

final report

June 22, 2021

Traffic Impact Study

Preston Highway at Interchange Drive
Louisville, KY

Prepared for

Louisville Metro Planning Commission
Kentucky Transportation Cabinet



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INTRODUCTION

The development plan for three lots on the northeast corner of Preston Highway and Interchange Drive in Louisville, KY shows a gas station with convenience store and two fast-food restaurants. **Figure 1** displays a map of the site. Access to the development will be from Interchange Drive, and a right-in/right-out on Preston Highway. 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 Preston Highway with Interchange Drive, and Cooper Chapel Road, and Mt. Washington Road.



Figure 1. Site Map

EXISTING CONDITIONS

Preston Highway (KY 61) is maintained by the Kentucky Transportation Cabinet (KYTC) with an estimated 2021 ADT of 34,600 vehicles per day south of Cooper Chapel Road, as estimated from the turning movement count using a K factor of 9.90. The road is a four-lane road with twelve-foot lanes with ten-foot paved shoulders. Northbound widens to three lanes north of Maple Springs Drive to the interchange with I 265. The southbound third lane drops 300 feet south of the intersection at Commerce Crossings Drive. The posted speed limit is 50 mph. There are no sidewalks. The intersections with Commerce Crossing Drive, Interchange Drive, and Mt. Washington Road are controlled with a traffic signal. At the intersection with Cooper Chapel Road, there are dual left turn lanes on each approach, except northbound. There is a right turn lane eastbound and southbound; and dual right turn lanes on westbound Cooper Chapel Road. At the intersection with Interchange Drive there are left turn lanes on all approaches and right turn lanes on the southbound and eastbound approaches. At the intersection with Mt. Washington Road there are left and right turn lanes on all approaches, except westbound Mt. Washington Road. Mt. Washington Road has a shared left/thru lane. Preston Highway is served by TARC.

Preston Highway at Interchange Drive
Traffic Impact Study

Peak hour traffic counts for the intersections were obtained on Tuesday, April 13, 2021 (see Appendix A). The a.m. peak hour occurred between 7:15 and 8:15 and the p.m. peak hour varied between the intersections. **Figure 2** illustrates the existing a.m. and p.m. peak hour traffic volumes.

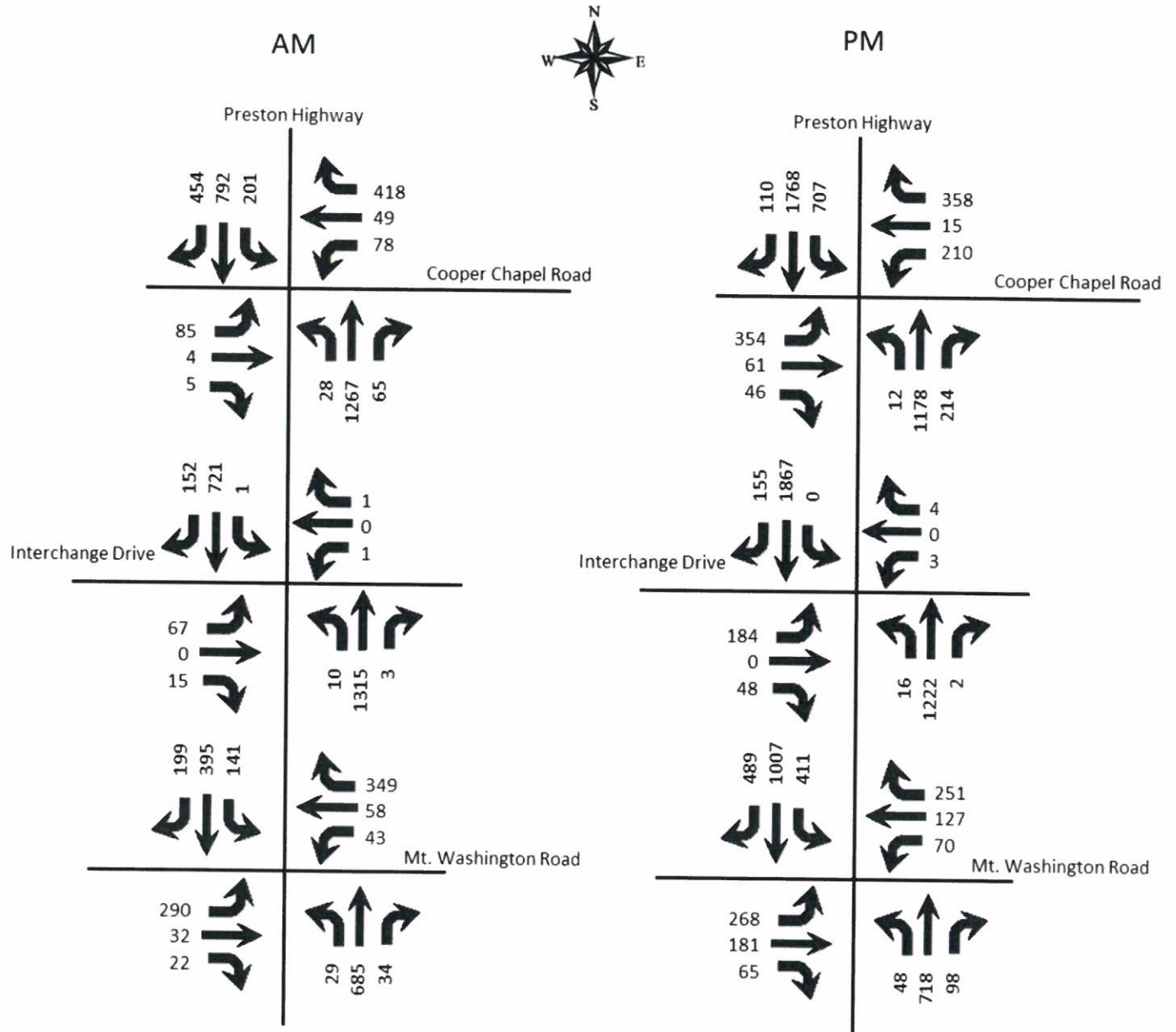


Figure 2. Existing Peak Hour Volumes

FUTURE CONDITIONS

The requested analysis year for this project is 2022. To predict traffic volumes in 2022, one half percent annual growth in traffic was added to the 2021 volumes. This growth rate is the same as was used in the Menards Traffic Impact Study dated April 9, 2019. **Figure 3** displays the 2022 No Build volumes.

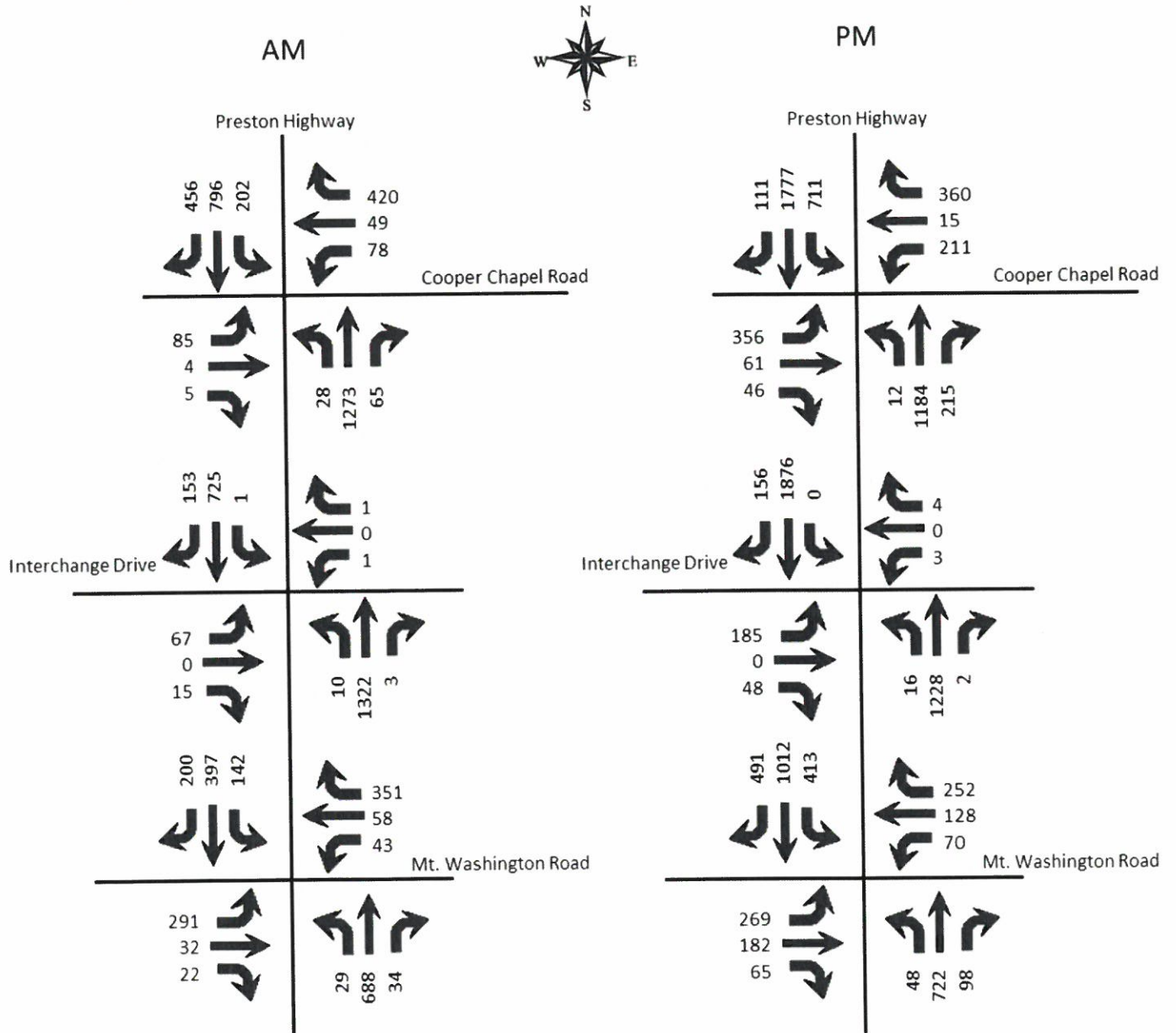


Figure 3. 2022 No Build Peak Hour Volumes

TRIP GENERATION

The Institute of Transportation Engineers Trip Generation Manual, 10th Edition contains trip generation rates for a wide range of developments. The land uses were reviewed and determined to be the best match. The trip generation

results are listed in **Table 1**. The primary trips were assigned to the highway network with the percentages shown in **Figure 4**. The pass-by trips are assigned using the existing traffic passing the site. These trips are shown in parenthesis. **Figure 5** shows the trips generated by this development and distributed throughout the road network for the year 2022 during the peak hours. **Figure 6** displays the individual turning movements for the year 2022 for the peak hours when the development is completed.

Table 1. Peak Hour Trips Generated by Site

Land Use	A.M. Peak Hour				P.M. Peak Hour			
	Trips	In	Out	Pass-by	Trips	In	Out	Pass-by
Convenience Market with Gas (16 fueling spots)	449	225	224	278	367	184	183	205
Fast-Food with Drive-Through (6,740 sq ft)	271	138	133	133	220	114	106	110
Total	720	363	357	411	587	298	289	315

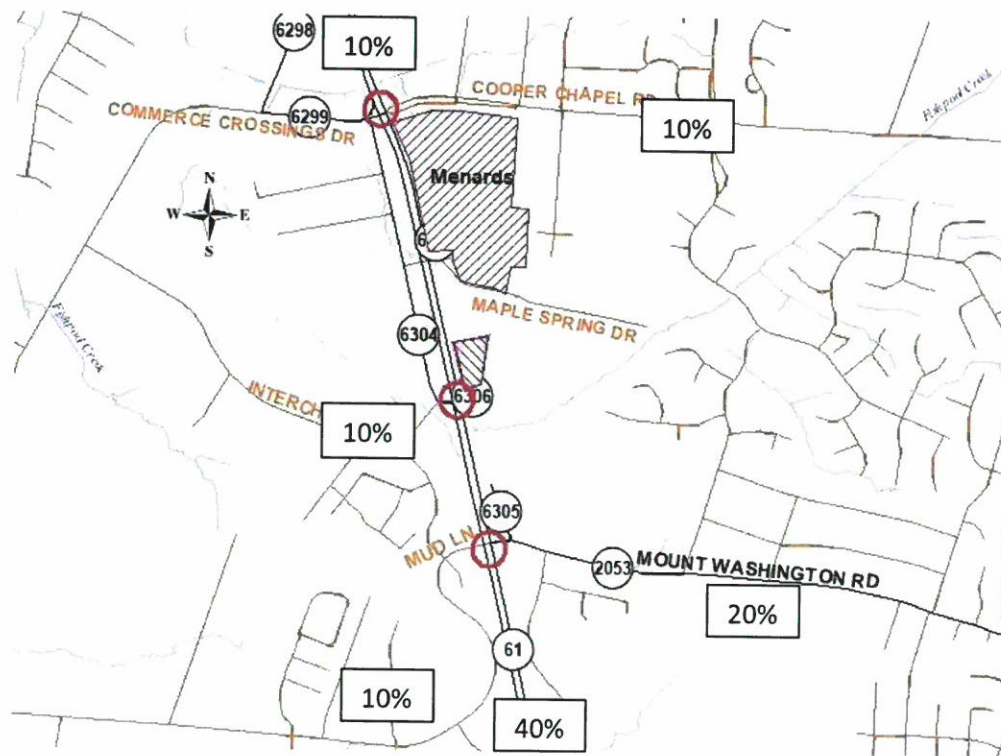


Figure 4. Trip Distribution Percentages

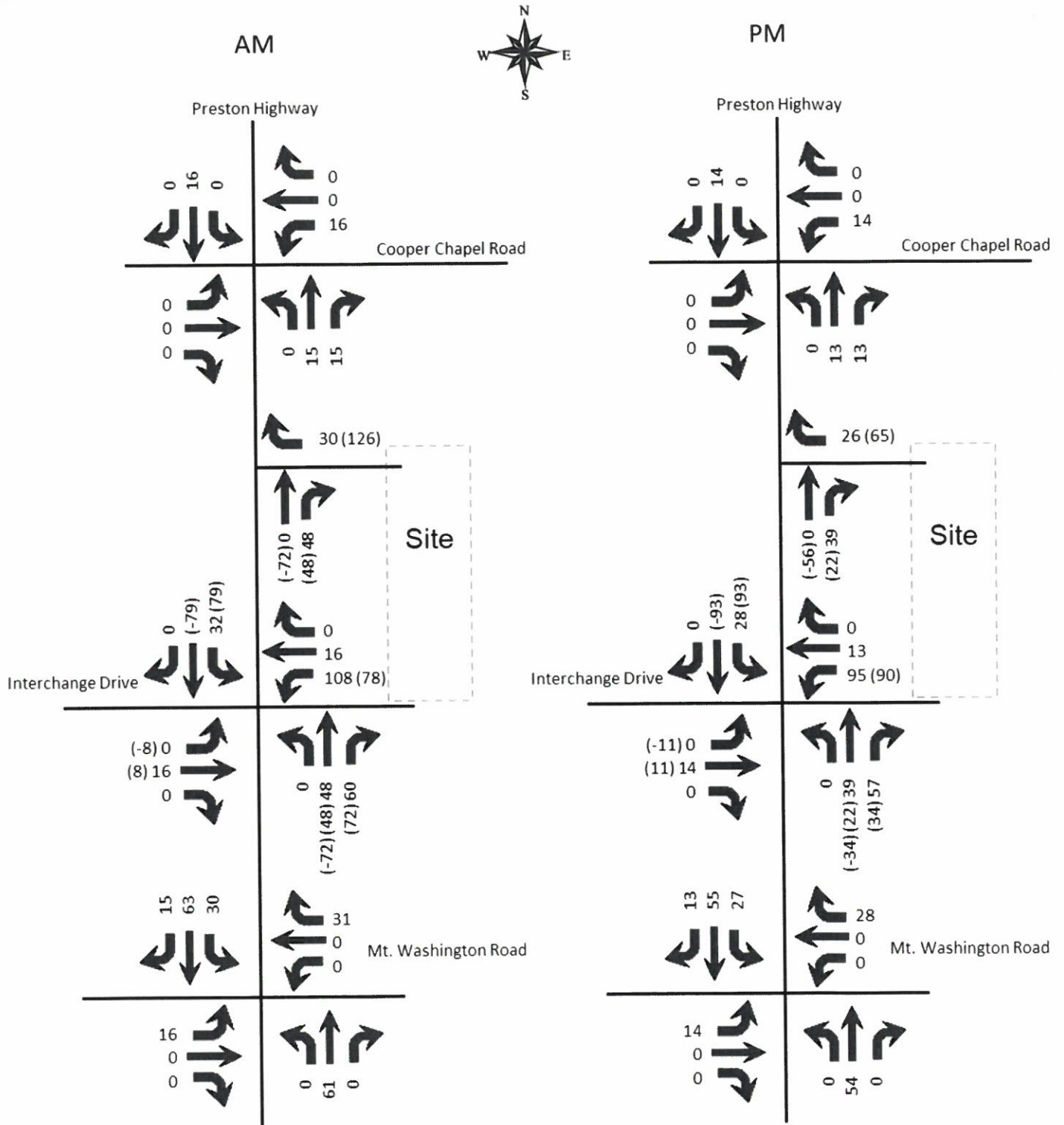


Figure 5. Peak Hour Trips Generated by Site

Preston Highway at Interchange Drive
Traffic Impact Study

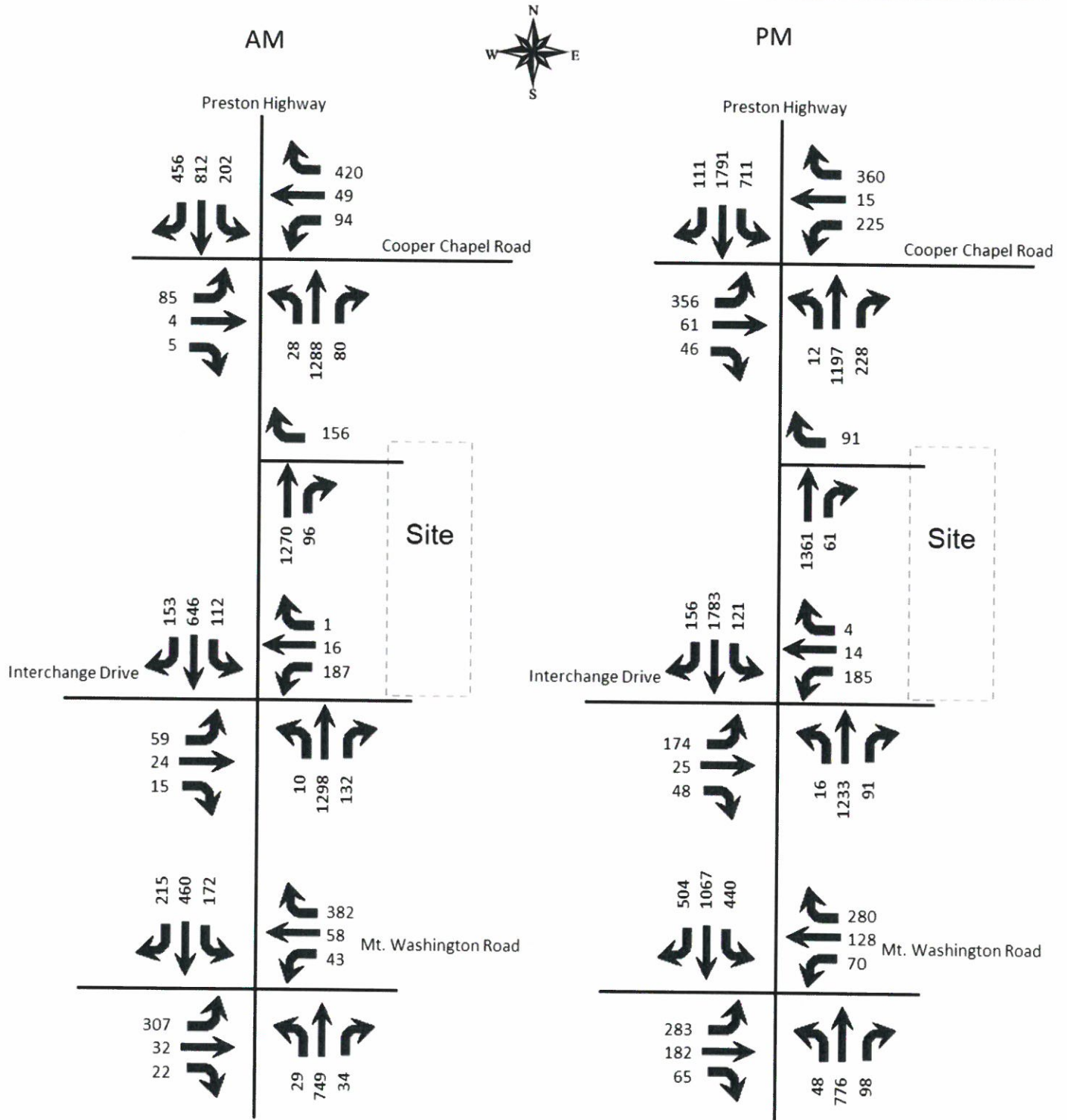


Figure 6. 2022 Peak Hour Build

ANALYSIS

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

To evaluate the impact of the proposed development, the vehicle delays at the intersections were determined using procedures detailed in the Highway Capacity Manual, 6th edition. Future delays and Level of Service were determined for the intersections using the HCS Streets (version 7.9.5) software. The delays and Level of Service are summarized in **Table 2**.

Table 2. Peak Hour Level of Service

Approach	A.M.			P.M.		
	2021 Existing	2022 No Build	2022 Build	2021 Existing	2022 No Build	2022 Build
Preston Highway at Cooper Chapel Road	C 29.6	C 29.1	C 29.1	D 44.5	D 44.7	D 37.8
Commerce Crossings Eastbound	E 59.2	E 59.8	E 58.9	E 77.6	E 77.5	E 77.7
Cooper Chapel Road Westbound	D 43.1	D 42.1	D 42.1	E 60.3	E 60.2	E 60.6
Preston Highway Northbound	C 25.6	C 25.2	C 25.0	D 52.7	D 53.4	C 27.7
Preston Highway Southbound	C 25.5	C 25.1	C 25.0	C 30.7	C 30.8	C 30.8
Preston Highway at Interchange Drive	A 7.4	A 7.4	C 26.4	B 19.4	B 19.3	D 37.0
Interchange Drive Eastbound	E 72.6	E 72.6	E 69.4	E 75.0	E 75.0	E 78.1
Entrance Westbound	F 87.9	F 87.9	E 72.8	F 84.8	F 84.8	F 87.3
Preston Highway Northbound	A 4.1	A 4.1	B 19.2	A 8.8	A 8.7	C 28.6
Preston Highway Southbound	A 5.9	A 5.9	C 22.2	B 19.2	B 19.3	C 32.4
Preston Highway at Mt. Washington Road	D 43.9	D 44.8	D 44.8	D 45.3	D 45.4	D 49.7
Mud Lane Eastbound	E 59.3	E 59.4	E 60.3	E 79.7	E 79.9	F 81.9
Mt. Washington Road Westbound	D 49.4	D 49.9	D 50.0	E 61.8	E 61.8	E 58.5
Preston Highway Northbound	D 42.8	D 43.4	D 47.3	D 51.6	D 51.9	D 53.8
Preston Highway Southbound	C 34.7	C 36.3	C 33.0	C 28.7	C 28.7	C 36.9

Key: Level of Service, Delay in seconds per vehicle

Preston Highway at Interchange Drive
Traffic Impact Study

The entrance that aligns with Interchange Drive was analyzed as a split phase signal, to allow the continued operation of the dual left turn lanes on Interchange Drive. The exit should have a dedicated left turn lane and a shared thru and right turn lane. The entrances were evaluated for turn lanes using the Kentucky Transportation Cabinet Highway Design Guidance Manual dated July, 2020. The traffic impact policy requires using volumes for ten years beyond build-out, or 2032. The 2032 volumes were determined applying a one-half percent annual growth rate from 2021. Figure 7 illustrates the 2032 No Build volumes. Figure 8 illustrates the 2032 Build Volumes. Using the volumes in Figure 8, a right turn lane will be required at the right-in/right-out entrance on Preston Highway. The right turn lane will be designed to KYTC standards. Table 3 summarizes the delay and Level of Service for 2032.

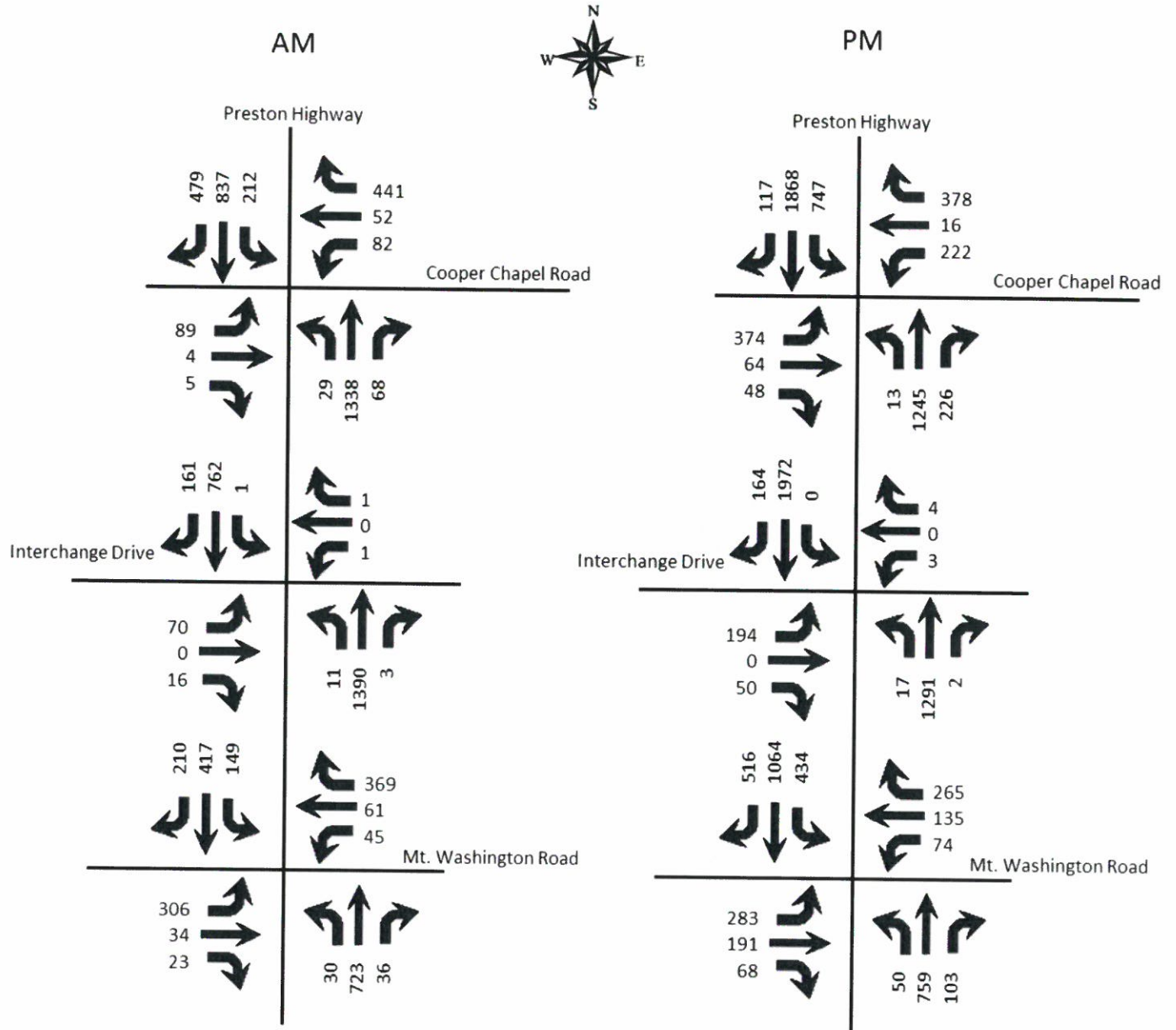


Figure 7. 2032 Peak Hour No Build

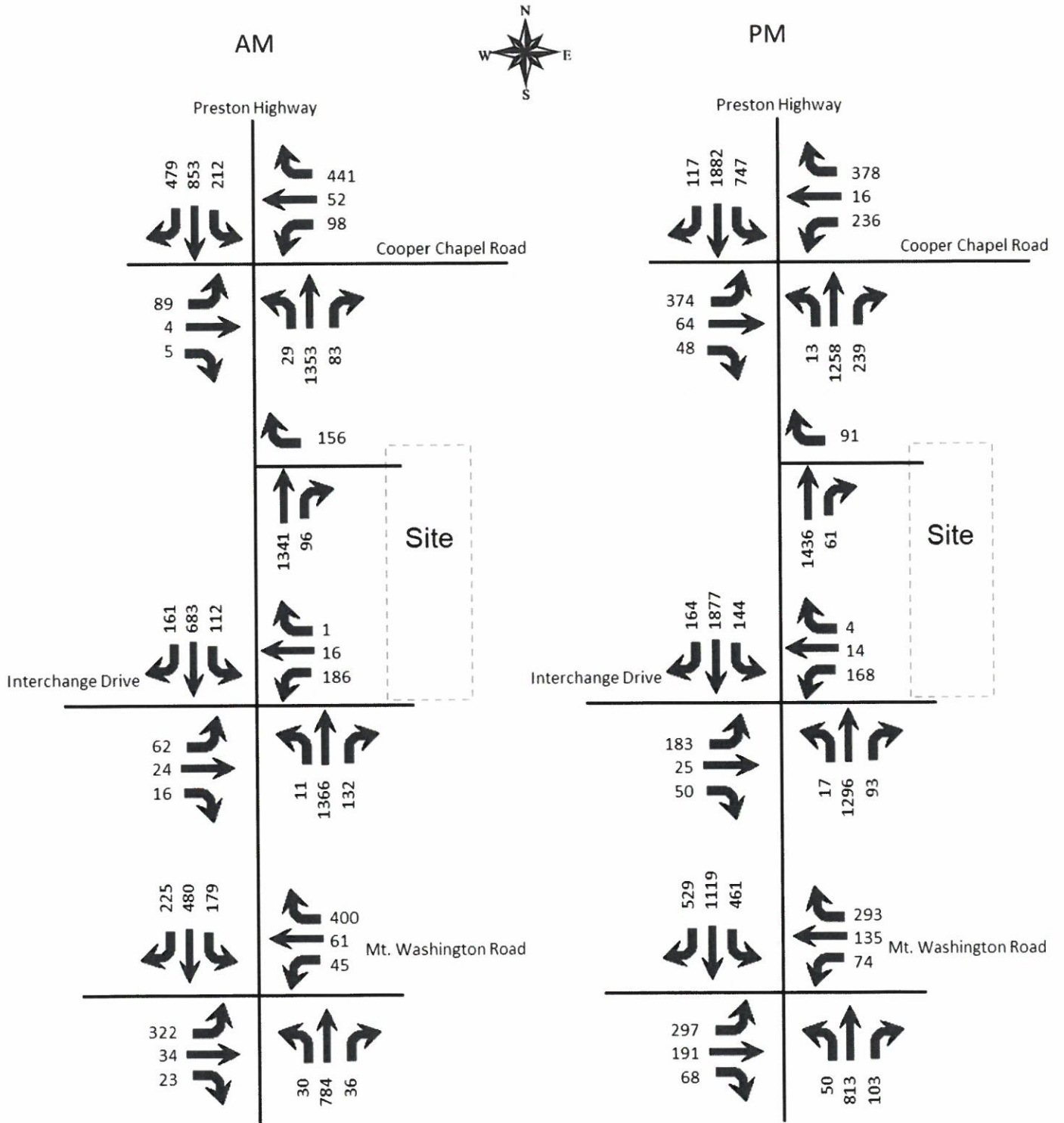


Figure 8. 2032 Peak Hour Build

Table 3. Peak Hour Level of Service

Approach	A.M.			P.M.		
	2021 Existing	2032 No Build	2032 Build	2021 Existing	2032 No Build	2032 Build
Preston Highway at Cooper Chapel Road	C 29.6	C 30.7	C 30.7	D 44.5	D 46.6	D 39.3
Commerce Crossings Eastbound	E 59.2	E 64.1	E 63.3	E 77.6	E 76.8	E 77.0
Cooper Chapel Road Westbound	D 43.1	D 44.8	D 44.8	E 60.3	E 59.2	E 59.6
Preston Highway Northbound	C 25.6	C 26.7	C 26.4	D 52.7	D 57.9	C 30.6
Preston Highway Southbound	C 25.5	C 26.1	C 26.0	C 30.7	C 32.5	C 32.4
Preston Highway at Interchange Drive	A 7.4	A 7.5	C 27.4	B 19.3	B 18.9	D 39.6
Interchange Drive Eastbound	E 72.6	E 73.0	E 69.8	E 75.0	E 75.2	E 78.2
Entrance Westbound	F 87.9	F 87.9	E 72.9	F 84.8	F 84.8	E 78.7
Preston Highway Northbound	A 4.1	A 4.2	C 21.5	A 8.8	A 7.9	C 32.8
Preston Highway Southbound	A 5.9	A 5.9	C 22.0	B 19.2	B 19.1	D 35.8
Preston Highway at Mt. Washington Road	D 43.9	D 44.9	D 45.6	D 45.3	D 48.8	D 52.9
Mud Lane Eastbound	E 59.3	E 60.3	E 61.3	E 79.7	F 83.5	F 85.9
Mt. Washington Road Westbound	D 49.4	D 50.5	D 51.0	E 61.8	E 62.1	E 59.0
Preston Highway Northbound	D 42.8	D 44.4	D 49.2	D 51.6	D 53.3	D 54.7
Preston Highway Southbound	C 34.7	C 34.9	C 32.4	C 28.7	C 33.7	D 41.4

Key: Level of Service, Delay in seconds per vehicle

An additional comparison was made for the Interchange Drive intersection without the right-in right-out. The absence of the second entrance requires all the site traffic to use the signal at Interchange Drive. The results are shown in **Table 4**. In both a.m. and p.m. peaks the intersection functions better with the proposed right-in/ right-out.

Table 4. 2032 Comparison with and without Right-in/Right-out

Approach	A.M.		P.M.	
	2032 Build	2032 Build No Right-in/Right-out	2032 Build	2032 Build No Right-in/Right-out
Preston Highway at Interchange Drive	C 27.4	C 30.6	D 39.6	D 40.5
Interchange Drive Eastbound	E 69.8	E 69.8	E 78.2	E 78.2
Entrance Westbound	E 72.9	E 71.3	E 78.7	E 77.9
Preston Highway Northbound	C 21.5	C 22.8	C 32.8	C 33.1
Preston Highway Southbound	C 22.0	C 22.5	D 35.8	D 35.8

Key: Level of Service, Delay in seconds per vehicle

CONCLUSIONS

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2022 and 2032, there will be an impact to the existing highway network. The proposed right-in/right-out provides improved operating conditions when compared to without the additional access. A right turn lane will be required at the right-in/right-out entrance on Preston Highway. The exit opposite Interchange Drive should have two lanes with a dedicated left and a shared thru/right. The southbound left turn lane will need additional storage.

APPENDIX

Traffic Counts



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Classified Turn Movement Count | All vehicles

Preston Highway, KY

Site 1 of 3
KY-61 Preston Hwy (South)
KY-61 Preston Hwy (North)
Commerce Crossings Dr
Cooper Chapel Rd

Date
Tuesday, April 13, 2021

Weather
Cloudy
61°F

Lat/Long
38.103518°, -85.672625°

0700 - 0900 (Weekday 2h Session) (13-04-2021)

All vehicles

TIME	Northbound KY-61 Preston Hwy (South)					Southbound KY-61 Preston Hwy (North)					Eastbound Commerce Crossings Dr					Westbound Cooper Chapel Rd					Int Total
	Left 1.1	Thru 1.2	Right 1.3	U-Turn 1.4	App Total	Left 1.5	Thru 1.6	Right 1.7	U-Turn 1.8	App Total	Left 1.9	Thru 1.10	Right 1.11	U-Turn 1.12	App Total	Left 1.13	Thru 1.14	Right 1.15	U-Turn 1.16	App Total	
	0700 - 0715	2	306	13	0	321	25	144	88	1	258	20	0	2	0	22	15	9	130	0	
0715 - 0730	8	327	16	0	351	34	189	86	1	310	23	1	2	0	26	16	8	109	0	133	820
0730 - 0745	5	365	19	0	389	56	191	93	0	340	24	1	1	0	26	9	14	117	0	140	895
0745 - 0800	10	298	15	0	323	59	221	173	0	453	13	1	1	0	15	24	16	97	0	137	928
Hourly Total	25	1296	63	0	1384	174	745	440	2	1361	80	3	6	0	89	64	47	453	0	564	3398
0800 - 0815	5	277	15	0	297	52	191	102	0	345	25	1	1	0	27	29	11	95	0	135	804
0815 - 0830	6	259	18	0	283	54	155	67	0	276	15	1	3	0	19	21	3	82	0	106	684
0830 - 0845	4	297	26	0	297	39	187	59	0	285	15	5	2	0	22	28	3	106	0	137	741
0845 - 0900	6	253	25	0	284	44	199	51	0	294	28	3	3	0	34	38	7	84	0	129	741
Hourly Total	21	1056	84	0	1161	189	732	279	0	1200	83	10	9	0	102	116	24	367	0	507	2970
Grand Total	46	2352	147	0	2545	363	1477	719	2	2561	163	13	15	0	191	180	71	820	0	1071	6368
Approach %	1.81	92.42	5.78	0.00	-	14.17	57.67	28.07	0.08	-	85.34	6.81	7.85	0.00	-	16.81	6.63	76.56	0.00	-	
Intersection %	0.72	36.93	2.31	0.00	39.97	5.70	23.19	11.29	0.03	40.22	2.56	0.20	0.24	0.00	3.00	2.83	1.11	12.88	0.00	16.82	
PHF	0.70	0.87	0.86	0.00	0.87	0.85	0.90	0.66	0.25	0.80	0.85	1.00	0.63	0.00	0.87	0.67	0.77	0.89	0.00	0.97	0.93

1600 - 1800 (Weekday 2h Session) (13-04-2021)

All vehicles

TIME	Northbound KY-61 Preston Hwy (South)					Southbound KY-61 Preston Hwy (North)					Eastbound Commerce Crossings Dr					Westbound Cooper Chapel Rd					Int Total
	Left 1.1	Thru 1.2	Right 1.3	U-Turn 1.4	App Total	Left 1.5	Thru 1.6	Right 1.7	U-Turn 1.8	App Total	Left 1.9	Thru 1.10	Right 1.11	U-Turn 1.12	App Total	Left 1.13	Thru 1.14	Right 1.15	U-Turn 1.16	App Total	
	1600 - 1615	1	297	49	0	347	173	436	46	2	657	97	12	8	0	117	45	5	116	0	
1615 - 1630	3	261	55	0	319	173	411	48	1	633	60	18	10	0	88	60	4	113	0	177	1217
1630 - 1645	4	313	57	0	374	159	380	35	2	576	120	22	17	0	159	45	4	93	1	143	1252
1645 - 1700	1	297	50	1	349	186	445	26	0	657	61	11	9	0	81	54	4	78	0	136	1223
Hourly Total	9	1168	211	1	1389	691	1672	155	5	2523	338	63	44	0	445	204	17	400	1	622	4979
1700 - 1715	2	272	51	0	325	156	454	39	0	649	122	15	14	0	151	56	6	87	0	149	1274
1715 - 1730	4	296	56	0	356	206	489	10	1	706	51	13	6	0	70	54	1	100	0	155	1287
1730 - 1745	5	300	47	0	352	158	435	28	1	622	60	8	7	0	75	62	1	109	0	172	1221
1745 - 1800	2	280	58	0	340	119	401	23	0	543	36	6	4	0	46	52	3	96	0	151	1080
Hourly Total	13	1148	212	0	1373	639	1779	100	2	2520	269	42	31	0	342	224	11	392	0	627	4862
Grand Total	22	2316	423	1	2762	1330	3451	255	7	5043	607	105	75	0	787	428	28	792	1	1249	9841
Approach %	0.80	83.85	15.31	0.04	-	26.37	68.43	5.06	0.14	-	77.13	13.34	9.53	0.00	-	34.27	2.24	63.41	0.08	-	
Intersection %	0.22	23.53	4.30	0.01	28.07	13.51	35.07	2.59	0.07	51.24	6.17	1.07	0.76	0.00	8.00	4.35	0.28	8.05	0.01	12.69	
PHF	0.69	0.94	0.94	0.25	0.94	0.86	0.90	0.71	0.38	0.92	0.73	0.69	0.68	0.00	0.72	0.93	0.63	0.90	0.25	0.94	0.98

Preston Highway at Interchange Drive
Traffic Impact Study

Classified Turn Movement Count || All vehicles



Preston Highway, KY

Site 2 of 3

KY-61 Preston Hwy (South)
KY-61 Preston Hwy (North)
Old Preston Hwy
Local Rd

Date
Tuesday, April 13, 2021

Weather
Cloudy
61°F

Lat/Long
38.096348°, -85.670213°

0700 - 0900 (Weekday 2h Session) (13-04-2021)

All vehicles

TIME	Northbound					Southbound					Eastbound					Westbound					Int Total
	KY-61 Preston Hwy (South)					KY-61 Preston Hwy (North)					Old Preston Hwy					Local Rd					
	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	
0700 - 0715	5	314	0	0	319	0	100	52	0	152	23	0	2	0	25	0	0	0	0	0	496
0715 - 0730	0	331	0	0	331	0	147	65	0	212	22	0	2	0	24	0	0	0	0	0	567
0730 - 0745	4	398	1	0	403	0	175	33	0	208	19	0	3	0	22	1	0	0	0	1	634
0745 - 0800	4	299	1	1	305	0	199	32	0	231	14	0	7	0	21	0	0	1	0	1	558
Hourly Total	13	1342	2	1	1358	0	621	182	0	803	78	0	14	0	92	1	0	1	0	2	2255
0800 - 0815	0	287	1	1	289	0	200	22	1	223	12	0	3	0	15	0	0	0	0	0	527
0815 - 0830	2	257	0	0	259	1	167	14	0	182	9	0	0	0	9	0	0	0	0	0	450
0830 - 0845	0	283	0	0	283	1	198	13	0	212	20	0	3	0	23	0	0	0	0	0	518
0845 - 0900	2	279	1	0	282	0	234	16	0	250	11	0	1	1	13	0	0	0	0	0	545
Hourly Total	4	1106	2	1	1113	2	799	65	1	867	52	0	7	1	60	0	0	0	0	0	2040
Grand Total	17	2448	4	2	2471	2	1420	247	1	1670	130	0	21	1	152	1	0	1	0	2	4295
Approach %	0.69	99.07	0.16	0.08	-	0.12	85.03	14.79	0.06	-	85.53	0.00	13.82	0.66	-	50.00	0.00	50.00	0.00	-	
Intersection %	0.40	57.00	0.09	0.05	57.53	0.05	33.06	5.75	0.02	38.88	3.03	0.00	0.49	0.02	3.54	0.02	0.00	0.02	0.00	0.05	
PHF	0.50	0.83	0.75	0.50	0.82	0.00	0.90	0.58	0.25	0.95	0.76	0.00	0.54	0.00	0.85	0.25	0.00	0.25	0.00	0.50	0.90

1600 - 1800 (Weekday 2h Session) (13-04-2021)

All vehicles

TIME	Northbound					Southbound					Eastbound					Westbound					Int Total
	KY-61 Preston Hwy (South)					KY-61 Preston Hwy (North)					Old Preston Hwy					Local Rd					
	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	
1600 - 1615	0	295	2	0	297	0	391	32	0	423	67	0	15	0	82	1	1	1	0	3	805
1615 - 1630	6	289	2	0	297	1	467	29	0	497	36	0	16	0	52	0	0	3	0	3	849
1630 - 1645	1	310	0	0	311	0	424	33	2	459	62	0	17	0	79	0	0	1	0	1	850
1645 - 1700	1	325	1	0	327	0	445	45	0	490	44	0	13	0	57	1	0	1	0	2	876
Hourly Total	8	1219	5	0	1232	1	1727	139	2	1869	209	0	61	0	270	2	1	6	0	9	3380
1700 - 1715	3	286	0	0	289	0	464	35	0	499	43	0	12	0	55	1	0	2	0	3	846
1715 - 1730	3	296	1	2	302	0	481	39	0	520	45	0	13	0	58	1	0	1	0	2	882
1730 - 1745	7	315	0	0	322	0	477	36	0	513	52	0	10	0	62	0	0	0	0	0	897
1745 - 1800	7	297	0	1	305	0	397	41	0	438	35	0	3	0	38	0	0	0	0	0	781
Hourly Total	20	1194	1	3	1218	0	1819	151	0	1970	175	0	38	0	213	2	0	3	0	5	3406
Grand Total	28	2413	6	3	2450	1	3546	290	2	3839	384	0	99	0	483	4	1	9	0	14	6786
Approach %	1.14	98.49	0.24	0.12	-	0.03	92.37	7.55	0.05	-	79.50	0.00	20.50	0.00	-	28.57	7.14	64.29	0.00	-	
Intersection %	0.41	35.56	0.09	0.04	36.10	0.01	52.25	4.27	0.03	56.57	5.66	0.00	1.46	0.00	7.12	0.06	0.01	0.13	0.00	0.21	
PHF	0.50	0.94	0.50	0.25	0.95	0.00	0.97	0.86	0.00	0.97	0.88	0.00	0.92	0.00	0.94	0.75	0.00	0.50	0.00	0.58	0.98

Preston Highway at Interchange Drive
Traffic Impact Study



www.marrtraffic.com

Classified Turn Movement Count || All vehicles

Preston Highway, KY

Site 3 of 3

KY-61 N Preston Hwy
KY-61 Preston Hwy
Mud Ln
Mt. Washington Rd

Date

Tuesday, April 13, 2021

Weather

Cloudy
61°F

Lat/Long

38.092809°, -85.669177°

0700 - 0900 (Weekday 2h Session) (13-04-2021)

All vehicles

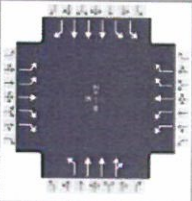
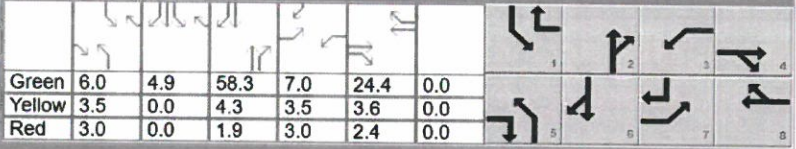
TIME	Northbound					Southbound					Eastbound					Westbound					Int Total
	KY-61 N Preston Hwy					KY-61 Preston Hwy					Mud Ln					Mt. Washington Rd					
	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	
	3.1	3.2	3.3	3.4		3.5	3.6	3.7	3.8		3.9	3.10	3.11	3.12		3.13	3.14	3.15	3.16		
0700 - 0715	11	148	5	0	164	18	53	29	0	100	68	9	0	0	77	7	18	100	0	125	466
0715 - 0730	13	165	8	0	186	34	73	46	0	153	79	7	7	0	93	9	14	93	0	116	548
0730 - 0745	4	203	6	0	213	30	96	40	0	166	95	9	7	0	111	8	17	96	0	121	611
0745 - 0800	6	176	13	0	195	40	113	60	0	213	56	8	2	0	66	7	8	73	0	88	562
Hourly Total	34	692	32	0	758	122	335	175	0	632	298	33	16	0	347	31	57	362	0	450	2187
0800 - 0815	6	141	7	0	154	37	113	53	0	203	60	8	6	0	74	19	19	87	0	125	556
0815 - 0830	6	133	12	0	151	31	95	41	0	167	46	16	3	0	65	6	17	82	0	105	488
0830 - 0845	7	147	17	0	171	19	113	52	0	184	69	6	8	0	83	12	20	73	0	105	543
0845 - 0900	3	147	8	0	158	39	138	53	0	230	61	10	3	0	74	15	20	63	0	98	560
Hourly Total	22	568	44	0	634	126	459	199	0	784	236	40	20	0	296	52	76	305	0	433	2147
Grand Total	56	1260	76	0	1392	248	794	374	0	1416	534	73	36	0	643	83	133	667	0	883	4334
Approach %	4.02	90.52	5.46	0.00	-	17.51	56.07	26.41	0.00	-	83.05	11.35	5.60	0.00	-	9.40	15.06	75.54	0.00	-	
Intersection %	1.29	29.07	1.75	0.00	32.12	5.72	18.32	8.63	0.00	32.67	12.32	1.68	0.83	0.00	14.84	1.92	3.07	15.39	0.00	20.37	
PHF	0.56	0.84	0.65	0.00	0.88	0.88	0.87	0.83	0.00	0.86	0.76	0.89	0.79	0.00	0.77	0.57	0.76	0.91	0.00	0.90	0.93

1600 - 1800 (Weekday 2h Session) (13-04-2021)

All vehicles

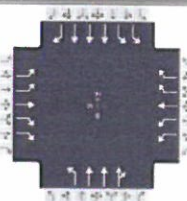
TIME	Northbound					Southbound					Eastbound					Westbound					Int Total
	KY-61 N Preston Hwy					KY-61 Preston Hwy					Mud Ln					Mt. Washington Rd					
	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	Left	Thru	Right	U-Turn	App Total	
	3.1	3.2	3.3	3.4		3.5	3.6	3.7	3.8		3.9	3.10	3.11	3.12		3.13	3.14	3.15	3.16		
1600 - 1615	5	153	23	0	181	101	197	87	0	385	65	46	13	0	124	24	30	72	0	126	816
1615 - 1630	12	161	27	0	200	119	269	123	0	511	71	40	19	0	130	14	28	62	0	104	945
1630 - 1645	18	196	34	0	248	95	232	123	0	450	74	32	10	0	116	21	32	62	1	116	930
1645 - 1700	9	205	31	0	245	100	242	116	0	458	50	46	19	0	115	17	33	59	0	109	927
Hourly Total	44	715	115	0	874	415	940	449	0	1804	260	164	61	0	485	76	123	255	1	455	3618
1700 - 1715	11	163	22	0	196	97	244	120	0	461	73	47	15	0	135	18	32	63	0	113	905
1715 - 1730	13	177	25	0	215	108	261	126	0	495	63	51	15	0	129	15	27	61	0	103	942
1730 - 1745	15	173	20	0	208	106	260	127	0	493	82	37	16	0	135	20	35	68	0	123	959
1745 - 1800	12	159	28	0	199	100	193	121	0	414	71	51	12	0	134	14	46	69	0	129	876
Hourly Total	51	672	95	0	818	411	958	494	0	1863	289	186	58	0	533	67	140	261	0	468	3682
Grand Total	95	1387	210	0	1692	826	1898	943	0	3667	549	350	119	0	1018	143	263	516	1	923	7300
Approach %	5.61	81.97	12.41	0.00	-	22.53	51.76	25.72	0.00	-	53.93	34.38	11.69	0.00	-	15.49	28.49	55.90	0.11	-	
Intersection %	1.30	19.00	2.88	0.00	23.18	11.32	26.00	12.92	0.00	50.23	7.52	4.79	1.63	0.00	13.95	1.96	3.60	7.07	0.01	12.64	
PHF	0.80	0.88	0.79	0.00	0.88	0.95	0.96	0.96	0.00	0.96	0.82	0.89	0.86	0.00	0.95	0.88	0.91	0.92	0.00	0.91	0.97

HCS Reports

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other								
Jurisdiction		Time Period	AM Peak			PHF	0.91								
Urban Street	Preston Highway		Analysis Year	2021		Analysis Period	1> 7:15								
Intersection	Cooper Chapel Road		File Name	AM 21 Preston.xus											
Project Description	Stern														
Demand Information				EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h	85	4	5	78	49	418	28	1267	65	201	792	454			
Signal Information															
Cycle, s	125.7	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	4.9	58.3	7.0	24.4	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.3	3.5	3.6	0.0					
				Red	3.0	0.0	1.9	3.0	2.4	0.0					
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	2.0	3.0	2.0	4.0	2.0	3.0				
Phase Duration, s				13.5	30.4	13.5	30.4	12.5	64.5	17.4	69.3				
Change Period, (Y+R _c), s				6.5	6.0	6.5	6.0	6.5	6.2	6.5	6.2				
Max Allow Headway (MAH), s				5.6	5.8	5.1	5.8	3.0	4.9	4.0	4.9				
Queue Clearance Time (g _s), s				5.5	2.2	5.1	19.7	4.1	25.7	10.0	15.3				
Green Extension Time (g _e), s				0.7	4.2	0.4	4.6	0.0	32.6	0.8	34.0				
Phase Call Probability				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Max Out Probability				0.00	0.03	0.00	0.01	0.00	0.21	0.00	0.17				
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	93	4	5	86	54	459	30	964	469	221	870	169			
Adjusted Saturation Flow Rate (s), veh/h/ln	1647	1900	1425	1675	1900	1403	1753	1856	1807	1689	1658	1585			
Queue Service Time (g _s), s	3.5	0.2	0.2	3.1	3.0	17.7	2.1	23.7	23.7	8.0	13.3	6.6			
Cycle Queue Clearance Time (g _c), s	3.5	0.2	0.2	3.1	3.0	17.7	2.1	23.7	23.7	8.0	13.3	6.6			
Green Ratio (g/C)	0.06	0.19	0.24	0.06	0.19	0.28	0.05	0.46	0.46	0.09	0.50	0.56			
Capacity (c), veh/h	183	368	688	186	368	786	84	1721	838	292	2499	885			
Volume-to-Capacity Ratio (X)	0.509	0.012	0.008	0.460	0.146	0.584	0.360	0.560	0.560	0.756	0.348	0.191			
Back of Queue (Q), ft/ln (95 th percentile)	73.4	5.1	2.9	65	63.9	258.3	42.8	371	356.9	163.1	218.2	102.5			
Back of Queue (Q), veh/ln (95 th percentile)	2.8	0.2	0.1	2.5	2.6	10.2	1.7	14.5	14.3	6.3	8.4	4.0			
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.22	0.51			
Uniform Delay (d ₁), s/veh	57.7	41.0	36.3	57.6	42.1	39.0	58.0	24.4	24.4	56.2	18.9	13.7			
Incremental Delay (d ₂), s/veh	3.7	0.0	0.0	2.4	0.3	1.1	0.8	0.3	0.7	4.0	0.1	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	61.4	41.0	36.3	60.0	42.4	40.1	58.8	24.8	25.1	60.1	19.0	13.9			
Level of Service (LOS)	E	D	D	E	D	D	E	C	C	E	B	B			
Approach Delay, s/veh / LOS	59.2	E		43.1	D		25.6	C		25.5	C				
Intersection Delay, s/veh / LOS	29.6						C								
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.60	C		3.28	C		2.57	C		2.42	B				
Bicycle LOS Score / LOS	0.66	A		1.48	A		1.31	A		1.18	A				

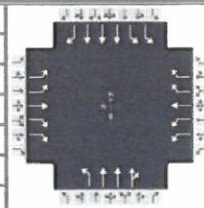
HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other												
Jurisdiction		Time Period	AM Peak			PHF	0.91												
Urban Street	Preston Highway		Analysis Year	2022 No Build		Analysis Period	1 > 7:15												
Intersection	Cooper Chapel Road		File Name	AM 22 NB Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				85	4	5	78	49	420	28	1273	65	202	796	456				
Signal Information																			
Cycle, s	122.4	Reference Phase	2																
Offset, s	0	Reference Point	End		Green	6.0	4.7	56.5	6.0	24.1	0.0								
Uncoordinated	Yes	Simult. Gap E/W	On		Yellow	3.5	0.0	4.3	3.5	3.6	0.0								
Force Mode	Fixed	Simult. Gap N/S	On		Red	3.0	0.0	1.9	3.0	2.4	0.0								
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		2.0		3.0		2.0		4.0		2.0		3.0	
Phase Duration, s				12.6		30.1		12.5		30.0		12.5		62.7		17.2		67.4	
Change Period, (Y+Rc), s				6.5		6.0		6.5		6.0		6.5		6.2		6.5		6.2	
Max Allow Headway (MAH), s				5.6		5.8		5.1		5.8		3.0		4.9		4.0		4.9	
Queue Clearance Time (gs), s				5.4		2.2		5.1		19.3		4.0		25.3		9.9		15.1	
Green Extension Time (ge), s				0.7		4.3		0.4		4.6		0.0		31.1		0.8		32.9	
Phase Call Probability				1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Max Out Probability				0.00		0.03		0.00		0.01		0.00		0.27		0.00		0.21	
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				93	4	5	86	54	462	30	967	471	222	875	171				
Adjusted Saturation Flow Rate (s), veh/h/ln				1647	1900	1425	1675	1900	1403	1753	1856	1807	1689	1658	1585				
Queue Service Time (gs), s				3.4	0.2	0.2	3.1	2.9	17.3	2.0	23.3	23.3	7.9	13.1	6.7				
Cycle Queue Clearance Time (gc), s				3.4	0.2	0.2	3.1	2.9	17.3	2.0	23.3	23.3	7.9	13.1	6.7				
Green Ratio (g/C)				0.05	0.20	0.25	0.05	0.20	0.28	0.05	0.46	0.46	0.09	0.50	0.55				
Capacity (c), veh/h				164	374	700	164	372	795	86	1712	834	295	2486	871				
Volume-to-Capacity Ratio (X)				0.569	0.012	0.008	0.523	0.145	0.581	0.351	0.565	0.565	0.752	0.352	0.197				
Back of Queue (Q), ft/ln (95 th percentile)				73	4.9	2.8	64.4	61.9	252.2	41.4	364.5	350.8	159	215.3	103				
Back of Queue (Q), veh/ln (95 th percentile)				2.7	0.2	0.1	2.5	2.5	9.9	1.6	14.2	14.0	6.1	8.3	4.1				
Queue Storage Ratio (RQ) (95 th percentile)				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.22	0.51				
Uniform Delay (d1), s/veh				56.9	39.6	34.9	56.9	40.8	37.7	56.4	24.1	24.1	54.6	18.6	13.9				
Incremental Delay (d2), s/veh				5.2	0.0	0.0	3.5	0.3	1.1	0.8	0.3	0.7	3.9	0.1	0.2				
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					
Control Delay (d), s/veh				62.2	39.7	34.9	60.4	41.1	38.8	57.1	24.4	24.8	58.5	18.7	14.1				
Level of Service (LOS)				E	D	C	E	D	D	E	C	C	E	B	B				
Approach Delay, s/veh / LOS				59.8		E		42.1		D		25.2		C		25.1		C	
Intersection Delay, s/veh / LOS				29.1						C									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.60		C		3.28		C		2.57		C		2.42		B	
Bicycle LOS Score / LOS				0.66		A		1.48		A		1.31		A		1.19		A	

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information															
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250														
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other														
Jurisdiction		Time Period	AM Peak	PHF	0.91														
Urban Street	Preston Highway	Analysis Year	2022 Build	Analysis Period	1> 7:15														
Intersection	Cooper Chapel Road	File Name	AM 22 B Preston.xus																
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				85	4	5	94	49	420	28	1288	80	202	812	456				
Signal Information																			
Cycle, s	120.8	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	4.6	55.2	6.1	23.6	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.3	3.5	3.6	0.0									
				Red	3.0	0.0	1.9	3.0	2.4	0.0									
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	2.0	3.0	2.0	4.0	2.0	3.0								
Phase Duration, s				12.6	29.6	12.6	29.7	12.5	61.4	17.1	66.0								
Change Period, (Y+R _c), s				6.5	6.0	6.5	6.0	6.5	6.2	6.5	6.2								
Max Allow Headway (MAH), s				5.6	5.8	5.1	5.8	3.0	4.9	4.0	4.9								
Queue Clearance Time (g _s), s				5.4	2.2	5.7	19.0	3.9	24.3	9.8	15.3								
Green Extension Time (g _e), s				0.7	4.3	0.5	4.6	0.0	30.8	0.8	32.3								
Phase Call Probability				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00								
Max Out Probability				0.00	0.03	0.00	0.00	0.00	0.25	0.00	0.21								
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				93	4	5	103	54	462	29	941	456	222	892	171				
Adjusted Saturation Flow Rate (s), veh/h/ln				1647	1900	1425	1675	1900	1403	1753	1856	1798	1689	1658	1585				
Queue Service Time (g _s), s				3.4	0.2	0.2	3.7	2.8	17.0	1.9	22.3	22.3	7.8	13.3	6.7				
Cycle Queue Clearance Time (g _c), s				3.4	0.2	0.2	3.7	2.8	17.0	1.9	22.3	22.3	7.8	13.3	6.7				
Green Ratio (g/C)				0.05	0.20	0.25	0.05	0.20	0.28	0.05	0.46	0.46	0.09	0.50	0.55				
Capacity (c), veh/h				165	372	700	170	374	798	87	1696	821	297	2463	864				
Volume-to-Capacity Ratio (X)				0.565	0.012	0.008	0.607	0.144	0.578	0.329	0.555	0.555	0.748	0.362	0.198				
Back of Queue (Q), ft/ln (95 th percentile)				71.9	4.8	2.8	77.5	60.9	248.9	38.7	350.7	336.1	156.5	218.1	102.5				
Back of Queue (Q), veh/ln (95 th percentile)				2.7	0.2	0.1	3.0	2.4	9.8	1.5	13.7	13.4	6.0	8.4	4.0				
Queue Storage Ratio (RQ) (95 th percentile)				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.22	0.51				
Uniform Delay (d ₁), s/veh				56.1	39.2	34.5	56.2	40.2	37.0	55.5	23.9	23.9	53.8	18.8	14.0				
Incremental Delay (d ₂), s/veh				5.1	0.0	0.0	4.7	0.3	1.1	0.7	0.3	0.7	3.8	0.1	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				61.3	39.2	34.5	60.9	40.4	38.1	56.2	24.2	24.6	57.6	18.9	14.2				
Level of Service (LOS)				E	D	C	E	D	D	E	C	C	E	B	B				
Approach Delay, s/veh / LOS				58.9		E	42.1		D	25.0		C	25.0		C				
Intersection Delay, s/veh / LOS				29.1						C									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.60		C	3.28		C	2.57		C	2.42		B				
Bicycle LOS Score / LOS				0.66		A	1.51		B	1.33		A	1.19		A				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other		
Jurisdiction		Time Period	AM Peak	PHF	0.91		
Urban Street	Preston Highway	Analysis Year	2032 No Build	Analysis Period	1 > 7:15		
Intersection	Cooper Chapel Road	File Name	AM 32 NB Preston.xus				
Project Description	Stern						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	89	4	5	82	52	441	29	1338	68	212	837	479

Signal Information				Signal Timing (s)																				
Cycle, s	130.8	Reference Phase	2	Green	6.0	5.7	61.1	6.0	0.5	26.2	Yellow	3.5	0.0	4.3	3.5	0.0	3.6	Red	3.0	0.0	1.9	3.0	0.0	2.4
Offset, s	0	Reference Point	End																					
Uncoordinated	Yes	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	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	13.0	32.8	12.5	32.2	12.5	67.3	18.2	73.0
Change Period, (Y+R _c), s	6.5	6.0	6.5	6.0	6.5	6.2	6.5	6.2
Max Allow Headway (MAH), s	5.6	5.8	5.1	5.8	3.0	4.9	4.0	4.9
Queue Clearance Time (g _e), s	5.8	2.2	5.5	21.4	4.2	27.9	10.8	16.5
Green Extension Time (g _e), s	0.7	4.5	0.4	4.8	0.0	33.2	0.8	35.8
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.00	0.03	0.00	0.01	0.00	0.34	0.00	0.28

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	98	4	5	90	57	485	31	1004	489	233	920	197												
Adjusted Saturation Flow Rate (s), veh/h/ln	1647	1900	1425	1675	1900	1403	1753	1856	1807	1689	1658	1585												
Queue Service Time (g _s), s	3.8	0.2	0.2	3.5	3.2	19.4	2.2	25.9	25.9	8.8	14.5	8.1												
Cycle Queue Clearance Time (g _c), s	3.8	0.2	0.2	3.5	3.2	19.4	2.2	25.9	25.9	8.8	14.5	8.1												
Green Ratio (g/C)	0.05	0.20	0.25	0.05	0.20	0.29	0.05	0.47	0.47	0.09	0.51	0.56												
Capacity (c), veh/h	165	389	714	154	381	814	80	1734	845	302	2542	889												
Volume-to-Capacity Ratio (X)	0.593	0.011	0.008	0.587	0.150	0.595	0.383	0.579	0.579	0.771	0.362	0.221												
Back of Queue (Q), ft/ln (95 th percentile)	82.1	5.2	3	73.8	70.2	278.3	45.9	403	387.8	179.9	236	126.9												
Back of Queue (Q), veh/ln (95 th percentile)	3.1	0.2	0.1	2.8	2.8	11.0	1.8	15.7	15.5	6.9	9.1	5.0												
Queue Storage Ratio (RQ) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.24	0.63												
Uniform Delay (d ₁), s/veh	60.9	41.5	36.8	61.2	43.1	39.9	60.6	25.5	25.5	58.3	19.2	14.4												
Incremental Delay (d ₂), s/veh	5.7	0.0	0.0	4.8	0.3	1.2	0.9	0.4	0.7	4.2	0.1	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	66.6	41.5	36.8	66.0	43.4	41.0	61.6	25.8	26.2	62.4	19.3	14.6												
Level of Service (LOS)	E	D	D	E	D	D	E	C	C	E	B	B												
Approach Delay, s/veh / LOS	64.1			E			44.8			D			26.7			C			26.1			C		
Intersection Delay, s/veh / LOS	30.7						C																	

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.60	C		3.28	C		2.57	C		2.42	B	
Bicycle LOS Score / LOS	0.67	A		1.53	B		1.35	A		1.23	A	

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other								
Jurisdiction		Time Period	AM Peak			PHF	0.91								
Urban Street	Preston Highway		Analysis Year	2032 Build		Analysis Period	1> 7:15								
Intersection	Cooper Chapel Road	File Name	AM 32 B Preston.xus												
Project Description	Stern														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				89	4	5	98	52	441	29	1353	83	212	853	479
Signal Information				EB			WB			NB			SB		
Cycle, s	129.2	Reference Phase	2	Green			Yellow			Red			Signal Phases		
Offset, s	0	Reference Point	End	6.0	5.6	59.9	6.6	25.9	0.0	Signal Phases			Signal Phases		
Uncoordinated	Yes	Simult. Gap E/W	On	3.5	0.0	4.3	3.5	3.6	0.0	Signal Phases			Signal Phases		
Force Mode	Fixed	Simult. Gap N/S	On	3.0	0.0	1.9	3.0	2.4	0.0	Signal Phases			Signal Phases		
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	2.0	3.0	2.0	4.0	2.0	3.0				
Phase Duration, s				13.0	31.9	13.1	32.0	12.5	66.1	18.1	71.7				
Change Period, (Y+R _c), s				6.5	6.0	6.5	6.0	6.5	6.2	6.5	6.2				
Max Allow Headway (MAH), s				5.6	5.8	5.1	5.8	3.0	4.9	4.0	4.9				
Queue Clearance Time (g _s), s				5.8	2.2	6.1	21.1	4.1	26.9	10.7	16.8				
Green Extension Time (g _e), s				0.7	4.5	0.5	4.8	0.0	33.0	0.8	35.2				
Phase Call Probability				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Max Out Probability				0.00	0.03	0.00	0.01	0.00	0.33	0.00	0.27				
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	4	5	108	57	485	29	979	474	233	937	197
Adjusted Saturation Flow Rate (s), veh/h/ln				1647	1900	1425	1675	1900	1403	1753	1856	1798	1689	1658	1585
Queue Service Time (g _s), s				3.8	0.2	0.2	4.1	3.2	19.1	2.1	24.9	24.9	8.7	14.8	8.1
Cycle Queue Clearance Time (g _c), s				3.8	0.2	0.2	4.1	3.2	19.1	2.1	24.9	24.9	8.7	14.8	8.1
Green Ratio (g/C)				0.05	0.20	0.25	0.05	0.20	0.29	0.05	0.46	0.46	0.09	0.51	0.56
Capacity (c), veh/h				166	381	704	171	383	817	81	1720	834	304	2522	883
Volume-to-Capacity Ratio (X)				0.590	0.012	0.008	0.631	0.149	0.593	0.361	0.569	0.569	0.768	0.372	0.223
Back of Queue (Q), ft/ln (95 th percentile)				81.1	5.2	3	87.1	69.3	275.1	43.1	388.4	372.1	177.3	239	125.9
Back of Queue (Q), veh/ln (95 th percentile)				3.0	0.2	0.1	3.3	2.8	10.8	1.7	15.2	14.9	6.8	9.2	5.0
Queue Storage Ratio (RQ) (95 th percentile)				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.24	0.63
Uniform Delay (d ₁), s/veh				60.1	41.4	36.7	60.2	42.5	39.3	59.8	25.3	25.3	57.5	19.4	14.5
Incremental Delay (d ₂), s/veh				5.6	0.0	0.0	5.2	0.3	1.1	0.8	0.4	0.7	4.1	0.1	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				65.7	41.4	36.7	65.4	42.8	40.4	60.7	25.6	26.0	61.6	19.5	14.6
Level of Service (LOS)				E	D	D	E	D	D	E	C	C	E	B	B
Approach Delay, s/veh / LOS				63.3	E	44.8	D	26.4	C	26.0	C				
Intersection Delay, s/veh / LOS				30.7			C								
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.60	C	3.28	C	2.57	C	2.42	B				
Bicycle LOS Score / LOS				0.87	A	1.56	B	1.37	A	1.24	A				

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other												
Jurisdiction		Time Period	PM Peak			PHF	0.98												
Urban Street	Preston Highway		Analysis Year	2021		Analysis Period	1 > 4:45												
Intersection	Cooper Chapel Rd		File Name	PM 21 Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				354	61	46	210	15	358	12	1178	214	707	1768	110				
Signal Information																			
Cycle, s	180.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	6.0	28.1	67.8	14.5	2.6	22.8									
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	1.9	3.0	3.0	2.4									
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		2.0		3.0		2.0		4.0		2.0		3.0	
Phase Duration, s				30.1		38.0		21.0		28.8		12.5		74.0		47.1		108.6	
Change Period, (Y+R _c), s				6.5		6.0		6.5		6.0		6.5		6.2		6.5		6.2	
Max Allow Headway (MAH), s				5.6		5.7		5.1		5.7		3.0		0.0		4.0		0.0	
Queue Clearance Time (g _s), s				20.9		7.0		13.1		19.3		3.3				38.1			
Green Extension Time (g _e), s				2.7		4.2		1.3		3.5		0.0		0.0		2.4		0.0	
Phase Call Probability				1.00		1.00		1.00		1.00		1.00				1.00			
Max Out Probability				0.00		0.00		0.00		0.04		0.00				0.09			
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				361	62	47	214	15	365	12	947	435	721	1804	112				
Adjusted Saturation Flow Rate (s), veh/h/ln				1675	1900	1425	1702	1900	1414	1697	1885	1733	1743	1698	1409				
Queue Service Time (g _s), s				18.9	5.0	2.4	11.1	1.3	17.3	1.3	38.6	38.2	36.1	29.2	2.7				
Cycle Queue Clearance Time (g _c), s				18.9	5.0	2.4	11.1	1.3	17.3	1.3	38.6	38.2	36.1	29.2	2.7				
Green Ratio (g/C)				0.13	0.18	0.21	0.08	0.13	0.35	0.03	0.38	0.38	0.23	0.57	0.70				
Capacity (c), veh/h				439	337	601	274	241	996	57	1420	653	805	2898	986				
Volume-to-Capacity Ratio (X)				0.823	0.184	0.078	0.783	0.063	0.367	0.211	0.667	0.667	0.896	0.623	0.114				
Back of Queue (Q), ft/ln (95 th percentile)				350.2	111.7	39.3	227.6	28.7	257.3	26.9	635.5	592.1	593.2	330.7	40.7				
Back of Queue (Q), veh/ln (95 th percentile)				13.4	4.5	1.6	8.8	1.1	10.2	1.0	25.2	23.7	23.5	13.0	1.4				
Queue Storage Ratio (RQ) (95 th percentile)				0.78	0.25	0.31	0.57	0.05	0.74	0.06	0.53	0.50	1.08	0.33	0.20				
Uniform Delay (d ₁), s/veh				76.2	62.9	57.0	81.2	69.2	43.4	87.5	49.7	48.5	67.1	12.9	4.8				
Incremental Delay (d ₂), s/veh				6.5	0.4	0.1	6.7	0.2	0.4	0.6	2.2	4.8	9.4	1.0	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				82.7	63.3	57.1	87.9	69.3	43.7	88.1	51.9	53.3	76.5	13.9	5.0				
Level of Service (LOS)				F	E	E	F	E	D	F	D	D	E	B	A				
Approach Delay, s/veh / LOS				77.6		E	60.3		E	52.7		D	30.7		C				
Intersection Delay, s/veh / LOS				44.5						D									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.62		C	2.88		C	2.59		C	2.42		B				
Bicycle LOS Score / LOS				1.26		A	1.47		A	1.28		A	1.94		B				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information															
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250														
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other														
Jurisdiction		Time Period	PM Peak	PHF	0.98														
Urban Street	Preston Highway	Analysis Year	2022 No Build	Analysis Period	1> 4:45														
Intersection	Cooper Chapel	File Name	PM 22 NB Preston.xus																
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				356	61	46	211	15	360	12	1184	215	711	1777	111				
Signal Information																			
Cycle, s	180.0	Reference Phase	2	Green	6.0	28.2	67.4	14.5	2.7	22.9									
Offset, s	0	Reference Point	End	Yellow	3.5	3.5	4.3	3.5	3.5	3.6									
Uncoordinated	No	Simult. Gap E/W	On	Red	3.0	3.0	1.9	3.0	3.0	2.4									
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	2.0	3.0	2.0	4.0	2.0	3.0								
Phase Duration, s				30.2	38.1	21.0	28.9	12.5	73.6	47.2	108.4								
Change Period, (Y+R c), s				6.5	6.0	6.5	6.0	6.5	6.2	6.5	6.2								
Max Allow Headway (MAH), s				5.6	5.7	5.1	5.7	3.0	0.0	4.0	0.0								
Queue Clearance Time (g s), s				21.0	7.0	13.2	19.4	3.3		38.3									
Green Extension Time (g e), s				2.7	4.2	1.3	3.5	0.0	0.0	2.4	0.0								
Phase Call Probability				1.00	1.00	1.00	1.00	1.00		1.00									
Max Out Probability				0.00	0.00	0.00	0.04	0.00		0.10									
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				363	62	47	215	15	367	12	951	437	726	1813	113				
Adjusted Saturation Flow Rate (s), veh/h/ln				1675	1900	1425	1702	1900	1414	1697	1885	1733	1743	1698	1409				
Queue Service Time (g s), s				19.0	5.0	2.4	11.2	1.3	17.4	1.3	39.0	38.6	36.3	29.6	2.7				
Cycle Queue Clearance Time (g c), s				19.0	5.0	2.4	11.2	1.3	17.4	1.3	39.0	38.6	36.3	29.6	2.7				
Green Ratio (g/C)				0.13	0.18	0.21	0.08	0.13	0.35	0.03	0.37	0.37	0.23	0.57	0.70				
Capacity (c), veh/h				441	339	603	275	242	1000	57	1413	649	809	2892	986				
Volume-to-Capacity Ratio (X)				0.824	0.184	0.078	0.784	0.063	0.367	0.211	0.674	0.674	0.897	0.627	0.115				
Back of Queue (Q), ft/ln (95 th percentile)				351.6	111.6	39.2	228.4	28.7	258	26.9	642.8	599	597	335.8	41.4				
Back of Queue (Q), veh/ln (95 th percentile)				13.4	4.5	1.6	8.9	1.1	10.2	1.0	25.5	24.0	23.7	13.2	1.5				
Queue Storage Ratio (RQ) (95 th percentile)				0.78	0.25	0.31	0.57	0.05	0.74	0.06	0.54	0.50	1.09	0.34	0.21				
Uniform Delay (d 1), s/veh				76.1	62.8	58.9	81.2	69.1	43.2	87.5	50.3	49.2	67.0	13.1	4.8				
Incremental Delay (d 2), s/veh				6.5	0.4	0.1	6.6	0.2	0.4	0.6	2.3	5.0	9.6	1.0	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				82.6	63.2	58.9	87.8	69.3	43.6	88.1	52.6	54.1	76.7	14.1	5.0				
Level of Service (LOS)				F	E	E	F	E	D	F	D	D	E	B	A				
Approach Delay, s/veh / LOS				77.5		E	60.2		E	53.4		D		30.8		C			
Intersection Delay, s/veh / LOS				44.7						D									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.62		C	2.88		C	2.59		C	2.42		B				
Bicycle LOS Score / LOS				1.27		A	1.47		A	1.28		A	1.95		B				

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary																
General Information						Intersection Information										
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250									
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other									
Jurisdiction		Time Period	PM Peak			PHF	0.98									
Urban Street	Preston Highway		Analysis Year	2022 Build		Analysis Period	1> 4:45									
Intersection	Cooper Chapel		File Name	PM 22 B Preston.xus												
Project Description	Stern															
Demand Information				EB			WB			NB		SB				
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h	356	61	46	225	15	360	12	1197	228	711	1791	111				
Signal Information																
Cycle, s	180.0	Reference Phase	2	Green	6.0	28.2	67.4	15.3	1.9	22.9						
Offset, s	0	Reference Point	End	Yellow	3.5	3.5	4.3	3.5	3.5	3.6						
Uncoordinated	No	Simult. Gap E/W	On	Red	3.0	3.0	1.9	3.0	3.0	2.4						
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					
Case Number	2.0		3.0		2.0		3.0		2.0		4.0					
Phase Duration, s	30.2		37.3		21.8		28.9		12.5		73.6					
Change Period, (Y+Rc), s	6.5		6.0		6.5		6.0		6.5		6.2					
Max Allow Headway (MAH), s	5.6		5.7		5.1		5.7		3.0		0.0					
Queue Clearance Time (gs), s	21.0		7.0		13.9		19.4		3.2		38.3					
Green Extension Time (ge), s	2.7		4.2		1.4		3.5		0.0		0.0					
Phase Call Probability	1.00		1.00		1.00		1.00		1.00		1.00					
Max Out Probability	0.00		0.00		0.00		0.04		0.00		0.10					
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	363	62	47	230	15	367	12	950	435	726	1828	113				
Adjusted Saturation Flow Rate (s), veh/h/ln	1675	1900	1425	1702	1900	1414	1697	1885	1727	1743	1698	1409				
Queue Service Time (gs), s	19.0	5.0	2.4	11.9	1.3	17.4	1.2	28.9	27.1	36.3	30.1	2.7				
Cycle Queue Clearance Time (gc), s	19.0	5.0	2.4	11.9	1.3	17.4	1.2	28.9	27.1	36.3	30.1	2.7				
Green Ratio (g/C)	0.13	0.17	0.21	0.09	0.13	0.35	0.03	0.37	0.37	0.23	0.57	0.70				
Capacity (c), veh/h	441	330	590	290	242	1000	57	1413	647	809	2892	986				
Volume-to-Capacity Ratio (X)	0.824	0.189	0.080	0.791	0.063	0.367	0.206	0.673	0.673	0.897	0.632	0.115				
Back of Queue (Q), ft/ln (95 th percentile)	351.6	112.2	39.5	240.1	28.7	258	26.2	362.8	302.3	597	340.3	41.4				
Back of Queue (Q), veh/ln (95 th percentile)	13.4	4.5	1.6	9.3	1.1	10.2	1.0	14.4	12.1	23.7	13.4	1.5				
Queue Storage Ratio (RQ) (95 th percentile)	0.78	0.25	0.32	0.60	0.05	0.74	0.06	0.30	0.25	1.09	0.34	0.21				
Uniform Delay (d1), s/veh	76.1	63.5	57.5	80.8	69.1	43.2	87.4	25.8	22.8	67.0	13.1	4.8				
Incremental Delay (d2), s/veh	6.5	0.4	0.1	6.5	0.2	0.4	0.4	1.7	3.7	9.6	1.1	0.2				
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	82.6	63.9	57.6	87.3	69.3	43.6	87.9	27.5	26.5	76.7	14.2	5.0				
Level of Service (LOS)	F	E	E	F	E	D	F	C	C	E	B	A				
Approach Delay, s/veh / LOS	77.7		E		60.6		E		27.7		C					
Intersection Delay, s/veh / LOS	37.8						D									
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS	2.62		C		2.88		C		2.59		C		2.42		B	
Bicycle LOS Score / LOS	1.27		A		1.50		A		1.29		A		1.95		B	

Preston Highway at Interchange Drive
Traffic Impact Study

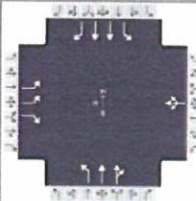
HCS7 Signalized Intersection Results Summary																
General Information						Intersection Information										
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250									
Analyst	DBZ	Analysis Date	Jun 2, 2021		Area Type	Other										
Jurisdiction		Time Period	PM Peak		PHF	0.98										
Urban Street	Preston Highway		Analysis Year	2032 No Build		Analysis Period	1> 4:45									
Intersection	Cooper Chapel		File Name	PM 32 NB Preston.xus												
Project Description	Stern															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h				374	64	48	222	16	378	13	1245	226	747	1868	117	
Signal Information																
Cycle, s	180.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	6.0	29.8	64.1	15.2	3.1	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	1.9	3.0	3.0	2.4						
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	2.0	3.0	2.0	4.0	2.0	3.0					
Phase Duration, s				31.3	39.2	21.7	29.6	12.5	70.3	48.8	106.6					
Change Period, (Y+Rc), s				6.5	6.0	6.5	6.0	6.5	6.2	6.5	6.2					
Max Allow Headway (MAH), s				5.6	5.7	5.1	5.7	3.0	0.0	4.0	0.0					
Queue Clearance Time (gs), s				22.0	7.2	13.7	20.0	3.4		40.2						
Green Extension Time (ge), s				2.8	4.5	1.4	3.6	0.0	0.0	2.0	0.0					
Phase Call Probability				1.00	1.00	1.00	1.00	1.00		1.00						
Max Out Probability				0.01	0.00	0.00	0.07	0.00		0.36						
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				382	65	49	227	16	386	13	997	458	762	1906	119	
Adjusted Saturation Flow Rate (s), veh/h/ln				1675	1900	1425	1702	1900	1414	1697	1885	1733	1743	1698	1409	
Queue Service Time (gs), s				20.0	5.2	2.5	11.7	1.4	18.0	1.4	42.4	42.1	38.2	34.4	3.0	
Cycle Queue Clearance Time (gc), s				20.0	5.2	2.5	11.7	1.4	18.0	1.4	42.4	42.1	38.2	34.4	3.0	
Green Ratio (g/C)				0.14	0.18	0.22	0.08	0.13	0.37	0.03	0.36	0.36	0.24	0.56	0.70	
Capacity (c), veh/h				461	351	621	287	249	1036	57	1343	617	839	2842	980	
Volume-to-Capacity Ratio (X)				0.828	0.186	0.079	0.789	0.065	0.372	0.227	0.742	0.742	0.909	0.671	0.122	
Back of Queue (Q), ft/ln (95 th percentile)				365.7	116.2	40.6	237.6	30.4	265.3	29.1	693.9	651.2	630	390.9	45.8	
Back of Queue (Q), veh/ln (95 th percentile)				14.0	4.6	1.6	9.2	1.2	10.5	1.1	27.5	26.0	25.0	15.4	1.6	
Queue Storage Ratio (RQ) (95 th percentile)				0.81	0.26	0.32	0.59	0.06	0.76	0.07	0.58	0.55	1.15	0.39	0.23	
Uniform Delay (d1), s/veh				75.5	62.0	56.0	80.8	68.5	41.9	87.6	53.5	52.4	66.4	14.6	5.1	
Incremental Delay (d2), s/veh				6.4	0.4	0.1	6.6	0.2	0.4	0.7	3.3	7.0	11.7	1.3	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				82.0	62.3	56.1	87.4	68.7	42.2	88.3	56.8	59.4	78.1	15.9	5.4	
Level of Service (LOS)				F	E	E	F	E	D	F	E	E	E	B	A	
Approach Delay, s/veh / LOS				76.8		E	59.2		E	57.9		E	32.5		C	
Intersection Delay, s/veh / LOS				46.6						D						
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				2.62	C	2.88	C	2.60	C	2.43	B					
Bicycle LOS Score / LOS				1.31	A	1.52	B	1.32	A	2.02	B					

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other								
Jurisdiction		Time Period	PM Peak			PHF	0.98								
Urban Street	Preston Highway	Analysis Year	2032 Build			Analysis Period	1> 4:45								
Intersection	Cooper Chapel	File Name	PM 32 B Preston.xus												
Project Description	Stern														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				374	64	48	236	16	378	13	1258	239	747	1882	117
Signal Information															
Cycle, s	180.0	Reference Phase	2	Green			6.0	29.8	64.1	16.0	2.3	23.6			
Offset, s	0	Reference Point	End	Yellow			3.5	3.5	4.3	3.5	3.5	3.6			
Uncoordinated	No	Simult. Gap E/W	On	Red			3.0	3.0	1.9	3.0	3.0	2.4			
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	2.0	3.0	2.0	4.0	2.0	3.0				
Phase Duration, s				31.3	38.4	22.5	29.6	12.5	70.3	48.8	106.6				
Change Period, (Y+R _c), s				6.5	6.0	6.5	6.0	6.5	6.2	6.5	6.2				
Max Allow Headway (MAH), s				5.6	5.7	5.1	5.7	3.0	0.0	4.0	0.0				
Queue Clearance Time (g _s), s				22.0	7.3	14.5	20.0	3.3		40.2					
Green Extension Time (g _e), s				2.8	4.4	1.5	3.6	0.0	0.0	2.0	0.0				
Phase Call Probability				1.00	1.00	1.00	1.00	1.00		1.00					
Max Out Probability				0.01	0.00	0.00	0.07	0.00		0.36					
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				382	65	49	241	16	386	13	991	454	762	1920	119
Adjusted Saturation Flow Rate (s), veh/h/ln				1675	1900	1425	1702	1900	1414	1697	1885	1727	1743	1698	1409
Queue Service Time (g _s), s				20.0	5.3	2.5	12.5	1.4	18.0	1.3	33.0	31.3	38.2	35.0	3.0
Cycle Queue Clearance Time (g _c), s				20.0	5.3	2.5	12.5	1.4	18.0	1.3	33.0	31.3	38.2	35.0	3.0
Green Ratio (g/C)				0.14	0.18	0.21	0.09	0.13	0.37	0.03	0.36	0.36	0.24	0.56	0.70
Capacity (c), veh/h				461	342	608	303	249	1036	57	1343	615	839	2842	980
Volume-to-Capacity Ratio (X)				0.828	0.191	0.081	0.796	0.065	0.372	0.222	0.738	0.738	0.909	0.676	0.122
Back of Queue (Q), ft/ln (95 th percentile)				365.7	117	40.9	249.1	30.4	265.3	28.1	401.1	337.7	630	396.5	45.8
Back of Queue (Q), veh/ln (95 th percentile)				14.0	4.7	1.6	9.7	1.2	10.5	1.1	15.9	13.5	25.0	15.6	1.6
Queue Storage Ratio (RQ) (95 th percentile)				0.81	0.26	0.33	0.62	0.06	0.76	0.07	0.33	0.28	1.15	0.40	0.23
Uniform Delay (d ₁), s/veh				75.5	62.7	56.7	80.4	68.5	41.9	87.5	28.1	25.0	66.4	14.7	5.1
Incremental Delay (d ₂), s/veh				6.4	0.4	0.1	6.5	0.2	0.4	0.4	2.2	4.7	11.7	1.3	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				82.0	63.1	56.8	86.9	68.7	42.2	87.9	30.3	29.7	78.1	16.0	5.4
Level of Service (LOS)				F	E	E	F	E	D	F	C	C	E	B	A
Approach Delay, s/veh / LOS				77.0	E	59.6	E	30.6	C	32.4	C				
Intersection Delay, s/veh / LOS				39.3					D						
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.62	C	2.88	C	2.60	C	2.43	B				
Bicycle LOS Score / LOS				1.31	A	1.55	B	1.34	A	2.03	B				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other		
Jurisdiction		Time Period	AM Peak	PHF	0.90		
Urban Street	Preston Highway		Analysis Year	2021	Analysis Period	1> 7:15	
Intersection	Interchange Drive		File Name	AM 21 Preston.xus			
Project Description	Stern						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	67		15	1	0	1	10	1315	3	1	721	152

Signal Information				Signal Timing (s)								Signal Phases						
Cycle, s	150.0	Reference Phase	2															
Offset, s	0	Reference Point	End															
Uncoordinated	No	Simult. Gap E/W	Off	Green	0.3	5.7	113.1	6.0	0.5	0.0								
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.3	3.6	3.6	0.0								
				Red	3.0	0.0	1.6	2.4	2.4	0.0								

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		12.0	2.0	4.0	2.0	3.0
Phase Duration, s		12.0		6.5	12.5	124.7	6.8	119.0
Change Period, (Y+Rc), s		6.0		6.0	6.5	5.9	6.5	5.9
Max Allow Headway (MAH), s		4.0		3.1	4.0	0.0	4.0	0.0
Queue Clearance Time (gs), s				2.2	3.0		2.1	
Green Extension Time (ge), s		0.0		0.0	0.0	0.0	0.0	0.0
Phase Call Probability				0.09	1.00		0.04	
Max Out Probability				0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	74		17		2		11	700	700	1	782	165
Adjusted Saturation Flow Rate (s), veh/h/ln	1661		1359		1704		1527	1856	1854	1810	1724	1585
Queue Service Time (gs), s	3.3		1.7		0.2		1.0	12.5	12.5	0.1	10.8	3.6
Cycle Queue Clearance Time (gc), s	3.3		1.7		0.2		1.0	12.5	12.5	0.1	10.8	3.6
Green Ratio (g/C)	0.04		0.08		0.00		0.60	0.79	0.79	0.00	0.75	0.79
Capacity (c), veh/h	133		109		6		61	1470	1468	3	2599	1258
Volume-to-Capacity Ratio (X)	0.560		0.153		0.368		0.174	0.477	0.477	0.338	0.301	0.131
Back of Queue (Q), ft/ln (95th percentile)	68.7		31.4		4.8		21.6	138.8	135.5	3.8	158.9	43.6
Back of Queue (Q), veh/ln (95th percentile)	2.6		1.1		0.2		0.7	5.4	5.4	0.2	6.1	1.7
Queue Storage Ratio (RQ) (95th percentile)	0.17		0.52		0.00		0.09	0.00	0.00	0.04	0.00	0.15
Uniform Delay (d1), s/veh	70.7		64.3		74.6		71.7	2.8	2.8	74.8	5.9	3.6
Incremental Delay (d2), s/veh	3.7		0.6		13.3		0.9	0.8	0.8	49.9	0.3	0.2
Initial Queue Delay (d3), s/veh	0.0		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	74.4		64.9		87.9		72.6	3.6	3.6	124.7	6.2	3.8
Level of Service (LOS)	E		E		F		E	A	A	F	A	A
Approach Delay, s/veh / LOS	72.6		E		87.9		F		A		5.9	A
Intersection Delay, s/veh / LOS			7.4						A			

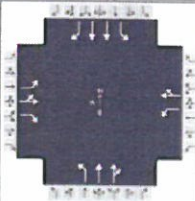
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.33		B	2.49		B	1.62		B	2.05		B
Bicycle LOS Score / LOS			F	0.49		A	1.70		B	1.29		A

Preston Highway at Interchange Drive
Traffic Impact Study

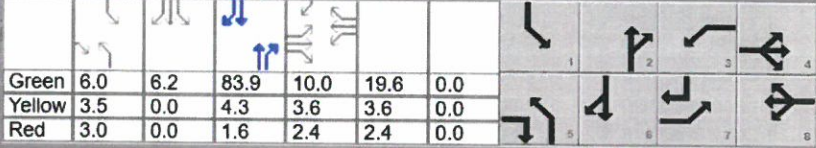
HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other												
Jurisdiction		Time Period	AM Peak			PHF	0.90												
Urban Street	Preston Highway		Analysis Year	2022 No Build		Analysis Period	1> 7:15												
Intersection	Interchange Drive		File Name	AM 22 NB Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				67		15	1	0	1	10	1322	3	1	725	153				
Signal Information																			
Cycle, s	150.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	0.3	5.7	113.1	6.0	0.5	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.3	3.6	3.6	0.0									
				Red	3.0	0.0	1.6	2.4	2.4	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						4				8		5		2		1		6	
Case Number						9.0				12.0		2.0		4.0		2.0		3.0	
Phase Duration, s						12.0				6.5		12.5		124.7		6.8		119.0	
Change Period, (Y+R c), s						6.0				6.0		6.5		5.9		6.5		5.9	
Max Allow Headway (MAH), s						4.0				3.1		4.0		0.0		4.0		0.0	
Queue Clearance Time (g s), s										2.2		3.0				2.1			
Green Extension Time (g e), s						0.0				0.0		0.0		0.0		0.0		0.0	
Phase Call Probability										0.09		1.00				0.04			
Max Out Probability										0.00		0.00				0.00			
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7		14	3	8	18	5	2	12	1	6	16				
Adjusted Flow Rate (v), veh/h				74		17		2		11	703	703	1	785	166				
Adjusted Saturation Flow Rate (s), veh/h/ln				1661		1359		1704		1527	1856	1854	1810	1724	1585				
Queue Service Time (g s), s				3.3		1.7		0.2		1.0	12.6	12.6	0.1	10.9	3.6				
Cycle Queue Clearance Time (g c), s				3.3		1.7		0.2		1.0	12.6	12.6	0.1	10.9	3.6				
Green Ratio (g/C)				0.04		0.08		0.00		0.60	0.79	0.79	0.00	0.75	0.79				
Capacity (c), veh/h				133		109		6		61	1470	1468	3	2599	1258				
Volume-to-Capacity Ratio (X)				0.560		0.153		0.368		0.174	0.478	0.479	0.338	0.302	0.132				
Back of Queue (Q), ft/ln (95 th percentile)				68.7		31.4		4.8		21.6	140	136.7	3.8	159.6	43.9				
Back of Queue (Q), veh/ln (95 th percentile)				2.6		1.1		0.2		0.7	5.5	5.5	0.2	6.1	1.7				
Queue Storage Ratio (RQ) (95 th percentile)				0.17		0.52		0.00		0.09	0.00	0.00	0.04	0.00	0.15				
Uniform Delay (d 1), s/veh				70.7		64.3		74.6		71.7	2.8	2.8	74.8	5.9	3.6				
Incremental Delay (d 2), s/veh				3.7		0.6		13.3		0.9	0.7	0.7	49.8	0.3	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				
Control Delay (d), s/veh				74.4		64.9		87.9		72.6	3.6	3.6	124.5	6.2	3.8				
Level of Service (LOS)				E		E		F		E	A	A	F	A	A				
Approach Delay, s/veh / LOS				72.6		E		87.9		F		4.1		A		5.9		A	
Intersection Delay, s/veh / LOS							7.4						A						
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.33		B		2.49		B		1.62		B		2.05		B	
Bicycle LOS Score / LOS						F		0.49		A		1.71		B		1.29		A	

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other		
Jurisdiction		Time Period	AM Peak	PHF	0.90		
Urban Street	Preston Highway	Analysis Year	2022 Build	Analysis Period	1> 7:15		
Intersection	Interchange Drive	File Name	AM 22 B Preston.xus				
Project Description	Stern						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	59	24	15	187	16	1	10	1298	132	112	645	153

Signal Information				Signal Timing (s)																				
Cycle, s	150.0	Reference Phase	2	Green	6.0	6.2	83.9	10.0	19.6	0.0	Yellow	3.5	0.0	4.3	3.6	3.6	0.0	Red	3.0	0.0	1.6	2.4	2.4	0.0
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		4		8	5	2	1	6
Case Number		9.0		10.0	2.0	4.0	2.0	3.0
Phase Duration, s		16.0		25.6	12.5	89.8	18.7	95.9
Change Period, (Y+Rc), s		6.0		6.0	6.5	5.9	6.5	5.9
Max Allow Headway (MAH), s		4.0		4.0	4.0	0.0	4.0	0.0
Queue Clearance Time (gs), s		7.6		18.9	3.0		11.9	
Green Extension Time (ge), s		0.2		0.6	0.0	0.0	0.3	0.0
Phase Call Probability		1.00		1.00	1.00		0.99	
Max Out Probability		0.00		0.00	0.00		0.00	

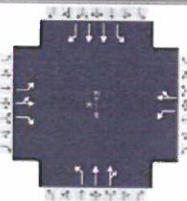
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	66	27	17	208	19		11	761	744	121	699	166
Adjusted Saturation Flow Rate (s), veh/h/ln	1711	1900	1359	1810	1880		1527	1856	1795	1810	1724	1585
Queue Service Time (gs), s	5.6	2.0	1.7	16.9	1.3		1.0	38.7	38.8	9.9	15.2	5.8
Cycle Queue Clearance Time (gc), s	5.6	2.0	1.7	16.9	1.3		1.0	38.7	38.8	9.9	15.2	5.8
Green Ratio (g/C)	0.07	0.07	0.11	0.13	0.13		0.04	0.56	0.56	0.08	0.60	0.67
Capacity (c), veh/h	114	127	145	236	245		61	1037	1004	147	2070	1057
Volume-to-Capacity Ratio (X)	0.575	0.211	0.115	0.880	0.077		0.172	0.734	0.741	0.827	0.338	0.157
Back of Queue (Q), ft/ln (95th percentile)	120.4	44	30.1	325	28.3		21.5	464	431.7	210.4	249.9	89.2
Back of Queue (Q), veh/ln (95th percentile)	4.6	1.8	1.0	13.0	1.1		0.7	18.1	17.3	8.4	9.5	3.5
Queue Storage Ratio (RQ) (95th percentile)	0.30	0.00	0.50	0.00	0.00		0.09	0.00	0.00	2.10	0.00	0.30
Uniform Delay (d1), s/veh	67.9	66.3	60.6	64.1	57.3		72.4	16.3	15.8	67.9	15.0	9.3
Incremental Delay (d2), s/veh	4.5	0.8	0.3	10.2	0.1		0.8	2.7	2.9	10.4	0.4	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
Control Delay (d), s/veh	72.4	67.1	60.9	74.2	57.4		73.2	19.0	18.6	78.3	15.4	9.6
Level of Service (LOS)	E	E	E	E	E		E	B	B	E	B	A
Approach Delay, s/veh / LOS	69.4		E	72.8		E	19.2		B	22.2		C
Intersection Delay, s/veh / LOS	26.4						C					

Multimodal Results	EB	WB	NB	SB
Pedestrian LOS Score / LOS	2.32	B	2.49	B
Bicycle LOS Score / LOS	0.67	A	0.86	A

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary																		
General Information						Intersection Information												
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250											
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other											
Jurisdiction		Time Period	AM Peak			PHF	0.90											
Urban Street	Preston Highway		Analysis Year	2032 No Build		Analysis Period	1> 7:15											
Intersection	Interchange Drive		File Name	AM 32 NB Preston.xus														
Project Description	Stern																	
Demand Information				EB			WB			NB			SB					
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R			
Demand (v), veh/h				70		16	1	0	1	11	1390	3	1	762	161			
Signal Information																		
Cycle, s	150.0	Reference Phase	2	Green	0.3	5.7	113.1	6.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0			
Offset, s	0	Reference Point	End	Yellow	3.5	0.0	4.3	3.6	3.6	0.0	0.0	0.0	0.0	0.0	0.0			
Uncoordinated	No	Simult. Gap E/W	On	Red	3.0	0.0	1.6	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On															
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT							
Assigned Phase					4		8	5	2	1	6							
Case Number					9.0		12.0	2.0	4.0	2.0	3.0							
Phase Duration, s					12.0		6.5	12.5	124.7	6.8	119.0							
Change Period, (Y+R c), s					6.0		6.0	6.5	5.9	6.5	5.9							
Max Allow Headway (MAH), s					4.0		3.1	4.0	0.0	3.0	0.0							
Queue Clearance Time (g s), s							2.2	3.1		2.1								
Green Extension Time (g e), s					0.0		0.0	0.0	0.0	0.0	0.0							
Phase Call Probability							0.09	1.00		0.04								
Max Out Probability							0.00	0.00		0.00								
Movement Group Results				EB			WB			NB			SB					
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R			
Assigned Movement				7		14	3	8	18	5	2	12	1	6	16			
Adjusted Flow Rate (v), veh/h				78		18		2		12	731	731	1	824	174			
Adjusted Saturation Flow Rate (s), veh/h/ln				1661		1359		1704		1527	1856	1854	1810	1724	1585			
Queue Service Time (g s), s				3.5		1.8		0.2		1.1	13.6	13.6	0.1	11.6	3.8			
Cycle Queue Clearance Time (g c), s				3.5		1.8		0.2		1.1	13.6	13.6	0.1	11.6	3.8			
Green Ratio (g/C)				0.04		0.08		0.00		0.60	0.79	0.79	0.00	0.75	0.79			
Capacity (c), veh/h				133		109		6		61	1470	1468	3	2599	1258			
Volume-to-Capacity Ratio (X)				0.585		0.163		0.368		0.189	0.498	0.498	0.338	0.317	0.138			
Back of Queue (Q), ft/ln (95 th percentile)				72		33.6		4.8		23.5	144	140.6	2.6	170.3	46.3			
Back of Queue (Q), veh/ln (95 th percentile)				2.7		1.2		0.2		0.8	5.6	5.6	0.1	6.5	1.8			
Queue Storage Ratio (RQ) (95 th percentile)				0.18		0.56		0.00		0.09	0.00	0.00	0.03	0.00	0.15			
Uniform Delay (d 1), s/veh				70.8		64.3		74.6		71.8	2.9	2.9	74.8	6.0	3.6			
Incremental Delay (d 2), s/veh				4.0		0.7		13.3		0.9	0.7	0.7	20.1	0.3	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			
Control Delay (d), s/veh				74.8		65.0		87.9		72.7	3.7	3.7	94.8	6.3	3.8			
Level of Service (LOS)				E		E		F		E	A	A	F	A	A			
Approach Delay, s/veh / LOS				73.0		E		87.9		F		4.2		A		A		
Intersection Delay, s/veh / LOS				7.5			A			A			A					
Multimodal Results				EB			WB			NB			SB					
Pedestrian LOS Score / LOS				2.33		B		2.49		B		1.62		B		2.05		B
Bicycle LOS Score / LOS						F		0.49		A		1.77		B		1.33		A

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other												
Jurisdiction		Time Period	AM Peak			PHF	0.90												
Urban Street	Preston Highway		Analysis Year	2032 Build		Analysis Period	1> 7:15												
Intersection	Interchange Drive		File Name	AM 32 B Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				62	24	16	186	16	1	11	1366	132	112	683	161				
Signal Information																			
Cycle, s	150.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	6.0	6.1	84.0	10.0	19.5	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	0.0	4.3	3.6	3.6	0.0									
				Red	3.0	0.0	1.6	2.4	2.4	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						4				8		5		2		1		6	
Case Number						9.0				10.0		2.0		4.0		2.0		3.0	
Phase Duration, s						16.0				25.5		12.5		89.9		18.6		96.0	
Change Period, (Y+R _c), s						6.0				6.0		6.5		5.9		6.5		5.9	
Max Allow Headway (MAH), s						4.0				4.0		4.0		0.0		4.0		0.0	
Queue Clearance Time (g _s), s						7.9				18.8		3.1				11.9			
Green Extension Time (g _e), s						0.3				0.6		0.0		0.0		0.3		0.0	
Phase Call Probability						1.00				1.00		1.00				0.99			
Max Out Probability						0.00				0.00		0.00				0.00			
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16				
Adjusted Flow Rate (v), veh/h				69	27	18	207	19		11	788	773	121	738	174				
Adjusted Saturation Flow Rate (s), veh/h/ln				1711	1900	1359	1810	1880		1527	1856	1798	1810	1724	1585				
Queue Service Time (g _s), s				5.9	2.0	1.8	16.8	1.3		1.1	43.3	43.8	9.9	16.3	6.2				
Cycle Queue Clearance Time (g _c), s				5.9	2.0	1.8	16.8	1.3		1.1	43.3	43.8	9.9	16.3	6.2				
Green Ratio (g/C)				0.07	0.07	0.11	0.13	0.13		0.04	0.56	0.56	0.08	0.60	0.67				
Capacity (c), veh/h				114	127	145	235	244		61	1039	1007	146	2072	1058				
Volume-to-Capacity Ratio (X)				0.604	0.211	0.123	0.880	0.077		0.188	0.759	0.768	0.827	0.356	0.165				
Back of Queue (Q), ft/ln (95 th percentile)				127.4	44	32.2	323.8	28.3		23.4	529	502.4	209.6	264.2	93.9				
Back of Queue (Q), veh/ln (95 th percentile)				4.8	1.8	1.1	13.0	1.1		0.8	20.7	20.1	8.4	10.1	3.7				
Queue Storage Ratio (RQ) (95 th percentile)				0.32	0.00	0.54	0.00	0.00		0.09	0.00	0.00	2.10	0.00	0.31				
Uniform Delay (d ₁), s/veh				68.1	66.3	60.6	64.1	57.4		72.5	18.5	18.1	67.9	15.2	9.3				
Incremental Delay (d ₂), s/veh				5.1	0.8	0.4	10.2	0.1		0.7	2.7	2.9	10.3	0.4	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				
Control Delay (d), s/veh				73.1	67.1	61.0	74.3	57.5		73.2	21.2	21.0	78.2	15.7	9.6				
Level of Service (LOS)				E	E	E	E	E		E	C	C	E	B	A				
Approach Delay, s/veh / LOS				69.8		E	72.9		E		21.5		C	22.0		C			
Intersection Delay, s/veh / LOS							27.4						C						
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.32		B	2.49		B	1.90		B	2.09		B				
Bicycle LOS Score / LOS				0.67		A	0.86		A	1.87		B	1.36		A				

HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ		Analysis Date	Jun 2, 2021		Area Type	Other												
Jurisdiction			Time Period	PM Peak		PHF	0.98												
Urban Street	Preston Highway		Analysis Year	2021		Analysis Period	1 > 4:45												
Intersection	Interchange Dr		File Name	PM 21 Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				184		48	3	0	4	16	1222	2	0	1867	155				
Signal Information																			
Cycle, s	180.0	Reference Phase	2																
Offset, s	0	Reference Point	End	Green	3.4	126.2	20.0	6.0	0.0	0.0									
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.5	4.3	3.6	3.6	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Red	3.0	1.6	2.4	2.4	0.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						4				8		5		2		1		6	
Case Number						9.0				12.0		2.0		4.0		2.0		3.0	
Phase Duration, s						26.0				12.0		9.9		142.0		0.0		132.1	
Change Period, (Y+R _c), s						6.0				6.0		6.5		5.9		6.5		5.9	
Max Allow Headway (MAH), s						4.0				3.1		4.0		0.0		0.0		0.0	
Queue Clearance Time (g _e), s										2.7		3.6							
Green Extension Time (g _e), s						0.0				0.0		0.0		0.0		0.0		0.0	
Phase Call Probability										1.00		0.56							
Max Out Probability										0.00		0.00							
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7		14	3	8	18	5	2	12	1	6	16				
Adjusted Flow Rate (v), veh/h				188		49		7		16	630	629	0	1846	153				
Adjusted Saturation Flow Rate (s), veh/h/ln				1757		1610		1690		1810	1885	1884	1810	1781	1598				
Queue Service Time (g _s), s				9.0		4.9		0.7		1.6	19.9	19.9	0.0	61.1	3.8				
Cycle Queue Clearance Time (g _c), s				9.0		4.9		0.7		1.6	19.9	19.9	0.0	61.1	3.8				
Green Ratio (g/C)				0.11		0.13		0.03		0.65	0.76	0.76		0.70	0.81				
Capacity (c), veh/h				390		209		56		34	1425	1425	1	2497	1298				
Volume-to-Capacity Ratio (X)				0.481		0.234		0.127		0.486	0.442	0.442	0.000	0.739	0.118				
Back of Queue (Q), ft/ln (95 th percentile)				183.7		91.7		14.6		37.6	268.5	266.1	0	788.8	48.1				
Back of Queue (Q), veh/ln (95 th percentile)				7.3		3.7		0.6		1.5	10.7	10.6	0.0	31.1	1.9				
Queue Storage Ratio (RQ) (95 th percentile)				0.46		1.53		0.00		0.15	0.00	0.00	0.00	0.00	0.16				
Uniform Delay (d ₁), s/veh				75.1		70.3		84.5		88.8	6.9	6.9	0.0	19.0	3.7				
Incremental Delay (d ₂), s/veh				0.9		0.6		0.4		7.5	0.7	0.7	0.0	1.5	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				
Control Delay (d), s/veh				76.0		70.9		84.8		96.3	7.6	7.6	0.0	20.5	3.8				
Level of Service (LOS)				E		E		F		F	A	A		C	A				
Approach Delay, s/veh / LOS				75.0		E		84.8		F	8.8	A		19.2	B				
Intersection Delay, s/veh / LOS				19.3									B						
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.33		B	2.49		B	1.64		B	2.07		B				
Bicycle LOS Score / LOS						F	0.50		A	1.53		B	2.19		B				

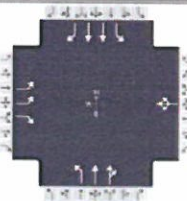
Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other												
Jurisdiction		Time Period	PM Peak			PHF	0.98												
Urban Street	Preston Highway		Analysis Year	2022 No Build		Analysis Period	1 > 4:45												
Intersection	Interchange Dr		File Name	PM 22 NB Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB		SB							
Approach Movement				L	T	R	L	T	R	L	T	R							
Demand (v), veh/h				185		48	3	0	4	16	1228	2	0	1876	156				
Signal Information																			
Cycle, s	180.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	3.4	126.2	20.0	6.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	4.3	3.6	3.6	0.0	0.0									
				Red	3.0	1.6	2.4	2.4	0.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						4				8		5		2		1		6	
Case Number						9.0				12.0		2.0		4.0		2.0		3.0	
Phase Duration, s						26.0				12.0		9.9		142.0		0.0		132.1	
Change Period, (Y+R _c), s						6.0				6.0		6.5		5.9		6.5		5.9	
Max Allow Headway (MAH), s						4.0				3.3		4.0		0.0		0.0		0.0	
Queue Clearance Time (g _s), s										2.7		3.6							
Green Extension Time (g _e), s						0.0				0.0		0.0		0.0		0.0		0.0	
Phase Call Probability										1.00		0.56							
Max Out Probability										0.00		0.00							
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7		14	3	8	18	5	2	12	1	6	16				
Adjusted Flow Rate (v), veh/h				189		49		7		16	633	632	0	1855	154				
Adjusted Saturation Flow Rate (s), veh/h/ln				1757		1610		1690		1810	1885	1884	1810	1781	1598				
Queue Service Time (g _s), s				9.1		4.9		0.7		1.6	19.9	19.9	0.0	61.7	3.8				
Cycle Queue Clearance Time (g _c), s				9.1		4.9		0.7		1.6	19.9	19.9	0.0	61.7	3.8				
Green Ratio (g/C)				0.11		0.13		0.03		0.65	0.76	0.76		0.70	0.81				
Capacity (c), veh/h				390		209		56		34	1425	1425	1	2497	1298				
Volume-to-Capacity Ratio (X)				0.483		0.234		0.127		0.486	0.444	0.444	0.000	0.743	0.119				
Back of Queue (Q), ft/ln (95 th percentile)				184.7		91.7		14.9		37.5	266.6	264.3	0	795.8	48.5				
Back of Queue (Q), veh/ln (95 th percentile)				7.4		3.7		0.6		1.5	10.6	10.6	0.0	31.3	1.9				
Queue Storage Ratio (RQ) (95 th percentile)				0.46		1.53		0.00		0.15	0.00	0.00	0.00	0.00	0.16				
Uniform Delay (d ₁), s/veh				75.1		70.3		84.5		88.8	6.9	6.9	0.0	19.1	3.7				
Incremental Delay (d ₂), s/veh				0.9		0.6		0.4		7.5	0.7	0.7	0.0	1.5	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				
Control Delay (d), s/veh				76.1		70.9		84.8		96.3	7.6	7.6	0.0	20.6	3.8				
Level of Service (LOS)				E		E		F		F	A	A		C	A				
Approach Delay, s/veh / LOS				75.0		E		84.8		F	A	A		19.3	B				
Intersection Delay, s/veh / LOS				19.4			B												
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.33		B	2.49		B	1.64		B	2.07		B				
Bicycle LOS Score / LOS						F	0.50		A	1.54		B	2.20		B				

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other												
Jurisdiction		Time Period	PM Peak			PHF	0.98												
Urban Street	Preston Highway		Analysis Year	2022 Build		Analysis Period	1> 4:45												
Intersection	Interchange Dr		File Name	PM 22 B Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB		SB							
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				174	25	48	185	14	4	16	1233	91	121	1783	156				
Signal Information																			
Cycle, s	180.0	Reference Phase	2																
Offset, s	0	Reference Point	End	Green	3.4	4.1	96.6	24.0	21.0	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	1.6	2.4	2.4	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						4				8		5		2		1		6	
Case Number						9.0				10.0		2.0		4.0		2.0		3.0	
Phase Duration, s						30.0				27.0		9.9		102.5		20.5		113.1	
Change Period, (Y+R _c), s						6.0				6.0		6.5		5.9		6.5		5.9	
Max Allow Headway (MAH), s						4.0				3.0		4.0		0.0		3.0		0.0	
Queue Clearance Time (g _s), s						19.0				20.5		3.6				13.9			
Green Extension Time (g _e), s						0.6				0.3		0.0		0.0		0.1		0.0	
Phase Call Probability						1.00				1.00		0.56				1.00			
Max Out Probability						0.02				0.00		0.00				0.00			
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16				
Adjusted Flow Rate (v), veh/h				178	26	49	189	18		16	689	675	120	1762	154				
Adjusted Saturation Flow Rate (s), veh/h/ln				1810	1900	1610	1810	1827		1810	1885	1839	1810	1781	1598				
Queue Service Time (g _s), s				17.0	2.1	4.8	18.5	1.6		1.6	44.9	43.9	11.9	70.3	4.4				
Cycle Queue Clearance Time (g _c), s				17.0	2.1	4.8	18.5	1.6		1.6	44.9	43.9	11.9	70.3	4.4				
Green Ratio (g/C)				0.13	0.13	0.15	0.12	0.12		0.02	0.54	0.54	0.08	0.60	0.73				
Capacity (c), veh/h				241	253	245	211	213		34	1012	987	141	2121	1165				
Volume-to-Capacity Ratio (X)				0.736	0.101	0.200	0.894	0.086		0.487	0.681	0.684	0.850	0.831	0.132				
Back of Queue (Q), ft/ln (95 th percentile)				325.3	46.5	88.9	351.7	33.9		37.1	634.7	591.6	236.1	917.7	62				
Back of Queue (Q), veh/ln (95 th percentile)				13.0	1.9	3.6	14.1	1.4		1.5	25.2	23.7	9.4	36.1	2.5				
Queue Storage Ratio (RQ) (95 th percentile)				0.81	0.00	1.48	0.00	0.00		0.15	0.00	0.00	2.36	0.00	0.21				
Uniform Delay (d ₁), s/veh				75.0	68.5	66.7	78.4	70.9		88.2	26.1	24.5	88.1	27.7	6.0				
Incremental Delay (d ₂), s/veh				7.6	0.2	0.4	10.4	0.1		6.9	2.4	2.5	4.0	2.9	0.2				
Initial Queue Delay (d ₃), s/veh				0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0				
Control Delay (d), s/veh				82.5	68.7	67.1	88.8	71.0		95.0	28.6	27.0	92.1	30.6	6.2				
Level of Service (LOS)				F	E	E	F	E		F	C	C	F	C	A				
Approach Delay, s/veh / LOS				78.1		E	87.3		F	28.6		C	32.4		G				
Intersection Delay, s/veh / LOS				37.0					D										
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.33		B	2.49		B	1.92		B	2.10		B				
Bicycle LOS Score / LOS				0.90		A	0.83		A	1.62		B	2.22		B				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information															
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250														
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other														
Jurisdiction		Time Period	PM Peak	PHF	0.98														
Urban Street	Preston Highway	Analysis Year	2032 No Build	Analysis Period	1> 4:45														
Intersection	Interchange Dr	File Name	PM 32 NB Preston.xus																
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement		L	T	R	L	T	R	L	T	R	L	T	R						
Demand (v), veh/h		194		50	3	0	4	17	1291	2	0	1972	164						
Signal Information																			
Cycle, s	180.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	3.5	128.1	20.0	6.4	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	4.3	3.6	3.6	0.0	0.0									
				Red	3.0	1.6	2.4	0.0	0.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase				4		8		5		2		1		6					
Case Number				9.0		12.0		2.0		4.0		2.0		3.0					
Phase Duration, s				26.0		10.0		10.0		144.0		0.0		134.0					
Change Period, (Y+R _c), s				6.0		4.0		6.5		5.9		3.5		5.9					
Max Allow Headway (MAH), s				4.0		3.3		4.0		0.0		0.0		0.0					
Queue Clearance Time (g _s), s						2.7		3.7											
Green Extension Time (g _e), s				0.0		0.0		0.0		0.0		0.0		0.0					
Phase Call Probability						1.00		0.58											
Max Out Probability						0.00		0.00											
Movement Group Results				EB			WB			NB			SB						
Approach Movement		L	T	R	L	T	R	L	T	R	L	T	R						
Assigned Movement		7		14	3	8	18	5	2	12	1	6	16						
Adjusted Flow Rate (v), veh/h		198		51		7		17	665	665	0	1948	162						
Adjusted Saturation Flow Rate (s), veh/h/ln		1757		1610		1690		1810	1885	1884	1810	1781	1598						
Queue Service Time (g _s), s		9.6		5.1		0.7		1.7	19.7	19.7	0.0	65.9	3.8						
Cycle Queue Clearance Time (g _c), s		9.6		5.1		0.7		1.7	19.7	19.7	0.0	65.9	3.8						
Green Ratio (g/C)		0.11		0.13		0.03		0.65	0.77	0.77		0.71	0.82						
Capacity (c), veh/h		390		210		56		35	1446	1446	1	2534	1314						
Volume-to-Capacity Ratio (X)		0.507		0.243		0.127		0.497	0.460	0.460	0.000	0.769	0.123						
Back of Queue (Q), ft/ln (95 th percentile)		193.2		95.6		14.9		39.6	250.6	248.4	0	832.3	47.6						
Back of Queue (Q), veh/ln (95 th percentile)		7.7		3.8		0.6		1.6	9.9	9.9	0.0	32.8	1.9						
Queue Storage Ratio (RQ) (95 th percentile)		0.48		1.59		0.00		0.16	0.00	0.00	0.00	0.00	0.16						
Uniform Delay (d ₁), s/veh		75.4		70.3		84.5		88.6	6.0	6.0	0.0	18.8	3.4						
Incremental Delay (d ₂), s/veh		1.0		0.6		0.4		7.0	0.7	0.7	0.0	1.6	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						
Control Delay (d), s/veh		76.4		70.9		84.8		95.7	6.7	6.7	0.0	20.4	3.5						
Level of Service (LOS)		E		E		F		F	A	A		C	A						
Approach Delay, s/veh / LOS		75.2		E		84.8		F	7.9	A		19.1	B						
Intersection Delay, s/veh / LOS						18.9							B						
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS		2.34		B		2.49		B		1.64		B		2.07		B			
Bicycle LOS Score / LOS				F		0.50		A		1.59		B		2.29		B			

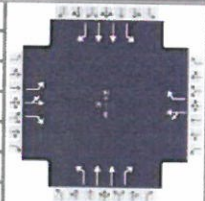
Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary																			
General Information						Intersection Information													
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250												
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other												
Jurisdiction		Time Period	PM Peak			PHF	0.98												
Urban Street	Preston Highway		Analysis Year	2032 Build		Analysis Period	1> 4:45												
Intersection	Interchange Dr		File Name	PM 32 B Preston.xus															
Project Description	Stern																		
Demand Information				EB			WB			NB		SB							
Approach Movement				L	T	R	L	T	R	L	T	R							
Demand (v), veh/h				183	25	50	168	14	4	17	1296	93	144	1877	164				
Signal Information																			
Cycle, s	180.0	Reference Phase	2																
Offset, s	0	Reference Point	End	Green	3.5	6.2	92.5	25.0	22.0	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	1.6	2.4	2.4	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						4				8		5		2		1		6	
Case Number						9.0				10.0		2.0		4.0		2.0		3.0	
Phase Duration, s						31.0				28.0		10.0		98.4		22.6		111.0	
Change Period, (Y+Rc), s						6.0				6.0		6.5		5.9		6.5		5.9	
Max Allow Headway (MAH), s						4.0				3.0		4.0		0.0		3.0		0.0	
Queue Clearance Time (gs), s						19.8				18.5		3.7				16.0			
Green Extension Time (ge), s						0.6				0.2		0.0		0.0		0.2		0.0	
Phase Call Probability						1.00				1.00		0.58				1.00			
Max Out Probability						0.04				0.00		0.00				0.00			
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16				
Adjusted Flow Rate (v), veh/h				187	26	51	171	18		17	718	704	141	1836	160				
Adjusted Saturation Flow Rate (s), veh/h/ln				1810	1900	1610	1810	1827		1810	1885	1840	1810	1781	1598				
Queue Service Time (gs), s				17.8	2.1	5.0	16.5	1.6		1.7	51.0	50.2	14.0	78.5	4.6				
Cycle Queue Clearance Time (gc), s				17.8	2.1	5.0	16.5	1.6		1.7	51.0	50.2	14.0	78.5	4.6				
Green Ratio (g/C)				0.14	0.14	0.16	0.12	0.12		0.02	0.51	0.51	0.09	0.58	0.72				
Capacity (c), veh/h				251	264	255	221	223		35	968	945	162	2080	1155				
Volume-to-Capacity Ratio (X)				0.743	0.097	0.200	0.775	0.082		0.496	0.741	0.745	0.868	0.883	0.139				
Back of Queue (Q), ft/ln (95 th percentile)				340.3	46.2	92	308.7	33.6		38.9	714	670.6	269.4	1011.6	64.8				
Back of Queue (Q), veh/ln (95 th percentile)				13.6	1.8	3.7	12.3	1.3		1.6	28.3	26.8	10.8	39.8	2.6				
Queue Storage Ratio (RQ) (95 th percentile)				0.85	0.00	1.53	0.00	0.00		0.16	0.00	0.00	2.69	0.00	0.22				
Uniform Delay (d1), s/veh				74.4	67.6	65.9	76.6	70.0		88.1	29.8	28.0	88.2	30.0	6.1				
Incremental Delay (d2), s/veh				8.4	0.2	0.4	3.0	0.1		6.4	3.1	3.3	3.7	4.1	0.2				
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				
Control Delay (d), s/veh				82.8	67.8	66.2	79.6	70.1		94.5	32.9	31.3	91.9	34.1	6.3				
Level of Service (LOS)				F	E	E	E	E		F	C	C	F	C	A				
Approach Delay, s/veh / LOS				78.2		E		78.7		E		32.8		C		35.8		D	
Intersection Delay, s/veh / LOS				39.6						D									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.33	B		2.49	B		1.92	B		2.10	B					
Bicycle LOS Score / LOS				0.92	A		0.80	A		1.67	B		2.33	B					

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other		
Jurisdiction		Time Period	AM Peak	PHF	0.93		
Urban Street	Preston Highway	Analysis Year	2021	Analysis Period	1 > 7:15		
Intersection	Mt Washington Rd	File Name	AM 21 Preston.xus				
Project Description	Stern						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	290	32	22	43	58	349	29	685	34	141	395	199

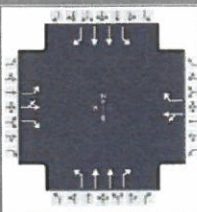
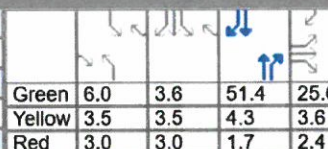
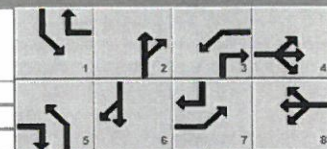
Signal Information				Signal Timing (s)								Signal Phases			
Cycle, s	150.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	Off	Green	6.0	3.1	52.0	25.0	33.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.5	3.5	4.3	3.6	3.6	0.0					
				Red	3.0	3.0	1.7	2.4	2.4	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		31.0		39.0	12.5	58.0	22.1	67.5
Change Period, (Y+Rc), s		6.0		6.0	6.5	6.0	6.5	6.0
Max Allow Headway (MAH), s		5.1		3.3	4.0	0.0	3.0	0.0
Queue Clearance Time (gs), s				33.5	4.5		15.4	
Green Extension Time (ge), s		0.0		0.0	0.0	0.0	0.2	0.0
Phase Call Probability				1.00	1.00		1.00	
Max Out Probability				1.00	0.00		0.00	

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	172	175	24	109	375	31	737	37	153	430	216	216
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1807	1610	1846	1585	1810	1752	1459	1697	1738	1522	1522
Queue Service Time (gs), s	13.2	13.4	1.8	7.3	31.5	2.5	26.1	1.7	13.4	12.7	10.5	10.5
Cycle Queue Clearance Time (gc), s	13.2	13.4	1.8	7.3	31.5	2.5	26.1	1.7	13.4	12.7	10.5	10.5
Green Ratio (g/C)	0.17	0.17	0.21	0.22	0.32	0.04	0.35	0.57	0.10	0.41	0.58	0.58
Capacity (c), veh/h	299	301	333	406	513	72	1214	827	176	1425	878	878
Volume-to-Capacity Ratio (X)	0.573	0.580	0.071	0.267	0.732	0.431	0.607	0.044	0.872	0.301	0.247	0.247
Back of Queue (Q), ft/ln (95th percentile)	259.1	267.4	32.8	154.6	479.8	55.3	434	27.5	260.1	235.3	173.9	173.9
Back of Queue (Q), veh/ln (95th percentile)	10.3	10.4	1.3	6.1	18.9	2.2	16.8	1.0	9.8	9.0	6.6	6.6
Queue Storage Ratio (RQ) (95th percentile)	1.04	0.89	0.16	0.77	0.00	0.26	0.00	0.20	0.36	0.00	0.99	0.99
Uniform Delay (d1), s/veh	57.6	57.7	47.9	48.5	45.0	70.3	40.6	14.5	66.0	30.5	15.7	15.7
Incremental Delay (d2), s/veh	2.5	2.5	0.1	0.1	4.7	4.0	2.3	0.1	5.0	0.5	0.6	0.6
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	60.0	60.2	48.0	48.6	49.6	74.3	42.8	14.6	70.9	31.0	16.3	16.3
Level of Service (LOS)	E	E	D		D	D	E	D	B	E	C	B
Approach Delay, s/veh / LOS	59.3		E	49.4		D	42.8		D	34.7		C
Intersection Delay, s/veh / LOS	43.9						42.8			D		

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.46		B	2.49		B	1.94		B	2.12		B
Bicycle LOS Score / LOS	1.10		A	1.29		A	1.15		A	1.14		A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information																							
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250																						
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other																						
Jurisdiction		Time Period	AM Peak	PHF	0.93																						
Urban Street	Preston Highway	Analysis Year	2022 No Build	Analysis Period	1 > 7:15																						
Intersection	Mt Washington Rd	File Name	AM 22 NB Preston.xus																								
Project Description	Stern																										
Demand Information				EB			WB			NB			SB														
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R															
Demand (v), veh/h	291	32	22	43	58	351	29	688	34	142	397	200															
Signal Information																											
Cycle, s	150.0	Reference Phase	2	Green	6.0	3.6	51.4	25.0	33.0	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	Off	Red	3.0	3.0	1.7	2.4	2.4	0.0																	
Force Mode	Fixed	Simult. Gap N/S	On																								
Timer Results				EBL			EBT			WBL			WBT			NBL			NBT			SBL			SBT		
Assigned Phase																											
Case Number																											
Phase Duration, s																											
Change Period, (Y+R _c), s																											
Max Allow Headway (MAH), s																											
Queue Clearance Time (g _s), s																											
Green Extension Time (g _e), s																											
Phase Call Probability																											
Max Out Probability																											
Movement Group Results				EB			WB			NB			SB														
Approach Movement	L	T	R	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	172	175	24		109	377	31	740	37	154	431	217															
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1807	1610		1846	1585	1810	1752	1459	1697	1738	1522															
Queue Service Time (g _s), s	13.3	13.4	1.8		7.3	31.5	2.5	26.4	1.7	13.4	12.7	10.6															
Cycle Queue Clearance Time (g _c), s	13.3	13.4	1.8		7.3	31.5	2.5	26.4	1.7	13.4	12.7	10.6															
Green Ratio (g/C)	0.17	0.17	0.21		0.22	0.33	0.04	0.34	0.56	0.11	0.41	0.58															
Capacity (c), veh/h	299	301	333		406	519	72	1202	821	182	1425	878															
Volume-to-Capacity Ratio (X)	0.575	0.582	0.071		0.267	0.728	0.431	0.616	0.045	0.848	0.303	0.247															
Back of Queue (Q), ft/ln (95 th percentile)	259.8	268.2	32.8		156.5	484.8	56.8	438.9	27.8	277.2	235.8	174.5															
Back of Queue (Q), veh/ln (95 th percentile)	10.3	10.5	1.3		6.2	19.1	2.3	17.0	1.0	10.4	9.1	6.6															
Queue Storage Ratio (RQ) (95 th percentile)	1.04	0.89	0.16		0.78	0.00	0.26	0.00	0.20	0.38	0.00	1.00															
Uniform Delay (d ₁), s/veh	57.6	57.7	47.9		48.5	44.6	70.3	41.1	14.7	65.7	30.5	15.7															
Incremental Delay (d ₂), s/veh	2.5	2.5	0.1		0.5	5.5	5.7	2.4	0.1	13.7	0.5	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															
Control Delay (d), s/veh	60.1	60.2	48.0		49.0	50.1	76.0	43.4	14.8	79.4	31.0	16.3															
Level of Service (LOS)	E	E	D		D	D	E	D	B	E	C	B															
Approach Delay, s/veh / LOS	59.4		E		49.9		D		43.4		D		36.3		D												
Intersection Delay, s/veh / LOS				44.8						D																	
Multimodal Results				EB			WB			NB			SB														
Pedestrian LOS Score / LOS	2.46		B	2.49		B	1.94		B	2.12		B															
Bicycle LOS Score / LOS	1.10		A	1.29		A	1.15		A	1.14		A															

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other								
Jurisdiction		Time Period	AM Peak			PHF	0.93								
Urban Street	Preston Highway		Analysis Year	2022 Build		Analysis Period	1 > 7:15								
Intersection	Mt Washington Rd		File Name	AM 22 B Preston.xus											
Project Description	Stern														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				307	32	22	43	58	382	29	749	34	172	460	216
Signal Information															
Cycle, s	150.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	Off	Green	6.0	5.9	49.1	25.0	33.0	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	1.7	2.4	2.4	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8	5	2	1	6				
Case Number					9.0		11.0	2.0	3.0	2.0	3.0				
Phase Duration, s					31.0		39.0	12.5	55.1	24.9	67.5				
Change Period, (Y+Rc), s					6.0		6.0	6.5	6.0	6.5	6.0				
Max Allow Headway (MAH), s					5.1		5.3	5.0	0.0	5.0	0.0				
Queue Clearance Time (gs), s							35.0	4.5		17.5					
Green Extension Time (ge), s					0.0		0.0	0.0	0.0	0.9	0.0				
Phase Call Probability							1.00	1.00		1.00					
Max Out Probability							1.00	0.01		0.00					
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h				182	183	24	109	411	31	805	37	187	501	235	
Adjusted Saturation Flow Rate (s), veh/h/in				1795	1807	1610	1846	1585	1810	1752	1459	1697	1738	1522	
Queue Service Time (gs), s				14.1	14.1	1.8	7.3	33.0	2.5	30.1	1.7	15.5	15.2	10.3	
Cycle Queue Clearance Time (gc), s				14.1	14.1	1.8	7.3	33.0	2.5	30.1	1.7	15.5	15.2	10.3	
Green Ratio (g/C)				0.17	0.17	0.21	0.22	0.34	0.04	0.33	0.55	0.12	0.41	0.58	
Capacity (c), veh/h				299	301	333	406	543	72	1148	799	208	1425	878	
Volume-to-Capacity Ratio (X)				0.607	0.608	0.071	0.267	0.757	0.431	0.702	0.046	0.901	0.351	0.268	
Back of Queue (Q), ft/in (95 th percentile)				273.9	280	32.8	156.5	524.8	56.8	495.7	29	239.8	267.7	154.3	
Back of Queue (Q), veh/in (95 th percentile)				10.9	10.9	1.3	6.2	20.7	2.3	19.2	1.1	9.0	10.3	5.8	
Queue Storage Ratio (RQ) (95 th percentile)				1.10	0.93	0.16	0.78	0.00	0.26	0.00	0.21	0.33	0.00	0.88	
Uniform Delay (d1), s/veh				57.9	58.0	47.9	48.5	43.8	70.3	44.0	15.7	43.8	31.4	13.4	
Incremental Delay (d2), s/veh				3.1	3.1	0.1	0.5	6.5	5.7	3.6	0.1	15.9	0.6	0.7	
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	
Control Delay (d), s/veh				61.0	61.1	48.0	49.0	50.2	76.0	47.6	15.9	59.7	32.0	14.1	
Level of Service (LOS)				E	E	D	D	D	E	D	B	E	C	B	
Approach Delay, s/veh / LOS				60.3	E	50.0	D	47.3	D	33.0	C				
Intersection Delay, s/veh / LOS				44.8			D								
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.46	B	2.49	B	1.94	B	2.12	B				
Bicycle LOS Score / LOS				1.13	A	1.34	A	1.21	A	1.24	A				

HCS7 Signalized Intersection Results Summary														
General Information						Intersection Information								
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250							
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other							
Jurisdiction		Time Period	AM Peak			PHF	0.93							
Urban Street	Preston Highway		Analysis Year	2032 No Build		Analysis Period	1> 7:15							
Intersection	Mt Washington Rd		File Name	AM 32 NB Preston.xus										
Project Description	Stern													
Demand Information				EB			WB			NB		SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R		
Demand (v), veh/h	306	34	23	45	61	369	30	723	36	149	417	210		
Signal Information														
Cycle, s	150.0	Reference Phase	2	Green	6.0	3.8	51.2	25.0	33.0	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	Off	Red	3.0	3.0	1.7	2.4	2.4	0.0				
Force Mode	Fixed	Simult. Gap N/S	On											
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT			
Assigned Phase			4			8		5	2	1	6			
Case Number			9.0			11.0		2.0	3.0	2.0	3.0			
Phase Duration, s			31.0			39.0		12.5	57.2	22.8	67.5			
Change Period, (Y+Rc), s			6.0			6.0		6.5	6.0	6.5	6.0			
Max Allow Headway (MAH), s			5.1			3.3		4.0	0.0	3.0	0.0			
Queue Clearance Time (gs), s						35.0		4.6		16.1				
Green Extension Time (ge), s			0.0			0.0		0.0	0.0	0.2	0.0			
Phase Call Probability						1.00		1.00		1.00				
Max Out Probability						1.00		0.00		0.00				
Movement Group Results				EB			WB			NB		SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R		
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16		
Adjusted Flow Rate (v), veh/h	181	185	25		114	397	32	777	39	162	453	228		
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1807	1610		1846	1585	1810	1752	1459	1697	1738	1522		
Queue Service Time (gs), s	14.0	14.2	1.9		7.7	33.0	2.6	28.2	1.8	14.1	13.5	11.2		
Cycle Queue Clearance Time (gc), s	14.0	14.2	1.9		7.7	33.0	2.6	28.2	1.8	14.1	13.5	11.2		
Green Ratio (g/C)	0.17	0.17	0.21		0.22	0.33	0.04	0.34	0.56	0.11	0.41	0.58		
Capacity (c), veh/h	299	301	333		406	521	72	1196	819	185	1425	878		
Volume-to-Capacity Ratio (X)	0.605	0.613	0.074		0.281	0.761	0.446	0.650	0.047	0.877	0.318	0.260		
Back of Queue (Q), ft/ln (95 th percentile)	272.9	282.5	34.3		162.7	511.3	57.3	465.1	29.6	272.3	247.1	186.5		
Back of Queue (Q), veh/ln (95 th percentile)	10.8	11.0	1.4		6.5	20.1	2.3	18.0	1.1	10.2	9.5	7.1		
Queue Storage Ratio (RQ) (95 th percentile)	1.09	0.94	0.17		0.81	0.00	0.27	0.00	0.21	0.38	0.00	1.07		
Uniform Delay (d1), s/veh	57.9	58.0	47.9		48.6	45.1	70.4	41.8	14.8	65.9	30.8	15.9		
Incremental Delay (d2), s/veh	3.1	3.2	0.1		0.1	5.9	4.2	2.7	0.1	4.9	0.6	0.7		
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		
Control Delay (d), s/veh	61.0	61.2	48.1		48.8	50.9	74.6	44.6	14.9	70.9	31.4	16.6		
Level of Service (LOS)	E	E	D		D	D	E	D	B	E	C	B		
Approach Delay, s/veh / LOS	60.3		E		50.5		D		44.4		D	34.9	C	
Intersection Delay, s/veh / LOS	44.9						D							
Multimodal Results				EB			WB			NB		SB		
Pedestrian LOS Score / LOS	2.46		B	2.49		B	1.94		B	2.12		B		
Bicycle LOS Score / LOS	1.13		A	1.33		A	1.19		A	1.18		A		

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary

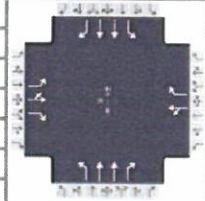
General Information												Intersection Information												
Agency	Diane B. Zimmerman Traffic Engineering						Duration, h	0.250																
Analyst	DBZ		Analysis Date	Jun 2, 2021		Area Type	Other																	
Jurisdiction			Time Period	AM Peak		PHF	0.93																	
Urban Street	Preston Highway		Analysis Year	2032 Build		Analysis Period	1> 7:15																	
Intersection	Mt Washington Rd		File Name	AM 32 B Preston.xus																				
Project Description	Stern																							
Demand Information																								
Approach Movement	EB			WB			NB			SB														
Demand (v), veh/h	L	T	R	L	T	R	L	T	R	L	T	R												
	322	34	23	45	61	400	30	784	36	179	480	225												
Signal Information																								
Cycle, s	150.0	Reference Phase	2																					
Offset, s	0	Reference Point	End																					
Uncoordinated	No	Simult. Gap E/W	Off		Green	6.0	6.5	48.5	25.0	33.0	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	1.7	2.4	2.4	0.0													
Timer Results																								
Assigned Phase	EBL			EBT			WBL			WBT			NBL			NBT			SBL			SBT		
Case Number				9.0						11.0			2.0			3.0			2.0			3.0		
Phase Duration, s				31.0						39.0			12.5			54.5			25.5			67.5		
Change Period, (Y+Rc), s				6.0						6.0			6.5			6.0			6.5			6.0		
Max Allow Headway (MAH), s				5.1						5.3			5.0			0.0			5.0			0.0		
Queue Clearance Time (gs), s										35.0			4.6						18.2					
Green Extension Time (ge), s				0.0						0.0			0.0			0.0			0.9			0.0		
Phase Call Probability										1.00			1.00						1.00					
Max Out Probability										1.00			0.01						0.00					
Movement Group Results																								
Approach Movement	EB			WB			NB			SB														
Assigned Movement	L	T	R	L	T	R	L	T	R	L	T	R												
Adjusted Flow Rate (v), veh/h	190	192	25		114	430	32	843	39	195	523	245												
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1807	1610		1846	1585	1810	1752	1459	1697	1738	1522												
Queue Service Time (gs), s	14.8	14.9	1.9		7.7	33.0	2.6	32.2	1.9	16.2	15.6	10.6												
Cycle Queue Clearance Time (gc), s	14.8	14.9	1.9		7.7	33.0	2.6	32.2	1.9	16.2	15.6	10.6												
Green Ratio (g/C)	0.17	0.17	0.21		0.22	0.35	0.04	0.32	0.54	0.13	0.41	0.58												
Capacity (c), veh/h	299	301	333		406	550	72	1132	793	215	1425	878												
Volume-to-Capacity Ratio (X)	0.636	0.639	0.074		0.281	0.782	0.446	0.745	0.049	0.905	0.367	0.279												
Back of Queue (Q), ft/ln (95 th percentile)	287.5	294.6	34.3		164.7	554.2	58.9	527.7	31.1	244.7	271.4	154.7												
Back of Queue (Q), veh/ln (95 th percentile)	11.4	11.5	1.4		6.5	21.8	2.4	20.5	1.1	9.2	10.4	5.9												
Queue Storage Ratio (RQ) (95 th percentile)	1.15	0.98	0.17		0.82	0.00	0.27	0.00	0.22	0.34	0.00	0.88												
Uniform Delay (d1), s/veh	58.3	58.3	47.9		48.6	43.9	70.4	45.3	16.1	43.1	30.7	13.0												
Incremental Delay (d2), s/veh	3.9	3.9	0.1		0.5	7.6	6.0	4.5	0.1	15.8	0.6	0.7												
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												
Control Delay (d), s/veh	62.1	62.2	48.1		49.2	51.5	76.4	49.7	16.2	58.9	31.3	13.7												
Level of Service (LOS)	E			E			D			D			D											
Approach Delay, s/veh / LOS	61.3			E			51.0			D			49.2			D								
Intersection Delay, s/veh / LOS				45.6									D											
Multimodal Results																								
Pedestrian LOS Score / LOS	2.46			B			2.49			B			1.94			B								
Bicycle LOS Score / LOS	1.16			A			1.39			A			1.24			A								

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other								
Jurisdiction		Time Period	PM Peak			PHF	0.97								
Urban Street	Preston Highway		Analysis Year	2021		Analysis Period	1> 4:45								
Intersection	Mt Washington Rd		File Name	PM 21 Preston.xus											
Project Description	Stern														
Demand Information				EB			WB			NB		SB			
Approach Movement				L	T	R	L	T	R	L	T	R			
Demand (v), veh/h				268	181	65	70	127	251	48	718	98	411	1007	489
Signal Information															
Cycle, s	180.0	Reference Phase	2	Green	13.0	22.4	59.8	29.0	24.8	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	Off	Red	3.0	3.0	1.7	2.4	2.4	0.0					
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8	5	2	1	6				
Case Number					9.0		11.0	2.0	3.0	2.0	3.0				
Phase Duration, s					35.0		30.8	19.5	65.8	48.4	94.7				
Change Period, (Y+Rc), s					6.0		6.0	6.5	6.0	6.5	6.0				
Max Allow Headway (MAH), s					5.1		4.2	4.0	0.0	4.0	0.0				
Queue Clearance Time (gs), s							23.9	6.7		41.7					
Green Extension Time (ge), s					0.0		0.9	0.1	0.0	0.2	0.0				
Phase Call Probability							1.00	1.00		1.00					
Max Out Probability							0.71	0.00		1.00					
Movement Group Results				EB			WB			NB		SB			
Approach Movement				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				221	242	67		203	259	49	740	101	409	1002	487
Adjusted Saturation Flow Rate (s), veh/h/in				1795	1853	1610		1823	1598	1810	1795	1598	1795	1781	1572
Queue Service Time (gs), s				21.1	22.5	6.0		19.3	21.9	4.7	31.2	6.4	39.7	26.4	20.1
Cycle Queue Clearance Time (gc), s				21.1	22.5	6.0		19.3	21.9	4.7	31.2	6.4	39.7	26.4	20.1
Green Ratio (g/C)				0.17	0.17	0.24		0.14	0.38	0.07	0.33	0.47	0.24	0.49	0.65
Capacity (c), veh/h				299	309	376		261	592	131	1193	751	428	1755	1028
Volume-to-Capacity Ratio (X)				0.739	0.783	0.178		0.778	0.437	0.379	0.620	0.135	0.956	0.571	0.473
Back of Queue (Q), ft/ln (95 th percentile)				399.9	444	112.2		385.4	345.7	100.4	513.6	114.5	587.9	326.3	171.5
Back of Queue (Q), veh/ln (95 th percentile)				15.9	17.5	4.5		15.1	13.7	4.0	20.4	4.5	23.3	12.8	6.7
Queue Storage Ratio (RQ) (95 th percentile)				1.60	1.48	0.56		1.93	0.00	0.47	0.00	0.82	0.81	0.00	0.98
Uniform Delay (d1), s/veh				71.3	71.9	55.2		74.4	42.6	79.6	50.5	27.0	50.5	18.8	8.3
Incremental Delay (d2), s/veh				10.0	13.0	0.3		11.2	0.5	1.8	2.4	0.4	23.5	0.8	1.0
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
Control Delay (d), s/veh				81.3	84.9	55.5		85.6	43.1	81.4	52.9	27.3	74.0	19.6	9.2
Level of Service (LOS)				F	F	E		F	D	F	D	C	E	B	A
Approach Delay, s/veh / LOS				79.7		E	61.8		E	51.6		D	28.7		C
Intersection Delay, s/veh / LOS				45.3						D					
Multimodal Results				EB			WB			NB		SB			
Pedestrian LOS Score / LOS				2.48		B	2.49		B	1.95		B	2.11		B
Bicycle LOS Score / LOS				1.36		A	1.25		A	1.22		A	2.11		B

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other
Jurisdiction		Time Period	PM Peak	PHF	0.97
Urban Street	Preston Highway	Analysis Year	2022 No Build	Analysis Period	1> 4:45
Intersection	Mt Washington Rd	File Name	PM 22 NB Preston.xus		
Project Description	Stern				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	269	182	65	70	128	252	48	722	98	413	1012	491

Signal Information				Signal Timing (s)								Signal Phases			
Cycle, s	180.0	Reference Phase	2	Green	13.0	22.6	59.6	29.0	24.8	0.0	1	2	3	4	
Offset, s	0	Reference Point	End	Yellow	3.5	3.5	4.3	3.6	3.6	0.0	5	6	7	8	
Uncoordinated	No	Simult. Gap E/W	Off	Red	3.0	3.0	1.7	2.4	2.4	0.0					
Force Mode	Fixed	Simult. Gap N/S	On												

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		11.0	2.0	3.0	2.0	3.0
Phase Duration, s		35.0		30.8	19.5	65.6	48.6	94.7
Change Period, (Y+R _c), s		6.0		6.0	6.5	6.0	6.5	6.0
Max Allow Headway (MAH), s		5.1		4.2	4.0	0.0	4.0	0.0
Queue Clearance Time (g _s), s				24.0	6.7		41.9	
Green Extension Time (g _e), s		0.0		0.9	0.1	0.0	0.1	0.0
Phase Call Probability				1.00	1.00		1.00	
Max Out Probability				0.73	0.00		1.00	

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	222	243	67		204	260	49	744	101	411	1007	489
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1853	1610		1823	1598	1810	1795	1598	1795	1781	1572
Queue Service Time (g _s), s	21.1	22.6	6.0		19.4	22.0	4.7	31.5	6.5	39.9	26.6	20.3
Cycle Queue Clearance Time (g _c), s	21.1	22.6	6.0		19.4	22.0	4.7	31.5	6.5	39.9	26.6	20.3
Green Ratio (g/C)	0.17	0.17	0.24		0.14	0.38	0.07	0.33	0.47	0.24	0.49	0.65
Capacity (c), veh/h	299	309	376		262	594	131	1189	750	429	1754	1028
Volume-to-Capacity Ratio (X)	0.741	0.787	0.178		0.780	0.438	0.379	0.626	0.135	0.957	0.574	0.475
Back of Queue (Q), ft/ln (95 th percentile)	401.7	446.8	112.2		387.4	346.3	100.4	517.8	114.8	591	328.6	171.9
Back of Queue (Q), veh/ln (95 th percentile)	15.9	17.6	4.5		15.1	13.7	4.0	20.5	4.6	23.5	12.9	6.7
Queue Storage Ratio (RQ) (95 th percentile)	1.61	1.49	0.56		1.94	0.00	0.47	0.00	0.82	0.82	0.00	0.98
Uniform Delay (d ₁), s/veh	71.3	71.9	55.2		74.3	42.4	79.6	50.8	27.1	50.5	18.8	8.3
Incremental Delay (d ₂), s/veh	10.2	13.3	0.3		11.4	0.5	1.8	2.5	0.4	23.6	0.8	1.0
Initial Queue Delay (d ₃), s/veh	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	81.5	85.3	55.5		85.8	43.0	81.4	53.3	27.4	74.1	19.6	9.3
Level of Service (LOS)	F	F	E		F	D	F	D	C	E	B	A
Approach Delay, s/veh / LOS	79.9		E	61.8		E	51.9		D	28.7		C
Intersection Delay, s/veh / LOS	45.4						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.48	B	2.49	B	1.95	B	2.11	B
Bicycle LOS Score / LOS	1.37	A	1.25	A	1.23	A	2.12	B

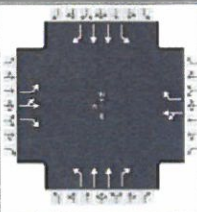
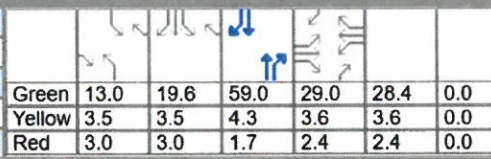
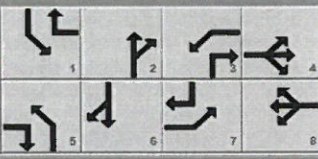
HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other								
Jurisdiction		Time Period	PM Peak			PHF	0.97								
Urban Street	Preston Highway		Analysis Year	2022 Build		Analysis Period	1> 4:45								
Intersection	Mt Washington Rd		File Name	PM 22 B Preston.xus											
Project Description	Stern														
Demand Information				EB			WB			NB		SB			
Approach Movement				L	T	R	L	T	R	L	T	R			
Demand (v), veh/h				283	182	65	70	128	280	48	776	98	440	1067	504
Signal Information															
Cycle, s	180.0	Reference Phase	2	Green	13.0	20.7	59.0	29.0	27.3	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	Off	Red	3.0	3.0	1.7	2.4	2.4	0.0					
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8	5	2	1	6				
Case Number					9.0		11.0	2.0	3.0	2.0	3.0				
Phase Duration, s					35.0		33.3	19.5	65.0	46.7	92.2				
Change Period, (Y+Rc), s					6.0		6.0	6.5	6.0	6.5	6.0				
Max Allow Headway (MAH), s					5.1		4.2	4.0	0.0	4.0	0.0				
Queue Clearance Time (gs), s							26.8	6.7		43.2					
Green Extension Time (ge), s					0.0		0.5	0.0	0.0	0.0	0.0				
Phase Call Probability							1.00	1.00		1.00					
Max Out Probability							1.00	0.00		1.00					
Movement Group Results				EB			WB			NB		SB			
Approach Movement				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				233	246	67		204	289	49	800	101	438	1061	501
Adjusted Saturation Flow Rate (s), veh/h/ln				1795	1853	1610		1823	1598	1810	1795	1598	1795	1781	1572
Queue Service Time (gs), s				22.4	23.0	6.0		19.1	24.8	4.7	34.7	6.3	41.2	27.4	16.8
Cycle Queue Clearance Time (gc), s				22.4	23.0	6.0		19.1	24.8	4.7	34.7	6.3	41.2	27.4	16.8
Green Ratio (g/C)				0.17	0.17	0.24		0.16	0.38	0.07	0.33	0.48	0.23	0.48	0.64
Capacity (c), veh/h				299	309	376		287	599	131	1177	766	411	1706	1006
Volume-to-Capacity Ratio (X)				0.780	0.797	0.178		0.712	0.482	0.379	0.680	0.132	1.065	0.622	0.498
Back of Queue (Q), ft/ln (95th percentile)				427.8	453.8	112.2		375.4	383.1	100.4	564.7	112.3	773.1	293.9	123.8
Back of Queue (Q), veh/ln (95th percentile)				17.0	17.9	4.5		14.7	15.2	4.0	22.4	4.5	30.7	11.6	4.8
Queue Storage Ratio (RQ) (95th percentile)				1.71	1.51	0.56		1.88	0.00	0.47	0.00	0.80	1.07	0.00	0.71
Uniform Delay (d1), s/veh				71.8	72.1	55.2		72.0	42.9	79.6	52.3	26.0	68.5	17.2	5.6
Incremental Delay (d2), s/veh				13.1	14.2	0.3		7.7	0.6	1.8	3.2	0.4	49.0	0.8	0.8
Initial Queue Delay (d3), s/veh				0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				84.9	86.3	55.5		79.7	43.5	81.4	55.5	26.4	117.5	18.0	6.4
Level of Service (LOS)				F	F	E		E	D	F	E	C	F	B	A
Approach Delay, s/veh / LOS				81.9	F	58.5	E	53.8	D	36.9	D				
Intersection Delay, s/veh / LOS				49.7					D						
Multimodal Results				EB			WB			NB		SB			
Pedestrian LOS Score / LOS				2.48	B	2.49	B	1.95	B	2.12	B				
Bicycle LOS Score / LOS				1.39	A	1.30	A	1.27	A	2.20	B				

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information				Diagram											
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250														
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other														
Jurisdiction		Time Period	PM Peak	PHF	0.97														
Urban Street	Preston Highway	Analysis Year	2032 No Build	Analysis Period	1> 4:45														
Intersection	Mt Washington Rd	File Name	PM 32 NB Preston.xus																
Project Description	Stern																		
Demand Information				EB			WB			NB			SB						
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R							
Demand (v), veh/h	283	191	68	74	135	265	50	759	103	434	1064	516							
Signal Information																			
Cycle, s	180.0	Reference Phase	2	Green	13.0	22.0	59.0	29.0	26.0	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	Off	Red	3.0	3.0	1.7	2.4	2.4	0.0									
Force Mode	Fixed	Simult. Gap N/S	On																
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase			4		8		5		2		1		6						
Case Number			9.0		11.0		2.0		3.0		2.0		3.0						
Phase Duration, s			35.0		32.0		19.5		65.0		48.0		93.5						
Change Period, (Y+Rc), s			6.0		6.0		6.5		6.0		6.5		6.0						
Max Allow Headway (MAH), s			5.1		4.2		4.0		0.0		4.0		0.0						
Queue Clearance Time (gs), s					25.2		6.9				44.5								
Green Extension Time (ge), s			0.0		0.7		0.1		0.0		0.0		0.0						
Phase Call Probability					1.00		1.00				1.00								
Max Out Probability					1.00		0.00				1.00								
Movement Group Results				EB			WB			NB			SB						
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R							
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16							
Adjusted Flow Rate (v), veh/h	233	255	70	215	273	52	782	106	431	1058	513								
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1853	1610	1823	1598	1810	1795	1598	1795	1781	1572								
Queue Service Time (gs), s	22.4	24.0	6.3	20.5	23.2	4.9	33.7	6.8	42.5	30.3	23.5								
Cycle Queue Clearance Time (gc), s	22.4	24.0	6.3	20.5	23.2	4.9	33.7	6.8	42.5	30.3	23.5								
Green Ratio (g/C)	0.17	0.17	0.24	0.15	0.38	0.07	0.33	0.47	0.24	0.49	0.65								
Capacity (c), veh/h	299	309	376	273	599	131	1178	755	424	1732	1018								
Volume-to-Capacity Ratio (X)	0.780	0.826	0.187	0.789	0.456	0.394	0.664	0.141	1.018	0.611	0.504								
Back of Queue (Q), ft/ln (95th percentile)	427.8	477	117.7	407.7	362.6	104.8	550.5	120.1	679.4	372.9	187.3								
Back of Queue (Q), veh/ln (95th percentile)	17.0	18.8	4.7	15.9	14.4	4.2	21.8	4.8	27.0	14.7	7.3								
Queue Storage Ratio (RQ) (95th percentile)	1.71	1.59	0.59	2.04	0.00	0.49	0.00	0.86	0.94	0.00	1.07								
Uniform Delay (d1), s/veh	71.8	72.5	55.3	73.8	42.5	79.7	52.0	26.8	53.1	20.7	9.4								
Incremental Delay (d2), s/veh	13.1	17.3	0.3	12.6	0.5	1.9	3.0	0.4	38.0	0.9	1.0								
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								
Control Delay (d), s/veh	84.9	89.7	55.6	86.4	43.0	81.7	54.9	27.2	91.1	21.6	10.4								
Level of Service (LOS)	F	F	E	F	D	F	D	C	F	C	B								
Approach Delay, s/veh / LOS	83.5		F	62.1		E	53.3		D	33.7		C							
Intersection Delay, s/veh / LOS	48.8						D												
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS	2.48	B		2.49	B		1.95	B		2.12	B								
Bicycle LOS Score / LOS	1.41	A		1.29	A		1.26	A		2.20	B								

Preston Highway at Interchange Drive
Traffic Impact Study

HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency	Diane B. Zimmerman Traffic Engineering					Duration, h	0.250								
Analyst	DBZ	Analysis Date	Jun 2, 2021			Area Type	Other								
Jurisdiction		Time Period	PM Peak			PHF	0.97								
Urban Street	Preston Highway		Analysis Year	2032 Build		Analysis Period	1> 4:45								
Intersection	Mt Washington Rd		File Name	PM 32 B Preston.xus											
Project Description	Stern														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				297	191	68	74	135	293	50	813	103	461	1119	529
Signal Information															
Cycle, s	180.0	Reference Phase	2	Green	13.0	19.6	59.0	29.0	28.4	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	Off	Red	3.0	3.0	1.7	2.4	2.4	0.0					
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8	5	2	1	6				
Case Number					9.0		11.0	2.0	3.0	2.0	3.0				
Phase Duration, s					35.0		34.4	19.5	65.0	45.6	91.1				
Change Period, (Y+Rc), s					6.0		6.0	6.5	6.0	6.5	6.0				
Max Allow Headway (MAH), s					5.1		4.2	4.0	0.0	4.0	0.0				
Queue Clearance Time (gs), s							28.2	6.9		42.1					
Green Extension Time (ge), s					0.0		0.2	0.0	0.0	0.0	0.0				
Phase Call Probability							1.00	1.00		1.00					
Max Out Probability							1.00	0.02		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				245	258	70		215	302	52	838	106	450	1092	516
Adjusted Saturation Flow Rate (s), veh/h/in				1795	1853	1610		1823	1598	1810	1795	1598	1795	1781	1572
Queue Service Time (gs), s				23.7	24.3	6.3		20.2	26.2	4.9	36.9	6.6	40.1	28.0	17.5
Cycle Queue Clearance Time (gc), s				23.7	24.3	6.3		20.2	26.2	4.9	36.9	6.6	40.1	28.0	17.5
Green Ratio (g/C)				0.17	0.17	0.24		0.16	0.38	0.07	0.33	0.49	0.22	0.47	0.63
Capacity (c), veh/h				299	309	376		298	599	131	1177	776	400	1683	997
Volume-to-Capacity Ratio (X)				0.819	0.836	0.187		0.723	0.504	0.394	0.712	0.137	1.126	0.649	0.518
Back of Queue (Q), ft/in (95th percentile)				456	484.7	117.7		394.1	401.3	104.8	596.1	116.6	846.1	273.4	117.6
Back of Queue (Q), veh/in (95th percentile)				18.1	19.1	4.7		15.4	15.9	4.2	23.7	4.6	33.6	10.8	4.6
Queue Storage Ratio (RQ) (95th percentile)				1.82	1.62	0.59		1.97	0.00	0.49	0.00	0.83	1.17	0.00	0.67
Uniform Delay (d1), s/veh				72.4	72.6	55.3		71.4	43.4	79.7	53.1	25.5	71.2	16.3	5.4
Incremental Delay (d2), s/veh				16.8	18.4	0.3		8.6	0.7	1.9	3.7	0.4	69.6	0.8	0.8
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
Control Delay (d), s/veh				89.2	91.0	55.6		80.0	44.0	81.7	56.7	25.9	140.8	17.1	6.1
Level of Service (LOS)				F	F	E		F	D	F	E	C	F	B	A
Approach Delay, s/veh / LOS				85.9	F	59.0	E	54.7	D	41.4	D				
Intersection Delay, s/veh / LOS				52.9						D					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.48	B	2.49	B	1.95	B	2.12	B				
Bicycle LOS Score / LOS				1.43	A	1.34	A	1.31	A	2.28	B				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250		
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other		
Jurisdiction		Time Period	AM Peak	PHF	0.90		
Urban Street	Preston Highway	Analysis Year	2032 Build	Analysis Period	1> 7:15		
Intersection	Interchange Drive	File Name	AM 32 B Preston no rro.xus				
Project Description	Stern No RI/ro						

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	62	24	16	186	16	157	11	1270	228	112	683	161

Signal Information				Signal Timing (s)																				
Cycle, s	150.0	Reference Phase	2	Green	6.0	6.1	82.9	10.0	20.6	0.0	Yellow	3.5	0.0	4.3	3.6	3.6	0.0	Red	3.0	0.0	1.6	2.4	2.4	0.0
Offset, s	0	Reference Point	End	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On
Uncoordinated	No	Simult. Gap E/W	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On
Force Mode	Fixed	Simult. Gap N/S	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On	On

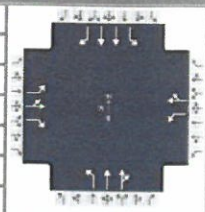
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		10.0	2.0	4.0	2.0	3.0
Phase Duration, s		16.0		26.6	12.5	88.8	18.6	94.9
Change Period, (Y+R _c), s		6.0		6.0	6.5	5.9	6.5	5.9
Max Allow Headway (MAH), s		4.0		4.1	4.0	0.0	4.0	0.0
Queue Clearance Time (g _s), s		7.9		19.3	3.1		11.9	
Green Extension Time (g _e), s		0.3		1.3	0.0	0.0	0.3	0.0
Phase Call Probability		1.00		1.00	1.00		0.99	
Max Out Probability		0.00		0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	69	27	18	207	192		11	794	767	121	738	174
Adjusted Saturation Flow Rate (s), veh/h/ln	1711	1900	1359	1810	1633		1527	1856	1758	1810	1724	1585
Queue Service Time (g _s), s	5.9	2.0	1.8	16.7	17.3		1.1	45.2	46.1	9.9	16.6	6.3
Cycle Queue Clearance Time (g _c), s	5.9	2.0	1.8	16.7	17.3		1.1	45.2	46.1	9.9	16.6	6.3
Green Ratio (g/C)	0.07	0.07	0.11	0.14	0.14		0.04	0.55	0.55	0.08	0.59	0.66
Capacity (c), veh/h	114	127	145	248	224		61	1025	971	146	2047	1047
Volume-to-Capacity Ratio (X)	0.604	0.211	0.123	0.833	0.859		0.188	0.774	0.789	0.827	0.361	0.166
Back of Queue (Q), ft/ln (95 th percentile)	127.4	44	32.2	316	302.5		23.4	557.5	516.9	209.8	269.4	96.9
Back of Queue (Q), veh/ln (95 th percentile)	4.8	1.8	1.1	12.6	12.1		0.8	21.8	20.7	8.4	10.3	3.8
Queue Storage Ratio (RQ) (95 th percentile)	0.32	0.00	0.54	0.00	0.00		0.09	0.00	0.00	2.10	0.00	0.32
Uniform Delay (d ₁), s/veh	68.1	66.3	60.6	63.0	63.3		72.5	19.6	18.9	67.9	15.8	9.7
Incremental Delay (d ₂), s/veh	5.1	0.8	0.4	7.2	9.2		0.7	3.0	3.4	10.4	0.5	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
Control Delay (d), s/veh	73.1	67.1	61.0	70.2	72.5		73.2	22.5	22.3	78.3	16.2	10.0
Level of Service (LOS)	E	E	E	E	E		E	C	C	E	B	B
Approach Delay, s/veh / LOS	69.8		E	71.3		E	22.8		C	22.5		C
Intersection Delay, s/veh / LOS	30.6						C					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.32		B	2.49		B	1.91		B	2.09		B
Bicycle LOS Score / LOS	0.67		A	1.15		A	1.87		B	1.36		A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Diane B. Zimmerman Traffic Engineering			Duration, h	0.250
Analyst	DBZ	Analysis Date	Jun 2, 2021	Area Type	Other
Jurisdiction		Time Period	PM Peak	PHF	0.98
Urban Street	Preston Highway	Analysis Year	2032 Build	Analysis Period	1> 4:45
Intersection	Interchange Dr	File Name	PM 32 B Preston No riro.xus		
Project Description	Stern No r/ro				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	183	25	50	168	14	95	17	1235	152	144	1877	164

Signal Information				Signal Timing (s)									
Cycle, s	180.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	3.5	6.2	92.5	25.0	22.0	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	1.6	2.4	2.4	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		9.0		10.0	2.0	4.0	2.0	3.0
Phase Duration, s		31.0		28.0	10.0	98.4	22.6	111.0
Change Period, (Y+Rc), s		6.0		6.0	6.5	5.9	6.5	5.9
Max Allow Headway (MAH), s		4.0		3.1	4.0	0.0	3.0	0.0
Queue Clearance Time (gs), s		19.8		18.5	3.7		16.0	
Green Extension Time (ge), s		0.6		0.4	0.0	0.0	0.2	0.0
Phase Call Probability		1.00		1.00	0.58		1.00	
Max Out Probability		0.04		0.00	0.00		0.00	

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	187	26	51	171	111		17	722	700	141	1836	160
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1900	1610	1810	1642		1810	1885	1813	1810	1781	1598
Queue Service Time (gs), s	17.8	2.1	5.0	16.5	11.5		1.7	52.0	50.6	14.0	78.5	4.6
Cycle Queue Clearance Time (gc), s	17.8	2.1	5.0	16.5	11.5		1.7	52.0	50.6	14.0	78.5	4.6
Green Ratio (g/C)	0.14	0.14	0.16	0.12	0.12		0.02	0.51	0.51	0.09	0.58	0.72
Capacity (c), veh/h	251	264	255	221	201		35	968	931	162	2079	1155
Volume-to-Capacity Ratio (X)	0.743	0.097	0.200	0.775	0.554		0.497	0.746	0.752	0.868	0.883	0.139
Back of Queue (Q), ft/ln (95 th percentile)	340.3	46.2	92	308.7	210.9		38.9	730.7	661.5	269.4	1011.6	64.8
Back of Queue (Q), veh/ln (95 th percentile)	13.6	1.8	3.7	12.3	8.4		1.6	29.0	28.5	10.8	39.8	2.6
Queue Storage Ratio (RQ) (95 th percentile)	0.85	0.00	1.53	0.00	0.00		0.16	0.00	0.00	2.69	0.00	0.22
Uniform Delay (d1), s/veh	74.4	67.6	65.9	76.6	74.4		88.1	30.5	27.5	88.2	30.0	6.1
Incremental Delay (d2), s/veh	8.4	0.2	0.4	3.0	0.9		6.4	3.2	3.4	3.7	4.1	0.2
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
Control Delay (d), s/veh	82.8	67.8	66.2	79.6	75.3		94.5	33.7	30.9	91.9	34.1	6.3
Level of Service (LOS)	F	E	E	E	E		F	C	C	F	C	A
Approach Delay, s/veh / LOS	78.2	E	E	77.9	E		33.1	C	C	35.8	D	
Intersection Delay, s/veh / LOS	40.5						D					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.33	B		2.49	B		1.92	B		2.10	B	
Bicycle LOS Score / LOS	0.92	A		0.95	A		1.67	B		2.33	B	

Date: September 29, 2021

Parking Spaces Site	41		56		44		24		21							
	Costco	3,400	Kohls	4,000	North	4,500	At the pumps	20	South	4,500	At the pumps	24	Ichobod	4,000	At the pumps	20
Time	Chick Fil A	Time	Chick Fil A	Time	Thorntons	Time	Thorntons	Time	Thorntons	Time	Thorntons	Time	Thorntons	Time	Thorntons	Time
10:18	21	10:41	16	10:14	14	2	10:16	5	3	10:36	12	7				
11:59	17	11:00	14	11:58	13	7	11:57	14	9	11:01	11	3				
12:11	17	12:40	19	12:07	12	7	12:03	13	7	12:37	10	11				
1:59	23	1:00	17	1:55	19	9	1:57	9	10	1:03	8	6				
2:01	23	2:22	11	2:05	15	10	2:09	8	1	2:25	6	5				
3:26	23	3:02	10	3:21	15	9	3:24	9	4	3:00	6	7				
4:05	18	4:24	15	4:00	13	10	4:03	8	3	4:31	4	5				
5:39	25	5:04	11	5:32	15	9	5:36	5	2	5:00	6	6				
Average	20.9		14.1		14.5		8.9		7.9							
Peak Use	25		19		19		14		12							
85th Percentile	23		17		15		13		11							
Peak per sq ft	7.35		4.75		4.22		3.11		3.00							

ITE 5th Ed Parking Site	934 Fast Food w/ Drive-Thru	960 Super Convenience with Gas
Site from above	1 2	1 2 3
Average	8.66 29	36 32
85th Percentile	13.78 47	50 45

Calculations for Stern Site using ITE Parking Manual 85th Percentile for Max

5,240	72	4,500	50
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- 1 Chick Fil A 3420 Bardstown Road in front of Costco 1 Thornton's 3255 Bardstown Road
- 2 Chick Fil A 7901 Bardstown Road at Kohl's 2 Thornton's 3300 Bardstown Road
- 3 Thornton's 7920 Bardstown Road

17	10	12	5	4
17	11	13	5	6
18	11	13	8	6
21	14	14	8	6
23	15	15	9	8
23	16	15	9	10
85th Percentile 23	17	15	13	11
25	19	19	14	12
6.8				

Date: September 29, 2021

Parking Spaces Site	41		56		44		24		21			
	Costco 3,400	Kohls 4,000	North 4,500	South 4,500	At the pumps	Thorntons Time	Thorntons Time	At the pumps	Ichobod Time	Thorntons Time		
Time	Chick Fil A	Chick Fil A	Thorntons	Thorntons						At the pumps		
10:18	21	10:41	16	10:14	14	2	10:16	5	3	10:36	12	7
11:59	17	11:00	14	11:58	13	7	11:57	14	9	11:01	11	3
12:11	17	12:40	19	12:07	12	7	12:03	13	7	12:37	10	11
1:59	23	1:00	17	1:55	19	9	1:57	9	10	1:03	8	6
2:01	23	2:22	11	2:05	15	10	2:09	8	1	2:25	6	5
3:26	23	3:02	10	3:21	15	9	3:24	9	4	3:00	6	7
4:05	18	4:24	15	4:00	13	10	4:03	8	3	4:31	4	5
5:39	25	5:04	11	5:32	15	9	5:36	5	2	5:00	6	6
Average	20.9		14.1	14.5				8.9			7.9	
Peak Use	25		19	19				14			12	
85th Percentile	23		17	15				13			11	
Peak per sq ft	7.35		4.75	4.22				3.11			3.00	

ITE 5th Ed Parking	934 Fast Food w/ Drive-Thru		960 Super Convenience with Gas			
Site from above	1	2	Site from above	1	2	3
Average	8.66	29	35	8.11	36	32
85th Percentile	13.78	47	55	11.15	50	45

Calculations for Stern Site using ITE Parking Manual 85th Percentile for Max

5,240	72
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4,500	50
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- | | | | |
|---------------|--|--------------|---------------------|
| 1 Chick Fil A | 3420 Bardstown Road in front of Costco | 1 Thornton's | 3255 Bardstown Road |
| 2 Chick Fil A | 7901 Bardstown Road at Kohl's | 2 Thornton's | 3300 Bardstown Road |
| | | 3 Thornton's | 7920 Bardstown Road |

85th Percentile Determination of Counts			
17	10	12	4
17	11	13	6
18	11	13	6
21	14	14	6
23	15	15	8
23	16	15	10
23	17	15	11
25	19	19	12
6.8			

Parking Study for Chick Fil A

On September 29, 2021 and October 12, 2021, parking studies were conducted at the following locations:

- St. Matthews Chick Fil A, located at 5001 Shelbyville Road from 9:00 am to 8:00 pm.
- Fern Creek Chick Fil A, located at 3420 Bardstown Road from 10:00 am to 5:30 pm.
- Hikes Point Chick Fil A, located at 7901 Bardstown Road from 10:30 am to 5:00 pm.

The results of these parking studies are set forth below, which included the offsite employee parking that was leased by the above-named Chick Fil A.

Date: **October 12, 2021** **September 29, 2021** **September 29, 2021**

Time	CFA - St. Matthews	Time	CFA - Fern Creek	Time	CFA - Hikes Point
9:05	27				
10:02	29	10:18	21	10:41	16
11:00	36	11:59	17	11:00	14
12:11	63	12:11	17	12:40	19
1:10	52	1:59	23	1:00	17
2:01	44	2:01	23	2:22	11
3:05	46	3:26	23	3:02	10
4:05	27	4:05	18	4:24	15
5:05	44	5:39	25	5:04	11
6:00	37				
7:06	46				
8:10	31				
Average	41.36		20.9		14.1

