ratio (g/C)	0.13	0.26	0.39	0.24	0.26	0.26	0.13	0.33	0.45	0.14	0.34	0.47												
Capacity (c), veh/h	234	933	607	564	974	472	235	1172	731	250	1218	744												
Volume-to-Capacity Ratio (X)	0.459	1.036	0.714	0.900	0.823	0.823	1.235	0.626	0.583	0.663	0.972	0.228												
Back of Queue (Q), ft/ln (90 th percentile)	159.5	728.6	472.7	346.1	490.2	491.9	649.7	406.2	248.4	240.3	777.8	120.2												
Back of Queue (Q), veh/ln (90 th percentile)	6.4	28.9	18.8	13.7	19.5	19.7	25.4	16.1	9.9	9.5	30.9	4.8												
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	0.00	0.00												
Uniform Delay (d 1), s/veh	60.5	55.5	39.6	51.7	52.8	52.4	65.0	42.8	5.2	61.2	49.3	13.9												
Incremental Delay (d 2), s/veh	2.0	39.0	4.3	17.8	4.8	9.5	137.0	2.5	3.4	6.1	19.9	0.7												
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	0.0	0.0												
Control Delay (d), s/veh	62.5	94.5	43.9	69.5	57.6	61.8	202.0	45.3	8.6	67.3	69.3	14.6												
Level of Service (LOS)	E	F	D	E	E	E	F	D	A	E	E	B												
Approach Delay, s/veh / LOS	77.7			E			62.1			E			65.9			E			63.0			E		
Intersection Delay, s/veh / LOS	67.0												E											
Multimodal Results				EB			WB			NB			SB											
Pedestrian LOS Score / LOS	2.46			B			2.47			B			2.61			C			2.59			C		
Bicycle LOS Score / LOS	1.73			B			1.42			A			1.68			B			1.74			B		

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson at Entrance							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Entrance							
Analysis Year	2024							North/South Street	S Watterson Trail							
Time Analyzed	AM Peak							Peak Hour Factor	0.89							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	1	0	0	0	1	0
Configuration		L		R						L	T					TR
Volume (veh/h)		8		114						14	260				97	12
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)		7.1		6.2						4.1						
Critical Headway (sec)		6.41		6.21						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.51		3.31						2.21						
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		9		128						16						
Capacity, c (veh/h)		571		939						1471						
v/c Ratio		0.02		0.14						0.01						
95% Queue Length, Q ₉₅ (veh)		0.0		0.5						0.0						
Control Delay (s/veh)		11.4		9.4						7.5						
Level of Service (LOS)		B		A						A						
Approach Delay (s/veh)		9.6								0.4						
Approach LOS		A														

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson at Entrance							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Entrance							
Analysis Year	2034							North/South Street	S Watterson Trail							
Time Analyzed	AM Peak							Peak Hour Factor	0.89							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	1	0	0	0	1	0
Configuration		L		R						L	T					TR
Volume (veh/h)		8		114						14	286				107	12
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)		7.1		6.2						4.1						
Critical Headway (sec)		6.41		6.21						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.51		3.31						2.21						
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		9		128						16						
Capacity, c (veh/h)		541		926						1457						
v/c Ratio		0.02		0.14						0.01						
95% Queue Length, Q ₉₅ (veh)		0.1		0.5						0.0						
Control Delay (s/veh)		11.8		9.5						7.5						
Level of Service (LOS)		B		A						A						
Approach Delay (s/veh)		9.7								0.3						
Approach LOS		A														

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson at Entrance							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Entrance							
Analysis Year	2024							North/South Street	S Watterson Trail							
Time Analyzed	PM Peak							Peak Hour Factor	0.95							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	1	0	0	0	1	0
Configuration		L		R						L	T					TR
Volume (veh/h)		6		141						5	129				262	18
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)		7.1		6.2						4.1						
Critical Headway (sec)		6.41		6.21						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.51		3.31						2.21						
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		6		148						5						
Capacity, c (veh/h)		580		756						1272						
v/c Ratio		0.01		0.20						0.00						
95% Queue Length, Q ₉₅ (veh)		0.0		0.7						0.0						
Control Delay (s/veh)		11.3		10.9						7.8						
Level of Service (LOS)		B		B						A						
Approach Delay (s/veh)		10.9								0.3						
Approach LOS		B								A						

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson at Entrance							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/19/2020							East/West Street	Entrance							
Analysis Year	2034							North/South Street	S Watterson Trail							
Time Analyzed	PM Peak							Peak Hour Factor	0.95							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	0	0	0	1	1	0	0	0	1	0
Configuration		L		R						L	T					TR
Volume (veh/h)		6		141						5	142				290	18
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)		7.1		6.2						4.1						
Critical Headway (sec)		6.41		6.21						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.51		3.31						2.21						
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		6		148						5						
Capacity, c (veh/h)		548		728						1241						
v/c Ratio		0.01		0.20						0.00						
95% Queue Length, Q ₉₅ (veh)		0.0		0.8						0.0						
Control Delay (s/veh)		11.6		11.2						7.9						
Level of Service (LOS)		B		B						A						
Approach Delay (s/veh)		11.2								0.3						
Approach LOS		B								A						

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	2/18/2020							East/West Street	Fair Lane							
Analysis Year	2020							North/South Street	S Watterson Tr							
Time Analyzed	AM Peak							Peak Hour Factor	0.81							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						5		65			922	3		10	266	
Percent Heavy Vehicles (%)						0		11						10		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage					Undivided											
Critical and Follow-up Headways																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.31						4.20		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.40						2.29		
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						86								12		
Capacity, c (veh/h)						222								584		
v/c Ratio						0.39								0.02		
95% Queue Length, Q ₉₅ (veh)						1.7								0.1		
Control Delay (s/veh)						31.1								11.3		
Level of Service (LOS)						D								B		
Approach Delay (s/veh)						31.1								0.7		
Approach LOS						D										

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/20/2020							East/West Street	Fair Lane							
Analysis Year	2024							North/South Street	S Watterson Tr							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.81							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						5		65			959	3		10	277	
Percent Heavy Vehicles (%)						0		11						10		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage					Undivided											
Critical and Follow-up Headways																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.31						4.20		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.40						2.29		
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)								86						12		
Capacity, c (veh/h)								208						560		
v/c Ratio								0.41						0.02		
95% Queue Length, Q ₉₅ (veh)								1.9						0.1		
Control Delay (s/veh)								34.0						11.6		
Level of Service (LOS)								D						B		
Approach Delay (s/veh)						34.0								0.7		
Approach LOS						D										

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln									
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction										
Date Performed	11/20/2020							East/West Street	Fair Lane									
Analysis Year	2024							North/South Street	S Watterson Tr									
Time Analyzed	AM Peak Build							Peak Hour Factor	0.81									
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25									
Project Description	Star Hill																	
Lanes																		
<p style="text-align: center;">Major Street: North-South</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6		
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0		
Configuration			LTR			LTR				L		TR		L		TR		
Volume (veh/h)		10	0	46		5	0	65		39	1002	3		10	313	35		
Percent Heavy Vehicles (%)		0	0	0		0	3	11		3				10				
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)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1				
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.53	6.31		4.13				4.20				
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2				
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.03	3.40		2.23				2.29				
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)			69				86			48				12				
Capacity, c (veh/h)			286				198			1125				535				
v/c Ratio			0.24				0.44			0.04				0.02				
95% Queue Length, Q ₉₅ (veh)			0.9				2.0			0.1				0.1				
Control Delay (s/veh)			21.5				36.5			8.3				11.9				
Level of Service (LOS)			C				E			A				B				
Approach Delay (s/veh)		21.5				36.5					0.3				0.3			
Approach LOS		C				E												

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/20/2020							East/West Street	Fair Lane							
Analysis Year	2034							North/South Street	S Watterson Tr							
Time Analyzed	AM Peak No Build							Peak Hour Factor	0.81							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						5		65			1059	3		10	306	
Percent Heavy Vehicles (%)						0		11						10		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage					Undivided											
Critical and Follow-up Headways																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.31						4.20		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.40						2.29		
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						86								12		
Capacity, c (veh/h)						175								502		
v/c Ratio						0.49								0.02		
95% Queue Length, Q ₉₅ (veh)						2.4								0.1		
Control Delay (s/veh)						44.3								12.4		
Level of Service (LOS)						E								B		
Approach Delay (s/veh)						44.3								0.8		
Approach LOS						E										

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	S Watterson TI at Fair Ln								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	11/20/2020							East/West Street	Fair Lane								
Analysis Year	2034							North/South Street	S Watterson Tr								
Time Analyzed	AM Peak Build							Peak Hour Factor	0.81								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Star Hill																
Lanes																	
<p>Major Street: North-South</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0	
Configuration			LTR				LTR			L		TR		L		TR	
Volume (veh/h)		10	0	46		5	0	65		39	1102	3		10	342	35	
Percent Heavy Vehicles (%)		0	0	0		0	3	11		3				10			
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)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1			
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.53	6.31		4.13				4.20			
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2			
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.03	3.40		2.23				2.29			
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			69				86			48				12			
Capacity, c (veh/h)			227				167			1091				479			
v/c Ratio			0.30				0.52			0.04				0.03			
95% Queue Length, Q ₉₅ (veh)			1.2				2.6			0.1				0.1			
Control Delay (s/veh)			27.7				47.4			8.5				12.7			
Level of Service (LOS)			D				E			A				B			
Approach Delay (s/veh)		27.7				47.4				0.3				0.3			
Approach LOS		D				E											

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	2/18/2020							East/West Street	Fair Lane							
Analysis Year	2020							North/South Street	S Watterson Tr							
Time Analyzed	PM Peak							Peak Hour Factor	0.92							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						6		23			345	7		26	772	
Percent Heavy Vehicles (%)						0		4						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage					Undivided											
Critical and Follow-up Headways																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.24						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.34						2.20		
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)								32						28		
Capacity, c (veh/h)								424						1187		
v/c Ratio								0.07						0.02		
95% Queue Length, Q ₉₅ (veh)								0.2						0.1		
Control Delay (s/veh)								14.2						8.1		
Level of Service (LOS)								B						A		
Approach Delay (s/veh)						14.2						0.6				
Approach LOS						B										

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/20/2020							East/West Street	Fair Lane							
Analysis Year	2024							North/South Street	S Watterson Tr							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.92							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						6		23			359	7		26	803	
Percent Heavy Vehicles (%)						0		4						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage					Undivided											
Critical and Follow-up Headways																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.24						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.34						2.20		
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						32								28		
Capacity, c (veh/h)						405								1172		
v/c Ratio						0.08								0.02		
95% Queue Length, Q ₉₅ (veh)						0.3								0.1		
Control Delay (s/veh)						14.6								8.1		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)						14.6								0.6		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	11/20/2020							East/West Street	Fair Lane								
Analysis Year	2024							North/South Street	S Watterson Tr								
Time Analyzed	PM Peak Build							Peak Hour Factor	0.92								
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25								
Project Description	Star Hill																
Lanes																	
<p>Major Street: North-South</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0	
Configuration			LTR				LTR			L		TR			TR		
Volume (veh/h)		6	0	33		6	0	23		41	394	7		26	836	37	
Percent Heavy Vehicles (%)		4	0	0		0	0	4		3				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)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1			
Critical Headway (sec)		7.14	6.50	6.20		7.10	6.50	6.24		4.13				4.10			
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2			
Follow-Up Headway (sec)		3.54	4.00	3.30		3.50	4.00	3.34		2.23				2.20			
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)			42				32			45				28			
Capacity, c (veh/h)			297				394			720				1135			
v/c Ratio			0.14				0.08			0.06				0.02			
95% Queue Length, Q ₉₅ (veh)			0.5				0.3			0.2				0.1			
Control Delay (s/veh)			19.1				14.9			10.3				8.3			
Level of Service (LOS)			C				B			B				A			
Approach Delay (s/veh)		19.1				14.9				1.0				0.2			
Approach LOS		C				B											

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	11/20/2020							East/West Street	Fair Lane							
Analysis Year	2034							North/South Street	S Watterson Tr							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.92							
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25							
Project Description	Star Hill															
Lanes																
<p>Major Street: North-South</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						6		23			397	7		26	887	
Percent Heavy Vehicles (%)						0		4						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type Storage					Undivided											
Critical and Follow-up Headways																
Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.24						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.34						2.20		
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						32								28		
Capacity, c (veh/h)						357								1131		
v/c Ratio						0.09								0.02		
95% Queue Length, Q ₉₅ (veh)						0.3								0.1		
Control Delay (s/veh)						16.1								8.3		
Level of Service (LOS)						C								A		
Approach Delay (s/veh)						16.1								0.7		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst	DBZ							Intersection	S Watterson Tr at Fair Ln									
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction										
Date Performed	11/20/2020							East/West Street	Fair Lane									
Analysis Year	2034							North/South Street	S Watterson Tr									
Time Analyzed	PM Peak Build							Peak Hour Factor	0.92									
Intersection Orientation	North-South							Analysis Time Period (hrs)	0.25									
Project Description	Star Hill																	
Lanes																		
<p>Major Street: North-South</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6		
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0		
Configuration			LTR				LTR			L		TR		L		TR		
Volume (veh/h)		8	0	33		6	0	23		41	432	7		26	920	37		
Percent Heavy Vehicles (%)		4	0	0		0	0	4		3				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)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1				
Critical Headway (sec)		7.14	6.50	6.20		7.10	6.50	6.24		4.13				4.10				
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2				
Follow-Up Headway (sec)		3.54	4.00	3.30		3.50	4.00	3.34		2.23				2.20				
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)			45				32			45				28				
Capacity, c (veh/h)			257				354			665				1096				
v/c Ratio			0.17				0.09			0.07				0.03				
95% Queue Length, Q ₉₅ (veh)			0.6				0.3			0.2				0.1				
Control Delay (s/veh)			22.0				16.2			10.8				8.4				
Level of Service (LOS)			C				C			B				A				
Approach Delay (s/veh)		22.0				16.2				0.9				0.2				
Approach LOS		C				C												